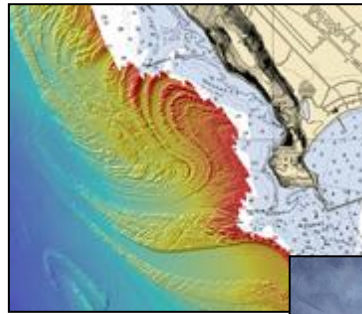


**MITIGATED NEGATIVE DECLARATION  
LOW ENERGY OFFSHORE GEOPHYSICAL  
PERMIT PROGRAM UPDATE**

Public Draft July 2013



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## LIST OF ACRONYMS AND ABBREVIATIONS

### UNITS OF MEASUREMENT

° N	degrees north	kn	knot(s); nautical mile per hour
° S	degrees south		
0-p	zero-to-peak	kW	kilowatt(s)
μPa	microPascal(s)	L	liter(s)
μPa <sup>2</sup>	microPascal(s) squared	lb	pound(s)
μsec or μs	microsecond(s)	lb/d	pound(s) per day
bbl	barrel(s)	lb/hr	pound(s) per hour
cm	centimeter(s)	m	meter(s)
CY	cubic yard(s)	m <sup>2</sup>	square meter(s)
dB	decibel(s)	mg	milligram
dB re 1 μPa	decibel referenced to one microPascal	mgd	million gallon(s) per day
ft	foot/feet	mi	mile(s)
gal	gallon(s)	mi <sup>2</sup>	square mile(s)
gph	gallons per hour	min	minute(s)
hr	hour(s)	mL	milliliter(s)
Hz	hertz (cycles per second)	mph	miles per hour
in	inch(es)	msec or ms	millisecond(s)
kHz	kilohertz	MT	metric tons
kJ	kiloJoule(s)	nm	nautical mile(s)
km	kilometer(s)	ppm	part(s) per million
		s or sec	second(s)

### OTHER ACRONYMS AND ABBREVIATIONS

<b>A</b>	AB	Assembly Bill
	ACOE	(U.S.) Army Corps of Engineers
	ADCP	Acoustic Doppler Current Profiler
	AFSC	Alaska Fisheries Science Center
	AHI	acute hazard index
	AIS	aquatic invasive species
	APCD	Air Pollution Control District
	AQMD	Air Quality Management District
	ASBS	area(s) of special biological significance
	ATOC	Acoustic Thermometry of Ocean Climate
	avg	average
<b>B</b>	BACT	Best Available Control Technology
	BAR	behavior avoidance reaction(s)
	BOEM	Bureau of Ocean Energy Management
	BSEE	Bureau of Safety and Environmental Enforcement
<b>C</b>	C14	carbon-14
	CA	California
	CAA	U.S. Clean Air Act
	CAAQS	California Ambient Air Quality Standards
	CalCOFI	California Cooperative Fisheries Investigations
	CAPCOA	California Air Pollution Control Officer's Association
	CARB	California Air Resources Board

CCC	California Coastal Commission
CDAS	Computer Data Analysis System
CDFG	California Department of Fish and Game
CDFW	California Department of Fish and Wildlife
CDHS	California Department of Health Services
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFGC	California Fish and Game Commission
C.F.R.	Code of Federal Regulations
Ch	chapter
CH <sub>4</sub>	methane
CINMS	Channel Islands National Marine Sanctuary
CN	coastal and/or nearshore
CNEL	community noise equivalent level
CNG	compressed natural gas
CNMI	Commonwealth of the Northern Mariana Islands
CO	carbon monoxide
CO <sub>2</sub>	carbon dioxide
CoOP	Coastal Ocean Processes
CPFV	commercial passenger fishing vessel(s)
CSA	CSA Ocean Sciences Inc.
cSEL	cumulative sound exposure level
CSLC	California State Lands Commission
CSMP	California Seafloor Mapping Program
CUFES	Continuous Underway Fish Egg Sampler
CWA	Clean Water Act
<b>D</b> D	depleted
DEPM	Division of Environmental Planning and Management
DOT	(U.S.) Department of Transportation
DPS	distinct population segment(s)
<b>E</b> E	endangered (species)
EEZ	exclusive economic zone
EFH	essential fish habitat
EIR	Environmental Impact Report
EO	Executive Order
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit(s)
<b>F</b> Fatho	fathometer
FC	Federal, candidate (species)
FDB	Food and Drug Branch
FE	Federal, endangered (species)
FESA	Federal Endangered Species Act
FMC	Fishery Management Council
FMP	Fishery Management Plan
FOCI	Fisheries-Oceanography Coordinated Investigations
FP	fully protected, State
FR	Federal Register
FT	Federal, threatened (species)
<b>G</b> GHG	greenhouse gas(es)
GIS	geographic information system

	GRT	gross register tons
<b>H</b>	H	horizontal
	H <sub>2</sub> S	hydrogen sulfide
	HAB	harmful algal bloom
	HAPC	Habitat Area(s) of Particular Concern
	HESS	High Energy Seismic Survey (Committee)
	HF	high frequency; M-weighting; also shown as M <sub>hf</sub>
<b>I</b>	IBA	Important Bird Area
	IIS	Ichthyoplankton Information System
	IPI	inter-pulse interval
	IS	initial study
<b>L</b>	LCP	Local Coastal Program(s)
	Ldn	day/night average sound level
	LF	low frequency; M-weighting; also shown as M <sub>lf</sub>
	LME	Large Marine Ecosystem
	LNG	liquefied natural gas
	LNM	Local Notice to Mariners
	LOA	length overall
	LTER	Long Term Ecological Research
<b>M</b>	M/S	merchant ship
	M/V	merchant vessel
	Mag	magnetometer
	MBES	multibeam echosounder
	MBNMS	Monterey Bay National Marine Sanctuary
	MBTA	Migratory Bird Treaty Act
	MF	mid-frequency; M-weighting; also shown as M <sub>mf</sub>
	MHTL	Mean High Tide Line
	MLPA	Marine Life Protection Act
	MM	mitigation measure
	MMA	marine managed area(s)
	MMP	mitigation monitoring program/plan
	MMPA	Marine Mammal Protection Act
	MMS	Minerals Management Service
	MND	mitigated negative declaration
	MOCNESS	Multiple Opening/Closing Net and Environmental Sensing System
	MPA	Marine Protected Area(s)
	MPRSA	Marine Protection, Research and Sanctuaries Act
	MSA	Magnuson-Stevens Fisheries Conservation and Management Act
	MSD	marine sanitation device
	MSDS	material safety data sheet(s)
	MWCP	Marine Wildlife Contingency Plan
	MWM	Marine Wildlife Monitor
<b>N</b>	N <sub>2</sub> O	nitrous oxides
	NA	not applicable
	NAAQS	National Ambient Air Quality Standards
	NCCOS	National Centers for Coastal Ocean Science
	ND	no data
	NHPA	National Historic Preservation Act
	NMFS	National Marine Fisheries Service
	NMS	National Marine Sanctuary

	NO <sub>2</sub>	nitrogen dioxide
	NOAA	National Oceanic and Atmospheric Administration
	NPDES	National Pollutant Discharge Elimination System
	NPS	National Park Service
	NRC	National Research Council
	NRHP	National Register of Historic Places
	NS/ND	not a strategic stock/not depleted under MMPA
	NSF	National Science Foundation
	NVIC	Navigation & Vessel Inspection Circular
<b>O</b>	O	offshore
	O <sub>3</sub>	ozone
	OBSSEAMAP	Ocean Biogeographic Information System Spatial Ecological Analysis of Megavertebrate Populations
	OCS	outer continental shelf
	OGPP	Offshore Geophysical Permit Program
	OPA/OPA 90	Oil Pollution Act of 1990
	OPC	Ocean Protection Council
	OR	Oregon
	OSCP	oil spill contingency plan
	OSHA	Occupational Safety and Health Administration
	OSPAR	Oslo and Paris (Convention); Convention for the Protection of the Marine Environment of the North-East Atlantic
	OSPRA	(Lempert-Keene-Seastrand) Oil Spill Prevention and Response Act
<b>P</b>	P	protected
	PAH	polycyclic aromatic hydrocarbon(s)
	PAR	photosynthetically active radiation
	Pb	lead
	PBR	potential biological removal
	PCO <sub>2</sub>	partial carbon dioxide
	PEIR	programmatic environment impact report
	PFMC	Pacific Fishery Management Council
	PM <sub>10</sub>	particulate matter less than 10 microns in aerodynamic diameter
	PM <sub>2.5</sub>	particulate matter less than 2.5 microns in aerodynamic diameter
	p-p	peak-to-peak
	PRBO	Point Reyes Bird Observatory
	PTS	permanent threshold shift
	PW	pinnipeds (in water); M-weighting; also shown as M <sub>pw</sub>
<b>R</b>	R <sub>95%</sub>	radius, 95%
	R <sub>max</sub>	radius, maximum
	rms	root mean squared
	RO	reverse osmosis
	ROC	reactive organic compound(s)
	ROV	remotely operated vehicle
	RRT	regional response team
	RWQCB	Regional Water Quality Control Board
<b>S</b>	S	strategic stock
	SB	Senate Bill
	SBES	single beam echosounder
	SBP	subbottom profiler
	SCB	Southern California Bight

SCCOOS	Southern California Coastal Ocean Observing System
SCP	scientific collecting permit
SDSS	spatial decision support system
SE	State, endangered (species)
SEL	sound exposure level
SERDP	Strategic Environmental Research and Development Program
SF	San Francisco
Si(OH) <sub>4</sub>	silicic acid/silicate
SIP	State Implementation Plan
SMCA	State Marine Conservation Area
SMP	State Marine Park
SMR	State Marine Reserve
SMRMA	State Marine Resource Management Area
SO <sub>2</sub>	sulfur dioxide
SO <sub>4</sub>	sulfates
Spark	sparker
SPL	sound pressure level
spp.	species, indeterminate
SR	State Route
SSC	species of special concern
SSS	side-scan sonar
ST	State, threatened (species)
Stat.	statute
SURTASS LFA	Surveillance Towed Array Sensor System, Low Frequency Active
SWPPP	stormwater pollution prevention plan
SWQPA	State water quality protection area
SWRCB	State Water Resources Control Board
<b>T</b>	
T	threatened
TAC	toxic air contaminant(s)
TCP	Traditional Cultural Properties
TMDL	total maximum daily load
TSS	traffic separation scheme
TTS	temporary threshold shift
<b>U</b>	
UCSD/SIO	University of California, San Diego, Scripps Institution of Oceanography
ULSD	ultra-low sulfur diesel
uEcho	unspecified echosounder
uSBP	unspecified subbottom profiler
USCG	U.S. Coast Guard
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
<b>V</b>	
V	vertical
VOC	volatile organic compound(s)
VPG	vessel general permit
<b>W</b>	
WERC	Western Ecological Research Center
WEST	Wind Events and Shelf Transport

## GLOSSARY

The following Glossary provides definitions and, as applicable, examples for acoustic terminology employed in this Mitigated Negative Declaration (MND). Definitions have been derived from several sources associated with underwater acoustics, geophysical equipment, regulatory thresholds, and noise-related impacts, including Ainslie (2011), André et al. (2010), Frankel and Ellison (2011), Hansen (2001), Harland et al. (2005), Marine Mammal Commission (2007), National Marine Fisheries Service (NMFS; 2013), National Oceanic and Atmospheric Administration (NOAA; 2013), Normandeau Associates, Inc. (2012), Richardson et al. (1995), and Scheifele and Darre (2005).

**Auditory brainstem response (ABR)** – An electrophysiological test used to measure hearing sensitivity and evaluate the integrity of ear structures from the auditory nerve through the brainstem.

**Absolute threshold** – The minimum level at which an acoustic signal (e.g., a pure tone) is detectable.

**Acoustic intensity** – The work done per unit area and per unit time by a sound wave on the medium as it propagates. The units of acoustic energy flux are Joules per square meter per second or watts per square meter. The acoustic energy flux is also called the acoustic intensity.

**Ambient noise** – The noise present within the environment; ambient noise can be contributed naturally (e.g., from wind, waves, bubbles, earthquakes) or from anthropogenic sources (e.g., vessel noise, sonars, industrial activity), and can be either local or distant. Some authors limit the term ambient noise to the noise background that has no distinguishable sources. Some researchers define ambient noise as the residual noise when identifiable sources, such as passing vessels, are removed.

**Audiogram** – The measurement of hearing sensitivity (or lowest sound level detectable) at a number of different frequencies in the hearing bandwidth of an organism.

**Auditory Evoked Potential (AEP)** – A physiological method for determining hearing bandwidth and sensitivity of animals without training. Electrodes are placed on the skull to record electrical signals (emitted by the ear and central nervous system) in response to sounds. These signals are low level, and are averaged to raise them above the background electrical noise. AEP provides insight into the frequency range audible to the organisms and to compare the effects of various treatments, such as exposure to high levels of sound.

**Bandwidth** – The range of frequencies over which a sound is produced or received (i.e., the difference between the upper and lower limits of any frequency band).



- 1 **Behavioral disturbance** – When an environmental stimulus (e.g., noise) produces a  
2 change in or alteration of normal behavior. In marine mammals and sea turtles exposed  
3 to anthropogenic sound, behavioral responses may range from changes in surfacing  
4 rates and breathing patterns to active avoidance or escape from the region of highest  
5 sound levels. Responses may also be conditioned by certain factors such as auditory  
6 sensitivity, behavioral state (e.g., resting, feeding, migrating), nutritional or reproductive  
7 condition, habit or desensitization, age, sex, presence of young, proximity to exposure  
8 and distance from the coast. The extent of behavioral disturbance for any given acoustic  
9 signal can vary both within a population as well as within the same individual.
- 10 **Boomer** – A type of subbottom profiler used to acquire medium penetration, seismic  
11 reflection profile data. Typically towed behind or alongside the survey vessel. Generates  
12 a relatively low-frequency acoustic pulse, but higher than those produced by  
13 mini-sparkers.
- 14 **Broadband** – Sounds that cover a wide range of frequencies.
- 15 **Cavitation** – Noise originating from propellers and other fast moving objects in the  
16 water caused when the pressure in the flow around the moving object goes sufficiently  
17 negative, resulting in the production of cavitation bubbles which very quickly collapse,  
18 causing a loud transient sound. The resulting spectrum is broadband but generally has  
19 a peak between 100 Hz (Hertz) and 1 kHz (kilohertz).
- 20 **Chirp** – A type of subbottom profiler used to acquire shallow penetration, high  
21 resolution, seismic reflection profile data. Chirps are typically towed behind or alongside  
22 the survey vessel. A chirp generates a relatively low-frequency acoustic pulse.
- 23 **Community noise equivalent level (CNEL)** – A 24-hour (hr) average noise level  
24 rating, adjusted according to local regulations to account for lower evening noise levels  
25 and/or nighttime noise levels.
- 26 **Continuous sound** – A sound for which the mean square sound pressure is  
27 approximately independent of averaging time. Current National Marine Fisheries  
28 Service (NMFS) acoustic criteria consider three sound types – single pulse, multiple  
29 pulse, and nonpulse, the latter of which equates to continuous. Examples of continuous  
30 noise sources include vessel/aircraft passes, drilling, many construction or other  
31 industrial operations, certain sonar systems (Low-Frequency Active [LFA], tactical  
32 mid-frequency), acoustic harassment/deterrent devices; acoustic tomography sources  
33 (ATOC), and some depth sounder signals.
- 34 **Critical band** – One of a number of contiguous frequency bands into which the  
35 audio-frequency range may be notionally divided, such that sounds in different  
36 frequency bands are heard independently of one another, without mutual interference.

1 An auditory critical band can be defined for various measures of sound perception that  
2 involve frequency.

3 **Cumulative Sound Exposure Level (cSEL)** – The total cumulative energy received by  
4 an organism or object over time in a sound field.

5 **Decibel (dB)** – A logarithmic scale most commonly used in reporting levels of sound.  
6 The actual sound measurement is compared to a fixed reference level and the decibel  
7 value is defined as  $10\log_{10}(\text{actual/reference})$ , where (actual/reference) is a power ratio.  
8 Because sound power is usually proportional to sound pressure squared, the decibel  
9 value for sound pressure is  $20\log_{10}(\text{actual pressure/reference pressure})$ . The standard reference for  
10 underwater sound pressure is 1 micro-Pascal ( $\mu\text{Pa}$ ). The dB symbol is followed by a  
11 second symbol identifying the specific reference value (i.e., dB re 1  $\mu\text{Pa}$ ). The  
12 logarithmic nature of the scale means that each 10-dB increase is a ten-fold increase in  
13 acoustic power; a 20-dB increase represents a 100-fold increase in power and a 30-dB  
14 increase a 1,000-fold increase in power.

15 **Duty cycle** – The proportion of time that a source is emitting acoustic energy.

16 **Echosounder** – Equipment designed to provide specific data regarding site-specific  
17 bathymetry and/or seafloor features (e.g., sediment ridges, rock outcrops, shipwrecks,  
18 underwater cables). This equipment category includes single beam echosounders,  
19 multibeam echosounders, and fathometers. Echosounders emit a short pulse of sound  
20 and listen to reflected energy from the seafloor or targets in the water column (e.g., fish  
21 schools, plankton).

22 **Exclusion zone** – See **Safety zone**.

23 **Far field** – A region far enough away from a source that the sound pressure behaves in  
24 a predictable way, and the particle velocity is related to only the fluid properties and  
25 exists only because of the propagating sound wave.

26 **Fathometer** – A type of echosounder. Fathometers transmit sound through the water  
27 and receive reflected signals from the seafloor; by measuring the elapsed time, the  
28 depth can be computed. In general terms, fathometers and echosounders are  
29 equivalent.

30 **Frequency** – The rate of vibration in cycles per second (Hertz; Hz) or thousands of  
31 cycles per second (kilohertz; kHz). Frequency determines the pitch of the sound: the  
32 higher the number of cycles per second, the higher the pitch. Human hearing ranges  
33 from about 20 to 20,000 Hz.

34 **Frequency weighting** – See **M-weighting**; the application of frequency weighting filters  
35 to account for variable sensitivities between animal groups to various frequencies.

1 **Functional hearing groups** – Approach developed by Southall et al. (2007) for marine  
2 mammals to estimate the lower and upper frequencies of functional hearing. The  
3 frequency range in which each group's hearing is estimated as being most sensitive is  
4 represented in the flat part of the M-weighting functions (see **M-weighting**).

5 **Gravity meter** – An acoustically passive device which measures slight gravity  
6 differences in an area.

7 **Hertz (Hz)** – The units of frequency where 1 Hertz = 1 cycle per second.

8 **Impulse or impulsive sound** – Transient sound produced by a rapid release of energy,  
9 usually electrical or chemical (e.g., circuit breakers, explosives). Impulse sound has  
10 very short duration and variable peak pressure levels relative to a continuous sound of  
11 comparable mean level.

12 **Impulse length** – Impulse length can be specified in many ways; an often used  
13 definition is the time between the accumulation of 5 percent and 95 percent of the total  
14 acoustic energy of a single impulse event.

15 **Infrasound** – Sound at frequencies below the hearing range of humans. These sounds  
16 have frequencies below about 20 Hz.

17 **Intermittent noise** – Noise for which the level drops to the level of the background  
18 noise several times during the period of observation.

19 **Joule (J)** – A measure of energy or work. A joule is the metric (SI)-derived unit equal to  
20 the energy used to accelerate a body with a mass of one kilogram using one newton of  
21 force over a distance of one meter. One joule is also equivalent to one watt-second.  
22 One kilojoule is equal to 1,000 joules.

23 **Kilohertz (kHz)** – One thousand **Hertz**.

24 **Kilojoule (kJ)** – One thousand **Joules**.

25 **Level A harassment** – Under the Marine Mammal Protection Act (MMPA), Level A  
26 harassment is statutorily defined as any act of pursuit, torment, or annoyance which has  
27 the potential to injure a marine mammal or marine mammal stock in the wild.

28 **Level B harassment** – Under MMPA, Level B harassment is statutorily defined as any  
29 act of pursuit, torment, or annoyance which has the potential to disturb a marine  
30 mammal or marine mammal stock in the wild by causing disruption of behavioral  
31 patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or  
32 sheltering but which does not have the potential to injure a marine mammal or marine  
33 mammal stock in the wild.

- 1    **Line spacing** – The distance between parallel survey lines.
- 2    **Lower functional hearing limit** – The lower limit of M-weighting frequency filter.
- 3    **Magnetometer** – An acoustically passive device which measures slight changes in the  
4 earth's magnetic field. Magnetometers are used to locate submerged objects ferrous in  
5 nature.
- 6    **Masking** – The phenomenon of one sound interfering with the perception of another  
7 sound. Masking occurs when increased levels of background or ambient noise reduce  
8 an animal's ability to detect relevant sound (e.g., acoustic signals for communication,  
9 echolocation, or sensing of the marine environment).
- 10   **Mini-sparker** – A type of subbottom profiler that is usually towed 5-10 meters (m)  
11 behind the survey vessel, just beneath the sea surface. Mini-sparkers generate a low-  
12 frequency acoustic pulse. They are used to acquire seismic reflection profile data (i.e.,  
13 shallow features of the seabed). Mini-sparker pulses penetrate further into the seafloor  
14 than other subbottom profilers (e.g., chirp), but data lack the resolution provided by  
15 other systems.
- 16   **M-weighting** – Frequency weighting function proposed by Southall et al. (2007) to  
17 account for differences in auditory capabilities across marine mammal species.  
18 Developed for five functional marine mammal hearing groups; has the same  
19 mathematical structure as C-weighting used in human hearing. M-weighting has been  
20 employed in injury (Level A harassment) assessment, with limited application in  
21 behavioral modification (Level B harassment) evaluations.
- 22   **Multibeam echosounder** – This type of echosounder utilizes multiple beams and  
23 frequencies, producing high-resolution bathymetric data. Because data acquisition  
24 occurs both along the ship's track and between the track lines, 100 percent coverage of  
25 the seafloor is possible. Multibeam echosounders are used to locate topographical  
26 features on the seafloor (e.g., sediment ridges, rock outcrops, shipwrecks, underwater  
27 cables).
- 28   **Multi-component system** – Low energy geophysical survey equipment packages  
29 which contain two or more complementary equipment types (e.g., echosounder,  
30 subbottom profiler, and/or side-scan sonar). Side-scan sonar can be used in conjunction  
31 with an echosounder to provide bathymetry and shallow structure data.
- 32   **Narrowband** – Sounds made up of only a small range of frequencies.
- 33   **Near field** – A region close to a sound source that has either irregular sound pressure  
34 or exponentially increasing sound pressure towards the source, and a high level of  
35 acoustic particle velocity because of kinetic energy added directly to the fluid by motion

of the source. This additional kinetic energy does not propagate with the sound wave. The extent of the near field depends on the wavelength of the sound and/or the size of the source.

**Non-pulse or Nonpulse** – Intermittent or continuous sounds. Non-pulse sounds can be tonal, broadband, or both; they may be of short duration, but without the essential properties of pulses (e.g., rapid rise-time). Examples include vessels, aircraft, machinery operations (e.g., drilling, wind turbines), and many active sonar systems. As a result of propagation, sounds with characteristics of a pulse at the source may lose their pulse-like characteristics at some (variable) distance and can be characterized as non-pulse by certain receivers. Low energy geophysical equipment is classified by NMFS as non-pulse, intermittent (i.e., not continuous) sound source.

**Octave** – A doubling of frequency. One octave above 200 Hz is 400 Hz, whereas one octave below 200 Hz is 100 Hz. The ratio of frequencies in different octaves is 2:1.

**Particle motion** – The displacement of fluid particles created by the forces exerted on the fluid by acoustic pressure in the presence of a sound wave.

**Passive system** – Includes low energy geophysical equipment which does not produce acoustic output; includes magnetometers and gravity meters.

**Peak pressure** – The highest pressure above or below ambient that is associated with a sound wave. Peak sound pressure is the maximum absolute value of the instantaneous sound pressure during a specified time interval. Peak pressure is a useful metric for either pulses or non-pulse sounds, but it is particularly important for characterizing pulses.

**Peak-to-peak (p-p)** – The pressure difference between the maximum positive pressure and the maximum negative pressure in a sound wave. Peak-to-peak SPLs are usually used to describe short, high intensity sounds.

**Permanent threshold shift (PTS)** – A permanent loss of hearing caused by some kind of acoustic or other trauma, or a threshold shift that shows no recovery with time after the apparent cause has been removed. PTS results from irreversible damage to the sensory hair cells of the ear, and thus a permanent loss of hearing.

**Power spectrum** – Because the range of frequencies of a sound source may vary, the sound's frequency bandwidth should be specified and included in the reference units. The units for a power spectrum are dB re  $1\mu\text{Pa}^2/\text{Hz}$ .

**Pulse** – Brief, broadband, atonal and transient sounds, characterized by a relatively rapid rise time to maximum pressure, followed by a decay that may include a period of diminishing and oscillating maximal and minimal pressures (e.g., explosions, gunshots,

sonic booms, seismic airgun pulses, pile driving strikes). Current NMFS acoustic criteria consider three sound types – single pulse, multiple pulse, and nonpulse. Examples of single pulse noise sources include single explosion, sonic boom, single airgun, watergun, pile strike, or sparker pulse, single ping of certain sonars, depth sounders, and pingers. Examples of multiple pulse noise sources include serial explosions, sequential airgun, watergun, pile strikes, or sparker pulses, certain active sonar (IMAPS), and some depth sounder signals.

**Ramp up** – Also termed soft start. The term applied to a low level, initial activation of an acoustic system, followed by a gradual increase in acoustic output to full power over a prescribed period of time. A common sense measure, the efficacy of ramp up has not been fully assessed. Ramp-up techniques starts are commonly used in seismic surveys around the world. In most regions, ramp up is required to be at least 20 minutes before full power is reached and a survey line commenced. The upper limit is generally 30 minutes with some regions going up to 40-45 minutes.

**Received level (RL)** – The level of sound that arrives at a receiver, the latter of which could be a listening device (hydrophone) or an organism.

**Root mean square(d) pressure (rms)** – The average of the squared pressure over some duration. Instantaneous sound pressures (which can be positive or negative) are squared, averaged, and the square root of the average is taken. For non-pulse sounds, the averaging time is any convenient period sufficiently long to permit averaging the variability inherent in the type of sound. Application of rms to pulse sounds is to be conducted with caution.

**Safety zone** – The safety zone (or exclusion zone) is usually defined as the radius around a sound source within which real-time mitigation measures are implemented if animals are detected. Safety or exclusion zones vary considerably in size, depending upon the sound source level of the equipment being used.

**Side-scan sonar** – Side-scan sonar equipment provides detailed imagery of the seafloor and seafloor features. Side-scan sonar can be towed or hull-mounted. This equipment emits conical- or fan-shaped pulses toward the seafloor across a wide angle perpendicular to the path of the sensor through the water. Side-scan data are frequently acquired along with bathymetric soundings and subbottom profiler data, providing a glimpse of the shallow structure of the seabed.

**Single beam echosounder** – This type of echosounder generates a solitary beam at a single low- or high-frequency. This equipment is used to acquire depth information.

**Soft start** – See **Ramp up**.

**Sound attenuation** – Reduction of the level of sound pressure. Sound attenuation occurs naturally as a wave travels in a fluid or solid through dissipative processes (e.g., friction) that convert mechanical energy into thermal energy and chemical energy.

**Sound exposure level (SEL)** – An energy metric that integrates the squared instantaneous sound pressure over a stated time interval (e.g., one second). The constant sound level acting for one second, which has the same amount of acoustic energy, as indicated by the square of the sound pressure, as the original sound. It is the time-integrated, sound-pressure-squared level. SEL is typically used to compare transient sound events having different time durations, pressure levels, and temporal characteristics. The SEL measure represents the cumulative (not average) sound exposure during a particular noise event, integrated with respect to a one second time frame. The units for SEL are dB re: 1  $\mu\text{Pa}^2\text{-s}$ .

**Sound exposure level (SEL) metric** – A value that characterizes a sound by some measure of its energy content.

**Sound exposure spectral density** – The relative energy in each narrow band of frequency that results from the Fast Fourier Transform (FFT, a mathematical operation that is used to express data recorded in the time domain as a function of frequency) of a transient waveform. It is a measure of the frequency distribution of a transient signal.

**Sound pressure level (SPL)** – An expression of the sound pressure using the decibel (dB) scale and the standard reference pressures of 1  $\mu\text{Pa}$  for water and biological tissues, and 20  $\mu\text{Pa}$  for air and other gases. Sound pressure is the force per unit area exerted by a sound wave above and below the ambient or static equilibrium pressure; also called acoustic pressure. The units of pressure are pounds per square inch (psi) or, in the SI system of units, Pascals (Pa). In underwater acoustics, the standard reference is one-millionth of a Pascal, or a microPascal (1  $\mu\text{Pa}$ ). The commonly used reference pressure level in underwater acoustics is 1  $\mu\text{Pa}$ , and the units for SPLs are dB re: 1  $\mu\text{Pa}$ . SPL is an instantaneous pressure measurement and can be expressed as the peak, the peak-peak, or the root mean square (rms). The conventional definition of sound pressure level is in terms of root mean square pressure (rms).

**Source level** – The source level characterizes the sound power radiated by an underwater sound source expressed in decibels. Source level is often expressed as the SPL at a standard reference distance from a point monopole, placed in a lossless uniform medium and extending to infinity in all directions. Underwater acoustic source levels are typically defined as the acoustic pressure at 1 m distance from a point source, expressed as dB re 1  $\mu\text{Pa}$  @ 1 m or dB re 1  $\mu\text{Pa-m}$ .

**Spectrum** – A graphical display of the contribution of each frequency component contained in a sound.

**Subbottom profiler** – Equipment which produces seismic reflection profile data, or information regarding the shallow subsurface structure of the seafloor. Subbottom profilers include several different devices, including mini-sparkers, boomers, chirp, and general subbottom profiler systems.

**Temporary threshold shift (TTS)** – A threshold shift that shows a recovery with the passage of time after the apparent cause has been removed. TTS is a temporary loss of hearing as a result of exposure to sound over time. Exposure to high levels of sound over relatively short time periods will cause the same amount of TTS as exposure to lower levels of sound over longer time periods. The mechanisms underlying TTS have been associated with temporary damage to the sensory hair cells. The duration of TTS varies depending on the nature of the stimulus, but there is generally recovery of full hearing over time.

**Threshold** – The threshold generally represents the lowest signal level an animal will detect in some statistically predetermined percent of presentations of a signal. Most often, the threshold is the level at which an animal will indicate detection 50 percent of the time. Auditory thresholds are the lowest sound levels detected by an animal at the 50 percent level.

**Tone** – Sound of a constant frequency that continues for a substantial time.

**Transient sound** – A sound of finite duration for which the sound exposure becomes independent of integration time when the integration time exceeds that duration.

**Transmission loss (TL)** – Energy losses as the pressure wave, or sound, travels through the water; the associated wavefront diminishes due to the spreading of the sound over an increasingly larger volume and the absorption of some of the energy by seawater.

**Upper functional hearing limit** – The upper limit of M-weighting frequency filter.

**Zero-to-peak (0-p)** – The pressure difference between zero and the maximum positive (or maximum negative) pressure in a sound wave.



This Mitigated Negative Declaration (MND) has been prepared by the California State Lands Commission (CSLC), as lead agency under the California Environmental Quality Act (CEQA) (Pub. Resources Code, § 21000 et seq.), to analyze and disclose the environmental effects associated with low energy geophysical survey activities conducted under the proposed Offshore Geophysical Permit Program Update (OGPP or Project). The CSLC prepared an MND because it determined that, while the Initial Study identified potentially significant impacts related to activities that may be carried out by individual applicants under the OGPP, project revisions and/or survey activity requirements have been incorporated into the Project that avoid or mitigate those impacts to a point where no significant impacts would occur.

The CSLC is the Lead Agency for preparation of the MND pursuant to the California Environmental Quality Act (CEQA), given the oversight responsibilities of the CSLC with regards to the OGPP. The CSLC has been the State agency with jurisdiction over geophysical survey activities in State waters since 1941 when the State Legislature added section 6826 to the Public Resources Code to allow the CSLC to adopt regulations and grant permits for geophysical activity. The CSLC has issued permits to conduct geophysical survey activities in some form since 1945.

## PROJECT LOCATION/REGIONS

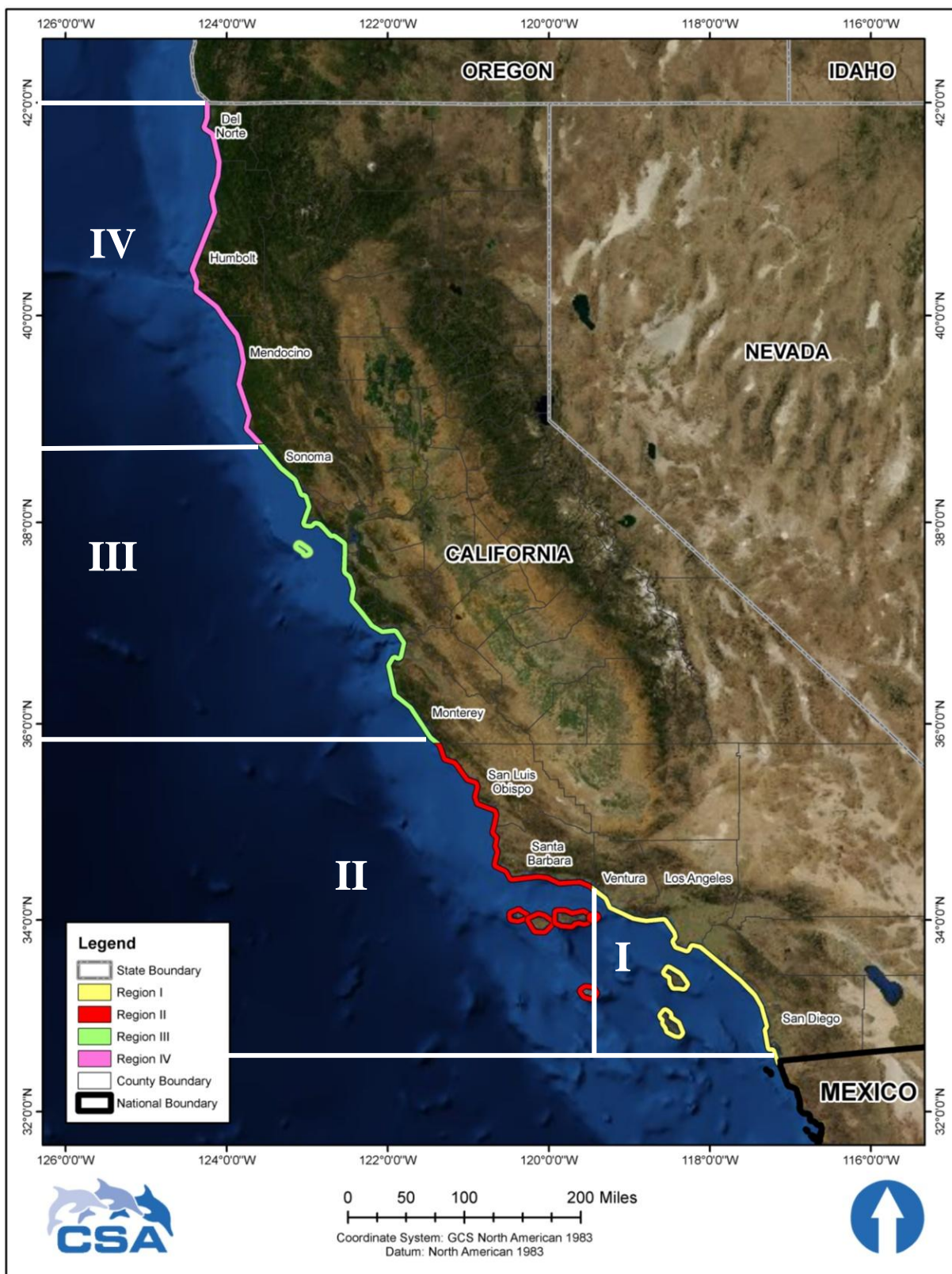
The CSLC issues permits to conduct geophysical surveys on sovereign lands in State waters, which include ungranted tide and submerged lands adjacent to the coast and offshore islands of the State between the Mexico and Oregon borders from the mean high-tide line to 3 nautical miles (nm) offshore. For purposes of this MND and the CSLC's administration of the OGPP, State waters are divided into four separate regions (**Figure ES-1**). Region designations and boundaries are defined as follows:

<b>Region I</b>	The area between the California-Mexico border and Los Angeles/Ventura County line.
<b>Region II</b>	The area between the Los Angeles/Ventura County line and Santa Barbara/San Luis Obispo County line.
<b>Region III</b>	The area between the San Luis Obispo/Monterey County line and Sonoma/Mendocino County line, excluding San Francisco, San Pablo, and Suisun Bays.
<b>Region IV</b>	The area between the Sonoma/Mendocino County line and the California-Oregon border.

The major variance from one region to another is the listing of individuals and agencies that must be notified prior to initiation of such activities and also locations at which such notices must be posted.

1  
2

**Figure ES-1. Regions Delineated under CSLC Offshore Geophysical Permit Program**



## 1 NEED FOR PROJECT

2 Pursuant to its general duties under Division 6 of the Public Resources Code, and the  
 3 specific authority provided in Public Resources Code section 6826, the CSLC issues  
 4 geophysical permits in State waters to qualified permittees for the use of low energy  
 5 geophysical equipment to perform geophysical surveys of the ocean bottom, subject to  
 6 specified terms and conditions.<sup>1</sup> These activities are also regulated under California  
 7 Code of Regulations, division 3, chapter 1, article 2.9, section 2100. Under Division 6 of  
 8 the Public Resources Code, the CSLC holds sovereign lands in the Public Trust. Under  
 9 the Public Trust Doctrine, uses of trust lands administered by the CSLC directly are  
 10 generally limited to those that are water dependent or related, and include commerce,  
 11 fisheries, and navigation, environmental preservation and recreation; Public Trust lands  
 12 may also be kept in their natural state for habitat, wildlife refuges, scientific study, or  
 13 open space (CSLC Public Trust Policy, [www.slc.ca.gov](http://www.slc.ca.gov); click on the “Information” and  
 14 “Statements” links).

15 Geophysical surveys conducted under CSLC permits use data-gathering methods that  
 16 follow a pre-defined course or spatial grid (i.e., a survey), and obtain critical data on a  
 17 variety of ocean resources and uses. Areas of study and survey objectives include, but  
 18 are not limited to:

- 19 • Scientific research, including surveys of near-shore sand erosion and deposition,  
 20 seafloor changes, and seafloor topography and bathymetry;
- 21 • Surveying existing pipelines to assess any structural damage, corrosion, or  
 22 spanning that could lead to a pollutant release;
- 23 • Identifying and avoiding seafloor hazards and faults when designing pipeline-  
 24 and cable-laying projects, reducing the likelihood of dangerous leaks, ruptures  
 25 and breakages;
- 26 • Surveying existing fiber-optic cables and other seafloor structures to determine  
 27 how well they are buried or if they can be snagged by fishing gear; and
- 28 • Developing maps of hard bottom and essential fish habitat or cultural resources  
 29 indicating where the placement of permanent or temporary objects (e.g., cables  
 30 or anchors) should be precluded.

31 The CSLC has proposed the OGPP Update as a means to develop and implement a  
 32 revised permitting structure for offshore geophysical surveys. The intent of the Update is  
 33 to establish consistent guidance, limitations, and permit conditions to ensure that the

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<sup>1</sup> For reference, a copy of a generic CSLC geophysical permit can be viewed online at [www.slc.ca.gov/Division\\_Pages/MRM/Program\\_Project\\_and\\_Updates/Geophysical\\_Permit\\_Program/generic\\_permit.pdf](http://www.slc.ca.gov/Division_Pages/MRM/Program_Project_and_Updates/Geophysical_Permit_Program/generic_permit.pdf) (accessed May 2013).

activities of permittees do not result in a significant effect on the environment. To ensure a transparent and rigorous analysis, CSLC staff has contracted with the California Ocean Science Trust (OST) to conduct a peer review of the MND's underwater noise analysis by subject-matter experts.

## **PROPOSED PROJECT**

Under the proposed OGPP, the CSLC would issue geophysical permits for general offshore (statewide) geophysical operations. Historically, these statewide permits were issued for a three-year period; however, permits issued within the last several years have been limited to one year in order to more frequently evaluate each permit in light of the emerging science related to acoustic effects on the marine environment. Because there is no provision in the Public Resources Code for permit renewal, geophysical permits must be reassessed and reissued upon expiration. Under the proposed OGPP, the CSLC would issue permits for a maximum of three years, subject to review and reassessment during the permit term at the discretion of the CSLC.

The CSLC's current general geophysical survey permit requires compliance with all provisions therein, including, but not limited to, provisions that require the permittee to:

- 1) Notify CSLC staff at least 15 days in advance of any survey activity;
- 2) Notify parties listed in the permit at least 15 days in advance of any survey activity;
- 3) Notify CSLC staff at least 14 days before initiating nighttime operations (including measures that will be implemented to ensure avoidance of impacts to marine mammals and reptiles);
- 4) Provide a National Oceanic and Atmospheric Administration (NOAA)-approved marine wildlife monitor aboard the survey vessel to be present during all survey operations (including transit to and from port);
- 5) Develop and submit to CSLC staff for review and approval an Oil Spill Contingency Plan (OSCP) that addresses accidental releases of petroleum and/or non-petroleum products during survey operations;
- 6) Develop a Marine Wildlife Contingency Plan (MWCP) that includes, at a minimum (the CSLC added this MWCP requirement in August 2008):
  - Measures that specify the distance, speed, and direction transiting vessels would maintain when in proximity to a marine mammal or reptile;
  - Qualifications, number, location, and authority of onboard marine mammal and reptile monitors;
  - Methods to reduce noise levels generated by geophysical equipment; and

- Reporting requirements in the event of an observed impact to marine organisms;

7) Provide CSLC staff at least 14 days prior to the survey a summary listing of all geophysical survey equipment to be used including equipment make and model, decibel (dB) level(s) referenced (re) to 1 microPascal (1  $\mu$ Pa), frequencies (hertz [Hz], kilohertz [kHz]), and length of time the equipment will operate;

8) Comply with future CSLC directions and requests (e.g., request for additional equipment information; preclusion of specific equipment); and

9) In order to avoid cumulative effects, schedule survey operations so that if several types of survey equipment are needed for a given survey project, the different equipment does not transmit simultaneously unless designed to do so (e.g., multi-component systems).

A variety of equipment may be employed during a low energy geophysical survey, depending upon survey purpose. Low energy geophysical survey equipment can be categorized according to the type of data being acquired. The OGPP expressly prohibits use of any air or water compression devices (e.g., airguns, water guns) for generating acoustic pulses. In general, low energy geophysical survey equipment can be broadly divided into five categories (see the **Glossary** following the Table of Contents for definitions of equipment types):

- Subbottom profilers (i.e., mini-sparkers, boomers, chirp, general subbottom profiler systems);
- Side-scan sonars;
- Echosounders (i.e., single beam and multibeam echosounders, fathometers);
- Multi-component systems (i.e., containing two or more complementary equipment types); and
- Passive systems (i.e., magnetometer, gravity meters).

The use of subbottom profilers, including boomers, sparkers, and chirp systems, provides seismic reflection profile data – information regarding the shallow subsurface structure of the seafloor. Surveys using single beam and multibeam echosounders provide specific data regarding site-specific bathymetry and/or seafloor features (e.g., sediment ridges, rock outcrops, shipwrecks, underwater cables). Side-scan sonar survey results provide similar data as multibeam echosounders, producing detailed imagery of the seafloor and seafloor features. Remotely operated vehicles (ROVs) have also come into use during low energy geophysical surveys, and may be equipped with passive or active (acoustic) components described above.

## OGPP BACKGROUND

In preparing this OGPP Update, the CSLC has relied on the most current scientific knowledge to identify the necessary conditions and limitations to incorporate into its geophysical survey permits in order to avoid the potential for a significant effect on the environment. As a starting point for the analysis in this MND, and to provide additional context, the CSLC staff reviewed surveys permitted by the CSLC in accordance with its current program over the past five years (2008-2012). This review and analysis allows the CSLC to determine the nature and magnitude of potential effects should the proposed OGPP be implemented unchanged from current practice, and then incorporate any necessary revisions to the proposed OGPP that would avoid or mitigate those effects that would otherwise be significant, such that the OGPP, as revised, would not have a significant effect on the environment (State CEQA Guidelines,<sup>2</sup> § 15070, subd. (b)). All measures identified in Section 3 of this MND would be incorporated into the CSLC's approval of the OGPP.

During the period 2008–2012, operators permitted by the CSLC conducted 49 individual low energy geophysical surveys. Low energy geophysical survey vessels generally operate only during daylight hours; on rare occasion, there may be 24-hour (hr) operations. Daylight-only operations are typically associated with a return to a local port for overnight berthing. In the past three years, the number of surveys has ranged between 10 and 14 per year. The number of days surveyed during the 2008–2012 period exhibited an extremely broad range (i.e., 19 to 163 days per year; **Table ES-1**).

**Table ES-1. Summary of Low Energy Geophysical Survey Activity, Including Number of Surveys and Survey Days (2008–2012)**

Year	Number of Surveys	Survey Days
2012	13	128
2011	14	132
2010	10	163
2009	8	59
2008	4	19
Total	49	501

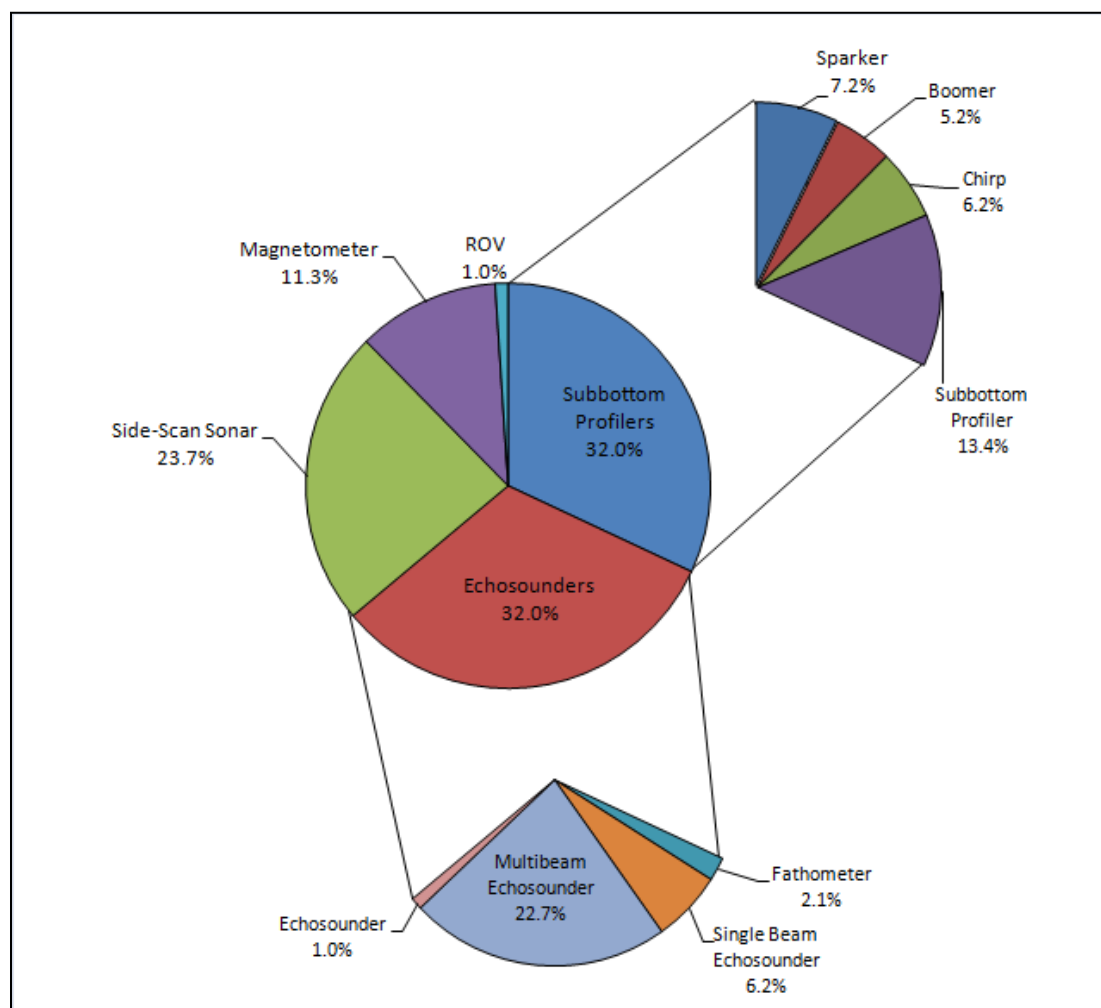
Activity levels between 2009 and 2010 realized a significant increase, jumping from 59 to 163 survey days, which was only an increase from 8 to 10 surveys. Several caveats to the survey activity occurred during the 2008–2012 period, including the completion of several long surveys (i.e., habitat mapping program, 2009–2010) and the concentrated survey efforts associated with the Diablo Canyon nuclear power plant (i.e., work concentrated offshore San Luis Obispo County).

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<sup>2</sup> The State CEQA Guidelines are found in Title 14 of the California Code of Regulations, commencing with section 15000.

During the 2008–2012 period, low energy geophysical surveys utilized 11 different equipment types.<sup>3</sup> Predominant equipment types used included side-scan sonars (23.7%), multibeam echosounders (22.7%), subbottom profilers (13.4%), and magnetometers (11.3%). Remaining systems were employed less than 10 percent of the time (**Figure ES-2**) during the 2008–2012 period. Depending on the survey, geophysical contractors may use several pieces of equipment simultaneously during a survey. Simultaneous equipment use during the 2008–2012 survey period was estimated to occur approximately 12 percent of the time (i.e., based on survey days noted as concurrent operations relative to total survey days).

**Figure ES-2. Low Energy Geophysical Survey Equipment Use (2008–2012)**

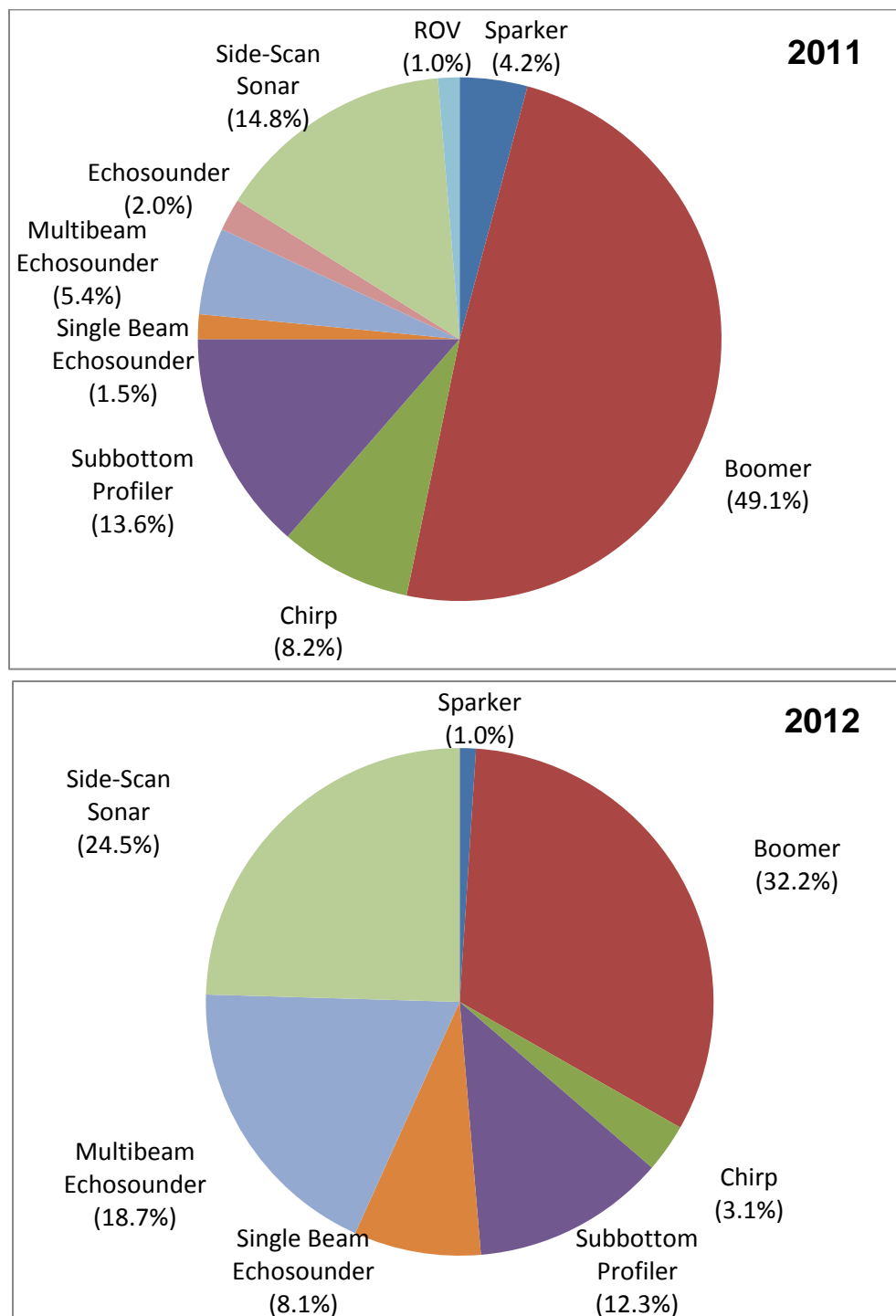


<sup>3</sup> For purposes of this analysis, equipment type is reported in the “Geophysical Survey Notification,” which permit holders are required to submit to the CSLC prior to the commencement of a survey.



1 Survey efforts conducted under the current OGPP during 2011 and 2012, indicative of  
 2 the most recent trends in low energy geophysical survey activity, are depicted  
 3 graphically in **Figure ES-3**.

4 **Figure ES-3. Equipment Used During Low Energy Geophysical Surveys**  
 5 **(2011-2012), Including %Total Survey Days Each Piece of Equipment was Used**





Recent trends evident in survey activity and equipment included:

- Boomers were prevalent among equipment types, particularly during longer surveys, and represented nearly half of the equipment use days realized in 2011, and greater than 32 percent of the equipment use days in 2012; this is in contrast to their relatively limited use prior to 2011. During low energy geophysical surveys off California, permittees did not report using boomers simultaneously with other equipment.
- In addition to boomers, multibeam echosounders, single beam echosounders, subbottom profilers, chirp, side-scan sonar, and sparkers were the most commonly used pieces of equipment; limited use was evident for magnetometers and ROVs. This trend for 2011–2012 is generally consistent with equipment use trends noted for the entire 2008–2012 period.
- Based on survey days, geophysical survey activity for each OGPP Region (see Figure ES-1) during 2011 and 2012 is summarized below.

Region	2011	2012
I	> 10%	> 34%
II	> 88%	> 63%
III	< 2%	2%
IV	0%	0%

- The predominance of survey activity in Regions I and II during 2011 and 2012 is consistent with that noted for the 2008–2012 period.
- During 2011 and 2012, the concurrent use of equipment (e.g., use of subbottom profiler and side-scan sonar) occurred during approximately 20 percent of the surveys (12 to 15 percent of the time based on total survey days).

## Predicted Activity Scenario

To provide additional context for this analysis, the past survey activity discussed above was extrapolated in an effort to predict what survey patterns are expected to occur under the updated OGPP. Based on the survey activity trends identified for the 2008-2012 period, including detailed analysis of the 2011–2012 surveys, coupled with CSLC and geophysical operator expectations on expected future survey activity, the following predicted activity scenario was developed for 2013 and 2014:

- Surveys are expected to typically last one to four days, with minor exceptions; most surveys will continue to be associated with infrastructure (e.g., surveys of outfalls, pipelines, and cables). A limited number of longer-term surveys (i.e., approximately 10 days) may be possible.

- 1       • A total of 10 to 12 surveys representing 70 to 80 survey days are anticipated  
2       although the implementation of longer duration surveys may push the total  
3       survey days to 100 or more; a prevalence of daytime surveys is expected.
- 4       • Multibeam echosounders, single beam echosounders, subbottom profilers  
5       (including chirp and sparkers), and side-scan sonar will continue to represent the  
6       most commonly used pieces of equipment, in addition to boomers. The  
7       concurrent use of equipment (e.g., use of subbottom profiler and side-scan  
8       sonar) will continue and may be expected to occur approximately 15 percent of  
9       the time.
- 10      • Boomer use, while generally limited to longer (duration) surveys, is expected to  
11      continue; its use relative to other equipment types will be dependent upon the  
12      nature and duration of future surveys.
- 13      • The vast majority of future survey work (i.e., 90 to 95 percent) is expected to  
14      occur in Regions I and II, with limited activity (i.e., 5 to 10 percent) expected in  
15      Regions III and IV.
- 16      • Survey vessels will mobilize and will overnight/berth at the closest suitable port.

## 17   **IMPACT ASSESSMENT**

18   The guidance provided in Appendix G of the State CEQA Guidelines (Appendix G  
19   Checklist) was employed to screen effects and provide impact categories. As stated in  
20   the Appendix G Checklist, the guidance is intended to encourage thoughtful  
21   assessment of impacts, but does not represent thresholds of significance. For many  
22   resource categories in this MND, the questions posed in the Appendix G Checklist  
23   served as reasonable significance thresholds; in other cases, the CSLC used the  
24   questions as an aid, but developed more Project-specific thresholds as well. Consistent  
25   with the guidance provided in the Appendix G Checklist, the CSLC has provided  
26   explanations following each question, using the best available information to both  
27   characterize existing conditions and support the analyses; information used to conduct  
28   the impact assessment included the following:

- 29      • Proximity of Survey Vessels to the Coastline: This depends on survey needs and  
30      the type of vessel used. Infrastructure surveys could take a vessel close to the  
31      surf line. The range for survey operations extends from just beyond the edge of  
32      the surf zone (i.e., from approximately 100 meters [m] to several hundred meters  
33      from the beach) to 3 nm offshore. Most surveys are likely to occur within  
34      relatively good visibility of the shoreline.
- 35      • Noise-Generating Potential of Equipment: Equipment is designed to produce a  
36      relatively narrow, focused beam directed toward the seafloor. Beam width varies  
37      between pieces of equipment and between fore-aft and athwartship (from side to

side). A minor amount of noise may escape above the water line, particularly for hull-mounted equipment. Above the water level, these sounds may be audible to crew, but are not likely to extend far from the vessel. Ambient noise, including surf, wind, and other noises, works to mask or diminish equipment noise with increasing distance.

- Potential Obstructions Created by Equipment: Most equipment is either hull mounted or deployed over the side, either close to the vessel or behind the vessel. Possible obstructions include towed gear (e.g., “towfish”) and the tow line (cable). Towed equipment includes boomer, subbottom profiler, and side scan-sonar. The amount of cable deployed and the location of the equipment (at the end of the cable) are dependent on water depth and where the equipment is supposed to be in the water column. Deployed cable and equipment present a potential entanglement hazard. Also, the amount of cable out is dictated by target water depth of the equipment; most low energy equipment is hull mounted or travels just below the surface. There are limited exceptions where some equipment must be closer to the seafloor; this is where the potential for entanglement is greatest.
- Potential for Boats and Equipment to Generate Unusual Levels of Light/Glare: The vast majority of survey efforts occur during daylight hours. Lights and glare would only be an issue for nighttime operations, which are very limited.

Most resource areas that are addressed in this MND characterize the physical, non-living environment of the study area. Survey activities under the predicted scenario, using representative survey vessels, provided the basis for these analyses, including for the calculation of air quality emissions and consideration of potential accidents (i.e., a small diesel fuel spill). As stated above, the main ways in which OGPP surveys are expected to affect the environment are through physical presence in the water and generation of noise from survey equipment. Because surveys operate on and in the water but do not construct structures or alter land, many of these physical resources are not affected.

Living marine resources considered in this analysis would be subjected to both the physical aspects of the survey vessels’ presence, and the acoustic effects of equipment operation. The analysis in the MND includes discussions of major habitats (i.e., benthic, pelagic, and neritic) and oceanographic influences on biological resources, followed by separate discussions of faunal components (i.e., plankton and ichthyoplankton, invertebrates, fishes, marine reptiles [sea turtles], and marine mammals). Ambient noise levels and sources of anthropogenic noise in California waters are also addressed. Acoustic modeling was conducted for each of five major representative equipment types. Modeling results are used to assess the potential impacts associated with low energy geophysical survey equipment noise, considering current regulatory noise

1 exposure thresholds, alternative sound exposure criteria, and recent scientific findings  
2 regarding noise impacts.

3 Based on prior permit-related low energy geophysical survey activities and the summary  
4 of predicted permit-related survey activities discussed above, a hypothetical “typical”  
5 survey, designed to reflect the most conservative survey scenario, was established as a  
6 basis for impact assessment. The scenario assumes the survey is compliant with  
7 current OGPP requirements. Other parameters include the following:

- 8 • Duration: 12 hrs of daylight (maximum), with 10 hrs maximum of equipment use  
9 time;
- 10 • Trackline Orientation: from shallow water perpendicular to shore, or a direct line  
11 from just beyond the surf zone (approximately 100 m to several hundred meters  
12 from the beach) to the 3 nm line;
- 13 • Tracklines: three tracklines total (center line, two flanking lines, one per side of  
14 the center line); assumes investigation of a pipeline, discharge line, or cable  
15 corridor; tracklines are spaced 75 m apart;
- 16 • Vessel speed: estimated to average 4 knots, but variable between 2 and 8 knots  
17 depending upon equipment in use; and
- 18 • Equipment pulse rate: estimated at four-second intervals.

19 For resource areas potentially impacted by a survey vessel's size and components, the  
20 analysis assumes use of a representative survey vessel. Using this impact assessment  
21 approach, vessel orientation to the coastline is not a critical concern.

22 The approach taken in this analysis is based on a single survey activity scenario  
23 developed through review of recent survey history. Use of a single survey scenario  
24 approach is appropriate for two reasons: (1) multi-day surveys conducted during  
25 daytime typically return to port for overnight berthing, removing survey-associated  
26 impact producing factors (e.g., acoustic sources) for a 12- to 14-hr period; and  
27 (2) interruptions in exposure effectively reset the cumulative exposure analysis,  
28 consistent with incidental take analysis methodology.

## 29 ENVIRONMENTAL IMPACTS AND PROPOSED MITIGATION MEASURES

30 The evaluation of environmental impacts provided in this MND is based, in part, on the  
31 Appendix G Checklist. An impact assessment matrix is provided as part of the  
32 evaluation for each environmental issue area, with impact levels defined as follows:

- **Potentially Significant Impact.** This column is checked if there was substantial evidence that a Project-related environmental effect may be significant. If one or more “Potentially Significant Impacts” are identified, a Project Environmental Impact Report (EIR) must be prepared.
- **Less than Significant with Mitigation.** This column is checked when the Project may result in a significant environmental impact, but the incorporation of identified applicant or project-specific mitigation measures into the Project will reduce the identified effect(s) to a less than significant level.
- **Less than Significant Impact.** This column is checked when the Project would not result in any significant effects. The Project’s impact was less than significant even without the incorporation of a project-specific mitigation measure.
- **No Impact.** This column is checked when the Project would not result in any impact in the category or the category did not apply.

The environmental factors checked below in **Table ES-2** would be potentially affected by this Project; a checked box indicates that at least one impact would be a “Potentially Significant Impact” except that the CSLC has incorporated Project revisions, including the implementation of mitigation measures, that reduce the impact to “Less than Significant with Mitigation,” as detailed in **Section 3** of this MND.

**Table ES-2. Environmental Factors Potentially Affected**

<input type="checkbox"/> Aesthetics	<input type="checkbox"/> Agriculture and Forest Resources	<input checked="" type="checkbox"/> Air Quality/Greenhouse Gas Emissions
<input checked="" type="checkbox"/> Biological Resources	<input type="checkbox"/> Cultural Resources	<input type="checkbox"/> Geology and Soils
<input checked="" type="checkbox"/> Hazards and Hazardous Materials	<input type="checkbox"/> Hydrology and Water Quality	<input type="checkbox"/> Land Use and Planning
<input type="checkbox"/> Mineral Resources	<input type="checkbox"/> Noise	<input type="checkbox"/> Population and Housing
<input type="checkbox"/> Public Services	<input checked="" type="checkbox"/> Recreation	<input type="checkbox"/> Transportation/Traffic
<input type="checkbox"/> Utilities and Service Systems	<input checked="" type="checkbox"/> Commercial and Recreational Fisheries	<input checked="" type="checkbox"/> Mandatory Findings of Significance

**Table ES-3** lists mitigation measures designed to reduce or avoid potentially significant impacts identified through the environmental analysis detailed in **Section 3**. With implementation of the proposed mitigation measures, all Project-related impacts would be reduced to less than significant.

1

**Table ES-3. Summary of Project Mitigation Measures (MMs)**

<b>Air Quality and Greenhouse Gas (GHG) Emissions</b>	
MM AIR-1: Engine Tuning, Engine Certification, and Fuels	
<b>Biological Resources</b>	
MM BIO-1: Marine Mammal and Sea Turtle Presence – Current Information	
MM BIO-2: Marine Wildlife Monitors	
MM BIO-3: Safety Zone Monitoring	
MM BIO-4: Limits on Nighttime OGPP Surveys	
MM BIO-5: Soft Start	
MM BIO-6: Verification of Sound Output and Practical Limitations on Equipment Use	
MM BIO-7: Avoidance of Pinniped Haul-Out Sites	
MM BIO-8: Reporting Requirements - Collision	
MM BIO-9: Limitations on Survey Operations in Select MPAs	
<b>Hazards and Hazardous Materials</b>	
MM HAZ-1: Oil Spill Contingency Plan (OSCP) Required Information	
MM HAZ-2: Vessel Fueling Restrictions	
MM HAZ-3: OSCP Equipment and Supplies	
<b>Recreation</b>	
MM REC-1: U.S. Coast Guard (USCG), Harbormaster, and Dive Shop Operator Notification	
<b>Commercial and Recreational Fishing</b>	
MM FISH-1: USCG and Harbormaster Notification	
MM FISH-2: Minimize Interaction with Fishing Gear	

2 The CSLC also evaluated the potential impacts of the Project on Environmental Justice  
3 and determined that the Project has little potential to disproportionately affect any  
4 low-income or minority populations that may reside in nearby communities or use the  
5 surrounding area for recreation or commerce, because effects on the human  
6 environment would be limited and short term, and would be disbursed over a large  
7 geographic area.

8 A Mitigation Monitoring Program (MMP) has been developed as a component of the  
9 MND. OGPP permit holders are responsible for integrating the mitigation monitoring  
10 procedures into survey-specific operations in coordination with the CSLC. Either CSLC  
11 staff or designee will oversee monitoring procedures and ensure that required measures  
12 are implemented properly. OGPP permit holders completing low energy geophysical  
13 surveys in California waters will be required to complete and submit to the CSLC  
14 environmental monitor a Final Monitoring Report which outlines their compliance with  
15 survey-related mitigation measures.

## 1.0 PROJECT AND AGENCY INFORMATION

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### 1.1 Project Title

Low Energy Offshore Geophysical Permit Program Update

### 1.2 Lead Agency and Project Sponsor

California State Lands Commission (CSLC)  
100 Howe Avenue, Suite 100-South  
Sacramento, CA 95825

#### Contact person:

Jennifer DeLeon, Environmental Program Manager  
Division of Environmental Planning and Management  
Jennifer.Deleon@slc.ca.gov  
(916) 574-0748

### 1.3 Project Location

The Low Energy Offshore Geophysical Permit Program (OGPP) Update (i.e., the proposed Project) includes State waters of the Pacific Ocean overlying sovereign lands under the jurisdiction of the CSLC. The Project area:

- Includes State waters of the Pacific Ocean between the California-Oregon and California-Mexico borders, extending from the shallow subtidal zone seaward to the State of California jurisdictional limit (3 nautical miles [nm] from the shoreline) overlying sovereign lands under the jurisdiction of the CSLC; and
- Does not include waters overlying tidelands and submerged lands legislatively granted in trust to local jurisdictions, San Francisco, San Pablo, and Suisun Bays.

Refer to **Section 2, Project Description**, for further details on the proposed Project location.

### 1.4 Organization of Mitigated Negative Declaration

This Mitigated Negative Declaration (MND) is intended to provide the CSLC, as lead agency under the California Environmental Quality Act (CEQA) (Pub. Resources Code, § 21000 et seq.), and other responsible agencies with the information required to exercise their discretionary responsibilities with respect to the proposed Project. The document is organized as follows:

- Section 1 provides the Project background, Agency and Project Sponsor information, Project Objectives, anticipated agency approvals, and a summary of the public review and comment process.
- Section 2 describes the proposed Project including its location, layout, equipment, and facilities. Section 2 also provides an overview of the Project's operations and schedule.
- Section 3 provides the Initial Study (IS), including the environmental setting, identification and analysis of potential impacts, and discussion of various Project changes and other measures that, if incorporated into the Project, would mitigate or avoid those impacts, such that no significant effect on the environment would occur. The IS was conducted by the CSLC pursuant to section 15063 of the State CEQA Guidelines.
- Section 4 includes a commercial and recreational fisheries analysis and environmental justice analysis and discussion consistent with CSLC Policy.
- Section 5 presents the Mitigation Monitoring Program (MMP).
- Section 6 presents information on report preparation and references.
- The appendices include specifications, technical data, and other information supporting the analysis presented in this MND.
  - Appendix A: Summary of Low Energy Offshore Geophysical Permit File Review
  - Appendix B: Representative Survey Vessels
  - Appendix C: Air Quality Emissions Calculations
  - Appendix D: Marine Habitat Summary
  - Appendix E: Summary Information for Plankton and Ichthyoplankton
  - Appendix F: Essential Fish Habitat Assessment
  - Appendix G: Underwater Sound Modeling of Low Energy Geophysical Equipment Operations
  - Appendix H: Scientific Review: Acoustics and Low Energy Geophysical Surveys and their Potential for Impact
  - Appendix I: Methodology for Estimation of Marine Mammal Take and Weighting or Correction Factors
  - Appendix J: Examples of Marine Wildlife Contingency Plan



## 1.5 Project Background and Objectives

The CSLC has been the State agency with jurisdiction over geophysical survey activities in State waters since 1941 when the State Legislature added section 6826 to the Public Resources Code to allow the CSLC to adopt regulations and grant permits for geophysical activity. The CSLC has issued permits to conduct geophysical survey activities in some form since 1945. Pursuant to its general duties under Division 6 of the Public Resources Code, and the specific authority provided in Public Resources Code section 6826, the CSLC issues geophysical permits in State waters to qualified permittees for the use of low energy geophysical equipment to perform geophysical surveys of the ocean bottom, subject to specified terms and conditions. These activities are also regulated under California Code of Regulations, division 3, chapter 1, article 2.9, section 2100. Geophysical surveys conducted under CSLC permits use data-gathering methods that follow a pre-defined course or spatial grid (i.e., a survey), and obtain critical data on a variety of ocean resources and uses; areas of study and survey objectives include, but are not limited to:

- Scientific research, including surveys of near-shore sand erosion and deposition, seafloor changes, and seafloor topography and bathymetry;
- Surveying existing pipelines to assess any structural damage, corrosion, or spanning that could lead to a pollutant release;
- Identifying and avoiding seafloor hazards and faults when designing pipeline- and cable-laying projects, reducing the likelihood of dangerous leaks, ruptures and breakages;
- Surveying existing fiber-optic cables and other seafloor structures to determine how well they are buried or if they can be snagged by fishing gear; and
- Developing maps of hard bottom and essential fish habitat or cultural resources indicating where the placement of permanent or temporary objects (e.g., cables or anchors) should be precluded.

Since 1984, the CSLC has relied on an MND adopted in 1984, with subsequent additional conditions imposed in 1987 and 2008, to comply with CEQA when issuing individual geophysical survey permits for low energy survey activities.<sup>4</sup> These low energy surveys use equipment such as:

<sup>4</sup> The term “low energy” under current CSLC permitting—referred to in this document as the OGPP—denotes equipment whose input energy source does not exceed 2 kilojoules (kJ). For the purposes of this MND, “OGPP” refers only to the general permit issued for low energy surveys, and does not include permits issued for high energy or inland surveys.

- Subbottom profilers (i.e., mini-sparkers, boomers, chirp, general subbottom profiler systems);
- Side-scan sonars;
- Echosounders (i.e., single beam and multibeam echosounders, fathometers);
- Multi-component systems (i.e., containing two or more complementary equipment types); and
- Passive systems (i.e., magnetometer, gravity meters).

Equipment types are defined in the **Glossary** that follows the Table of Contents and described further in Section 2. Airguns and other sources of high energy are expressly prohibited in permits the CSLC has issued under the current OGPP, as they will be under this OGPP Update. Therefore, high energy surveys, including airgun surveys, are not addressed in this MND.

The 1984 MND analyzed the expected impacts resulting from the use of both high ( $\geq 2$  kJ energy input) and low energy (less than 2 kJ energy input) geophysical survey equipment and identified measures to mitigate significant impacts to wildlife and the environment from geophysical surveys (Minute Item 11, 5/24/1984). Over the following three years, studies and increased concerns became known to the CSLC regarding the potential effects of acoustic pulses from high energy surveys, such as airguns, on marine life and divers. In response to this information, the CSLC voted to require preparation of an environmental impact report (EIR) before approving any further high energy surveys. At the time, staff found no evidence of similar environmental impact from surveys using less energy; as a result, the CSLC determined that the MND's analysis and conclusions were still adequate for surveys using less than 2 kJ of input energy (Minute Item 27, 9/23/1987).

In the years since the MND was developed and approved in 1984 and conditioned in 1987, a considerable amount of relevant research has been completed. Of importance to the CSLC's administration of the OGPP are applied study efforts characterizing acoustic sources and methodologies, as well as analyses of sound-related impacts to various marine resources, particularly marine mammals, sea turtles, and fishes. As noted by the California Ocean Protection Council (OPC 2011), recent acoustic-related study results "reveal a more complex picture of the hazards associated with ocean noise, based on frequency and sound pressure levels, rather than just energy levels."

CSLC staff has worked for many years to identify a funding source to update the existing OGPP and incorporate new scientific findings into the CSLC's geophysical permits. In 2011, the OPC, at the recommendation of its staff and in receipt of letters of support from resource agencies and fishing and industry representatives, provided funding to the CSLC to prepare a new MND and update the OGPP so that it can be

carried out consistent with the best available science and in compliance with CEQA. The OPC grant covered the preparation of three specific tasks which, taken together, will inform revisions to the OGPP:

- Scientific Review Report: A report reviewing the current scientific literature on ocean acoustics, particularly related to the effects of anthropogenic sound on marine biological resources (included as **Appendix H**);
- Program Review Report: A review of the current program requirements and operations, concluding with recommendations to improve the efficiency, effectiveness, and transparency of permits; and
- CEQA Review: This MND, which describes and evaluates the environmental impacts of low energy surveys currently permitted under the program and identifies feasible mitigation measures or program changes to reduce or avoid any impacts found to be potentially significant.

The objectives of the current CEQA environmental analysis, which draws from the Scientific Review Report, are to:

- 1) Complete a scientific review of the current state of knowledge regarding ocean acoustics, with an emphasis on the effects of low energy sound sources on marine resources;
- 2) Characterize the nature and extent of low energy geophysical surveys conducted in California waters over the past several years, including survey duration, location, and equipment type;
- 3) Evaluate the potential environmental impacts of low energy geophysical surveys on California's marine resources, including biological resources, use conflicts, and human safety; and
- 4) Characterize and evaluate the current permit-mandated mitigation measures and determine if they reduce identified impacts to a "less than significant" level and, if not, what revisions to the permit and/or Program are necessary to do so.

## 1.6 Public and Peer Review and Comment

Pursuant to State CEQA Guidelines sections 15072 and 15073, a lead agency must issue an MND in draft form for a minimum 30-day public review period; however, in light of interest in the Project expressed by agencies, organizations, individuals, and industry, as well as the technical nature of the biological resources impact analysis, the MND will be circulated for a 45-day public review period. Local and State agencies and the public will have the opportunity to review and comment on the draft document. Responses to written comments received by the CSLC during the 45-day public review period will be incorporated into the final MND.

To ensure a transparent and rigorous analysis, CSLC staff has contracted with the California Ocean Science Trust (OST) to conduct a peer review of the MND's underwater noise analysis by subject-matter experts. The OST is a nonprofit 501(c)(3) public benefit corporation established pursuant to the California Ocean Resources Stewardship Act (CORSA) of 2000, and works to connect policy-makers and the scientific community in issues related to coastal and ocean management. Comments from the panel's review will then also be incorporated into the final MND. In accordance with State CEQA Guidelines section 15074, subdivision (b), the CSLC will review and consider the proposed final MND, together with any comments received during the public review process, prior to taking action on approval of the MND and the Project. If the CSLC adopts the MND and approves the Project, it would begin issuing permits for geophysical survey proposals found to be consistent with the MND. Applicants proposing geophysical surveys that do not fall under the conditions and limitations specified in the MND would be required to complete survey-specific CEQA compliance prior to consideration by the CSLC.

## **1.7 Other General Permit Revisions**

With help from the OPC grant, CSLC staff is also conducting a review of the elements of the OGPP that do not relate to potential environmental impacts from permitted surveys themselves, but instead have implications on the efficiency, effectiveness and transparency of the OGPP and its management and enforcement. An evaluation of these issues is contained in the Program Review Report.<sup>5</sup> Because changes to the general permit provisions related to administration of the OGPP or access to geophysical data derived from surveys have no potential to result in environmental impacts, these issues are not evaluated in the MND; rather, any recommended changes resulting from the Program Review Report analysis will be proposed when the CSLC considers approval of new permits at one of its scheduled public meetings.

In the event the CSLC approves the MND, any geophysical survey performed under a future OGPP permit would be required to comply with all mitigation measures identified in the MND, as well as any other permit provisions the CSLC may specify.

## **1.8 Permits, Approvals, and Regulatory Requirements**

Although individual surveys proposed under OGPP permit may require permits or approvals from other agencies, the OGPP itself is not subject to the authorities, including statutory and/or regulatory jurisdiction, of other federal, state, or local entities.

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<sup>5</sup> The Program Review Report also contains recommendations for biological resource protection; however, the MND addresses these issues and any other OGPP components that may result in environmental impacts. The Report will be provided to the CSLC for consideration at the time it considers approval of the MND.

## 2.1 Need for Project

The California State Lands Commission (CSLC) has proposed the Low Energy Offshore Geophysical Permit Program (OGPP) Update as a means to develop and implement a revised permitting structure for offshore geophysical surveys. The intent of the Update is to establish consistent guidance, limitations, and conditions imposed on permittees to ensure that permitted activities do not result in a significant effect on the environment. Under Division 6 of the Public Resources Code, the CSLC holds sovereign lands, which include tide and submerged lands adjacent to the entire coast and offshore islands of the State from the mean high-tide line to 3 nautical miles (nm) offshore, in the Public Trust and, therefore, is the State agency with jurisdiction over geophysical survey activities in State waters. Under the Public Trust Doctrine, uses of trust lands administered by the CSLC directly are generally limited to those that are water dependent or related, and include commerce, fisheries, navigation, environmental preservation, and recreation; Public Trust lands may also be kept in their natural state for habitat, wildlife refuges, scientific study, or open space (CSLC Public Trust Policy, [www.slc.ca.gov](http://www.slc.ca.gov); click on the “Information” and “Statements” links).

The CSLC has discretion to determine whether and how geophysical surveys should be permitted in California waters and to promulgate regulations specifying the conditions upon which such permits may be issued (Pub. Resources Code, § 6826), and in doing so must comply with the California Environmental Quality Act (CEQA). As stated in **Section 1** of this Mitigated Negative Declaration (MND), while the CSLC has relied on its previously adopted 1984 MND when approving individual geophysical survey permits, the growing body of scientific knowledge related to underwater acoustic effects has prompted the CSLC to complete a new environmental analysis in order to support continued administration of the OGPP in compliance with CEQA.

## 2.2 Project Locations/Regions

The area within which the CSLC issues permits pursuant to the OGPP:

- Includes State waters of the Pacific Ocean between the California-Oregon and California-Mexico borders, extending from the shallow subtidal zone seaward to the State of California jurisdictional limit (3 nm from the shoreline) overlying sovereign lands under the jurisdiction of the CSLC; and
- Does not include waters overlying tidelands and submerged lands legislatively granted in trust to local jurisdictions, or San Francisco, San Pablo, and Suisun Bays.

- 1 For purposes of this MND and the CSLC's administration of the OGPP, State waters are  
2 divided into four regions with the following designations and boundaries out to the 3-nm  
3 limit (**Figure 2-1**):

<b>Region I</b>	The area between the California-Mexico border and Los Angeles/Ventura County line.
<b>Region II</b>	The area between the Los Angeles/Ventura County line and Santa Barbara/San Luis Obispo County line.
<b>Region III</b>	The area between the San Luis Obispo/Monterey County line and Sonoma/Mendocino County line, excluding San Francisco, San Pablo, and Suisun Bays.
<b>Region IV</b>	The area between the Sonoma/Mendocino County line and the California-Oregon border.

- 4 The major variance from one region to another is the listing of individuals and agencies  
5 that must be notified prior to initiation of such activities and also locations at which such  
6 notices must be posted.

### 7 **2.3 Issuance of Offshore Geophysical Permits**

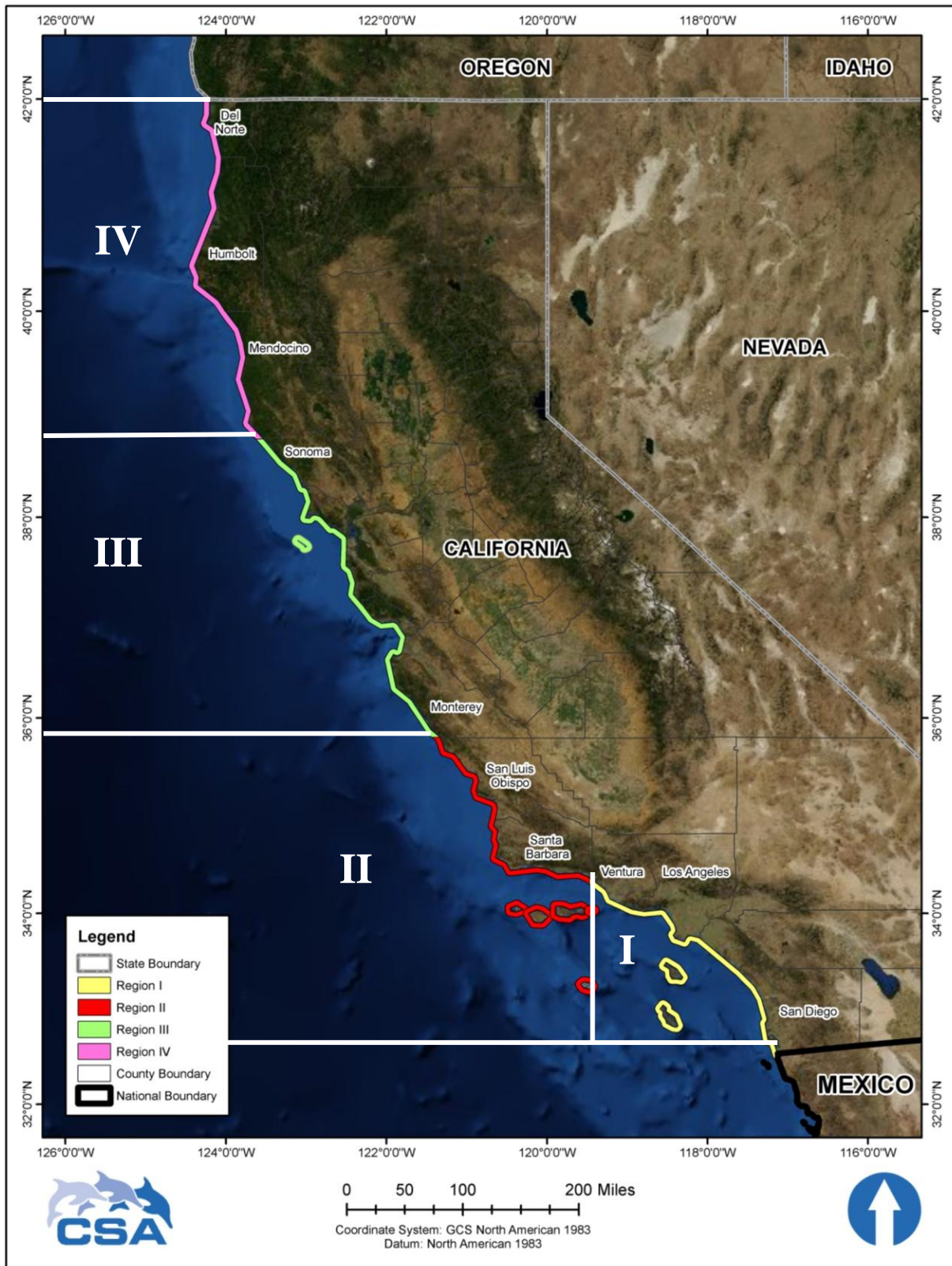
8 Under the proposed OGPP, the CSLC would issue geophysical permits for general  
9 offshore (statewide) geophysical operations. Historically, these statewide permits were  
10 issued for a three-year period; however, permits issued within the last several years  
11 have been limited to one year in order to more frequently evaluate each permit in light of  
12 the emerging science related to acoustic effects on the marine environment. Because  
13 there is no provision in the Public Resources Code for permit renewal, geophysical  
14 permits must be reassessed and reissued upon expiration. Under the proposed OGPP,  
15 the CSLC would issue permits for a maximum of three years, subject to review and  
16 reassessment during the permit term at the discretion of the CSLC.

17 The CSLC's general geophysical survey permit requires compliance with all provisions  
18 therein, including, but not limited to, provisions that require the permit holder to:

- 19 1) Notify CSLC staff at least 15 days in advance of any survey activity;  
20 2) Notify parties listed in the permit at least 15 days in advance of any survey  
21 activity;  
22 3) Notify CSLC staff at least 14 days before initiating nighttime operations (including  
23 measures that will be implemented to ensure avoidance of impacts to marine  
24 mammals and reptiles);  
25 4) Provide a National Oceanic and Atmospheric Administration (NOAA)-approved  
26 marine wildlife monitor aboard the survey vessel to be present during all survey  
27 operations (including transit to and from port);

1  
2

**Figure 2-1. Regions Delineated under CSLC Offshore Geophysical Permit Program**



- 1        5) Develop and submit to CSLC staff for review and approval an Oil Spill  
2        Contingency Plan (OSCP) that addresses accidental releases of petroleum  
3        and/or non-petroleum products during survey operations;
- 4        6) Develop a Marine Wildlife Contingency Plan (MWCP) that includes, at a  
5        minimum (the CSLC added this MWCP requirement in August 2008):
  - 6            • Measures that specify the distance, speed, and direction transiting vessels  
7            would maintain when in proximity to a marine mammal or reptile;
  - 8            • Qualifications, number, location, and authority of onboard marine mammal  
9            and reptile monitors;
  - 10           • Methods to reduce noise levels generated by geophysical equipment; and
  - 11           • Reporting requirements in the event of an observed impact to marine  
12           organisms;
- 13       7) Provide CSLC staff at least 14 days prior to the survey a summary listing of all  
14       geophysical survey equipment to be used including equipment make and model,  
15       decibel (dB) level(s) referenced (re) to 1 microPascal (1  $\mu$ Pa), frequencies (Hertz  
16       [Hz], kilohertz [kHz]), and length of time the equipment will operate;
- 17       8) Comply with future CSLC directions and requests (e.g., request for additional  
18       equipment information; preclusion of specific equipment); and
- 19       9) In order to avoid cumulative effects, schedule survey operations so that if several  
20       types of survey equipment are needed for a given survey project, the different  
21       equipment does not transmit simultaneously unless designed to do so  
22       (e.g., multi-component systems).

## 23    2.4    Low Energy Geophysical Survey Review

24    In preparing this OGPP Update, the CSLC has relied on the most current scientific  
25    knowledge to identify the necessary conditions and limitations to incorporate into its  
26    geophysical survey permits in order to avoid the potential for a significant effect on the  
27    environment. As a starting point for the analysis in this MND, the CSLC staff reviewed  
28    surveys permitted by the CSLC in accordance with its current program over the past five  
29    years (2008-2012). This review and analysis allows the CSLC to determine the nature  
30    and magnitude of potential effects should the proposed OGPP be implemented  
31    unchanged from current practice, and then incorporate any necessary revisions to the  
32    proposed OGPP that would avoid or mitigate those effects that would otherwise be  
33    significant, such that the Program, as revised, would not have a significant effect on the  
34    environment (State CEQA Guidelines, § 15070, subd. (b)). All measures identified in  
35    **Section 3** of this MND would be incorporated into the CSLC's approval of the OGPP.



## 2.4.1 Survey and Survey Equipment Types

Types of authorized low energy geophysical surveys<sup>6</sup> being conducted in State waters vary. An approximate distribution of survey type for commercial clients is as follows:

- 65 percent: surveys associated with infrastructure not related to oil and gas production and transportation (e.g., pipeline and cable routes, ports, harbors);
- 30 percent: surveys associated with the oil and gas industry (e.g., pipelines); and
- 5 percent: surveys associated with miscellaneous efforts.

Other survey efforts may include directed scientific research and specialized studies (e.g., California Seafloor Mapping Project [<http://seafloor.csumb.edu/csmp/csmp.html>] sponsored by the California Ocean Protection Council, State Coastal Conservancy, California Department of Fish and Wildlife, and NOAA) and broader survey efforts (e.g., Pacific Gas & Electric's [PG&E] low energy three-dimensional [3D] survey; August–November 2012; Pt. Sal to Morro Bay).

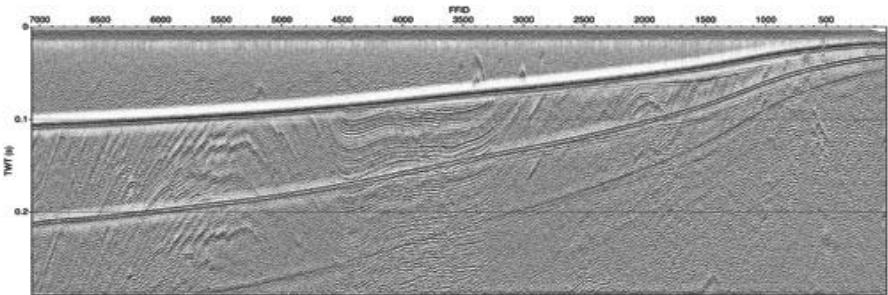
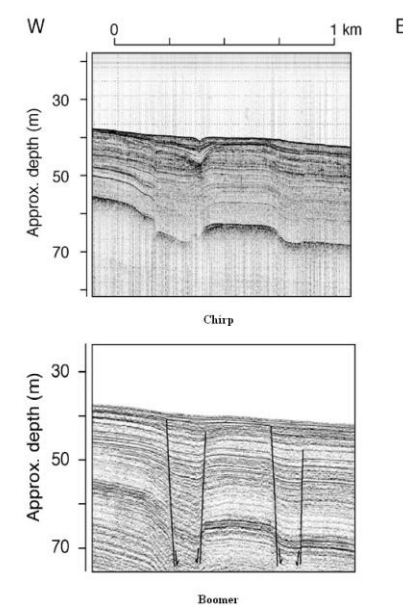
Equipment authorized under the OGPP, as detailed in the CSLC's low energy geophysical survey permit language, notes that "geophysical surveys shall include seismic, gravity, magnetic, electrical and geochemical methods of measuring and recording physical properties of subsurface geologic structures." Permitted equipment includes both acoustically active devices (e.g., subbottom profilers, side-scan sonar, echosounders) and passive equipment (e.g., magnetometers, gravity meters). Under current OGPP permits, permit holders are authorized to operate geophysical survey equipment in State waters when no more than 2 kilojoule (kJ) of energy input is used on any acoustic pulse-generating equipment during a survey (assuming all other permit conditions are met). The use of any air or water compression devices (e.g., airguns, water guns) for generating acoustic pulses is expressly prohibited. **The proposed OGPP Update no longer applies this 2 kJ threshold.**

A variety of equipment may be employed during a low energy geophysical survey, depending upon survey purpose. Low energy geophysical survey equipment can be categorized according to the type of data being acquired. **Table 2-1** summarizes the various equipment categories and provides a brief explanation of equipment application and data type. In general, low energy geophysical survey equipment can be broadly divided into five categories (specific equipment [i.e., manufacturer, model] used during recent OGPP surveys is discussed in greater detail in **Section 2.4.7**; a glossary of terms has also been developed and is provided at the beginning of this document):

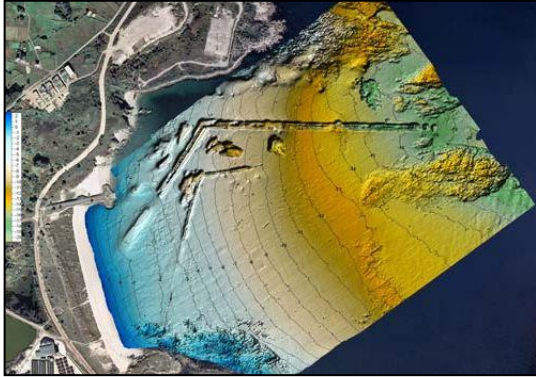
<sup>6</sup> References to "low energy geophysical surveys" in this MND are limited to OGPP surveys.

1

**Table 2-1. Descriptions and Uses of Low Energy Geophysical Survey Equipment**

Equipment	Description and Use
<b>SUBBOTTOM PROFILERS</b>	
<b>Mini-sparkers</b>	Usually towed 5 to 10 meters behind the survey vessel, just beneath the sea surface. Generates a low-frequency acoustic pulse. Used to acquire seismic reflection profile data (i.e., shallow features of the seabed). Mini-sparker pulses penetrate further into the seafloor than other subbottom profilers (e.g., chirp), but data lack the resolution provided by other systems. Mini-sparker image from <a href="http://walrus.wr.usgs.gov/mapping/Snavely.html#sparker">http://walrus.wr.usgs.gov/mapping/Snavely.html#sparker</a> .
<b>Boomers</b>	Typically towed behind or alongside the survey vessel. Generates a relatively low-frequency acoustic pulse, but higher than those produced by mini-sparkers. Used to acquire seismic reflection profile data.
<b>Subbottom Profilers (general)</b>	Includes chirp systems. Can be towed or hull-mounted. Generates a mid-frequency, and often multiple frequency, pulse. Used to identify and characterize layers of sediment or rock under the seafloor. Chirp and boomer images from <a href="http://www.epa.gov/esd/cmb/GeophysicsWebsite">www.epa.gov/esd/cmb/GeophysicsWebsite</a> .
<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  <p><b>Image from a Mini-sparker</b></p> </div> <div style="text-align: center;"> <p>W 0 1 km E</p>  <p><b>Images from a Chirp (top) and Boomer (bottom)</b></p> </div> </div>	

Equipment	Description and Use
<b>SIDE-SCAN SONARS</b>	
<b>Side-scan Sonars</b>	Can be towed or hull-mounted. Emit conical- or fan-shaped pulses toward the seafloor across a wide angle perpendicular to the path of the sensor through the water. Used to provide images of the seafloor. Side-scan data are frequently acquired along with bathymetric soundings and subbottom profiler data, providing a glimpse of the shallow structure of the seabed. Images from NOAA.
<div>Images from Side-Scan Sonar</div> <div> </div> <div> </div>	
<b>ECHOSOUNDERS</b>	
<b>Fathometers</b>	Transmit sound through the water and receive reflected signals from the seafloor; by measuring the elapsed time, the depth can be computed. In general terms, fathometers and echosounders are equivalent.
<b>Single Beam Echosounders</b>	Generate a solitary beam at a single low- or high-frequency. Used to acquire depth information.
<b>Multibeam Echosounders</b>	Utilize multiple beams and frequencies, producing high-resolution bathymetric data. Because data acquisition occurs both along the ship's track and between the track lines, 100% coverage of the seafloor is possible. Used to locate topographical features on the seafloor (e.g., sediment ridges, rock outcrops, shipwrecks, cables). Multibeam echosounder image from <a href="http://wwwold.nioz.nl/nioz_nl/68469c1a4e945686fd55592b4bc65e91.php">http://wwwold.nioz.nl/nioz_nl/68469c1a4e945686fd55592b4bc65e91.php</a> .
<div>Image from a Multibeam Echosounder</div> <div> </div>	

Equipment	Description and Use
<b>MULTI-COMPONENT SYSTEMS</b>	
<b>Multi-Component Systems</b>	Comprised of two or more complementary equipment types (e.g., echosounder, subbottom profiler, and/or side-scan sonar). Side-scan sonar can be used in conjunction with an echosounder to provide bathymetry and shallow structure data. Multi-component image from <a href="http://DredgingToday.com">DredgingToday.com</a> .
<div>Image from a Multi-Component System</div> 	
<b>PASSIVE SYSTEMS</b>	
<b>Magnetometers</b>	Measure slight changes in the magnetic field. Used to locate submerged objects ferrous in nature.
<b>Gravity meters</b>	Measure slight gravity differences in an area.

- **Subbottom profilers** (i.e., mini-sparkers, boomers, chirp, general subbottom profiler systems), which provide seismic reflection profile data – information regarding the shallow subsurface structure of the seafloor;
- **Echosounders** (i.e., single beam and multibeam echosounders, fathometers), which provide specific data regarding site-specific bathymetry and/or seafloor features (e.g., sediment ridges, rock outcrops, shipwrecks, underwater cables);
- **Side-scan sonars**, which provide similar data as multibeam echosounders, producing detailed imagery of the seafloor and seafloor features;
- **Multi-component systems** (i.e., containing two or more complementary equipment types); and
- **Passive systems** (i.e., magnetometer, gravity meters).

Remotely operated vehicles (ROVs) used during low energy geophysical surveys may be equipped with active (acoustic) or passive components described above.

#### 2.4.2 Permit File Review

In November 2012, a review of the CSLC OGPP permit holder files was conducted at the CSLC offices in Long Beach. Of primary interest during the review was the evaluation and characterization of each permit-mandated “Geophysical Survey Notification” (see Notification Procedures in Exhibit C of the current geophysical survey permit), which contains relevant information regarding survey location and extent, duration, and equipment use necessary to assess the potential impacts of low energy geophysical survey activities.

Each permit holder is required to notify the CSLC in advance of conducting a survey under its existing permit and to provide the following information:

Survey Notification Information	<ol style="list-style-type: none"> <li>1) Applicant/permit holder</li> <li>2) Location of survey, within State or Federal waters, or both</li> <li>3) Permit number</li> <li>4) Region and area</li> </ol>
Vessel Equipment Information	<ol style="list-style-type: none"> <li>1) Expected date(s) of operation</li> <li>2) Hours of operation</li> <li>3) Vessel name(s)</li> <li>4) Vessel official number(s)</li> <li>5) Vessel radio call sign(s)</li> <li>6) Vessel captain’s name(s)</li> <li>7) Monitor radio channel(s)</li> <li>8) Vessel navigation system</li> <li>9) Seismic equipment</li> <li>10) Approximate tow length</li> <li>11) Period of survey activity</li> </ol>

To establish current survey activity and to determine if any trends exist in survey activity, all files from 2008 through 2012 were reviewed. Emphasis was placed on 10 key information elements:

- Permit Holder
- Permit Number
- Area of Operations
- Region
- Period of Operations
- Duration of Operations (days)
- Equipment
- Simultaneous Operations;
- Field Operations Reporting
- Notes/Comments

Summary information derived from this review is provided in **Appendix A**.

### 2.4.3 Survey Activity Levels, 2008–2012

During the 2008–2012 period, 49 low energy geophysical surveys were conducted under permit. In the past three years, the number of surveys has ranged between 10 and 14 per year. The number of days surveyed during the 2008–2012 period ranged from 19 to 163 days per year (**Table 2-2**).

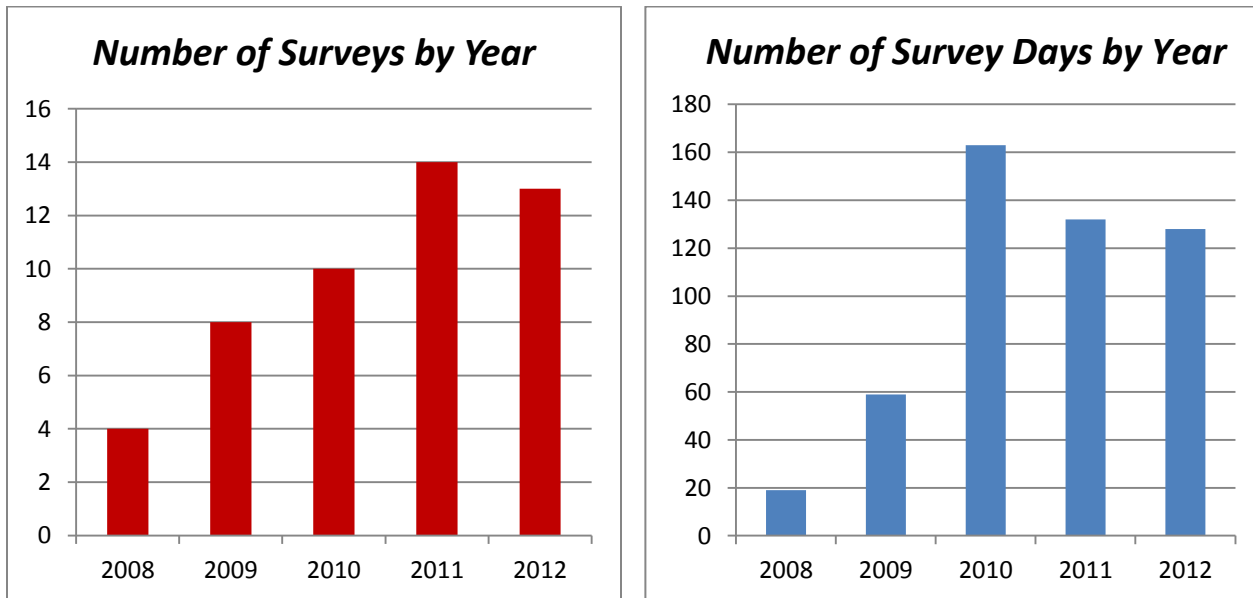
Survey activity during the 2008–2012 period can be evaluated on the basis of both numbers of surveys per year and total survey days per year. The trends evident in the number of surveys conducted during the past five years include: (1) increasing survey levels between 2008 and 2011; and (2) a slight decrease in survey level during 2012 compared to prior years; during the 2008–2012 period, total number of survey days peaked in 2010 (**Figure 2-2**).

Activity levels between 2009 and 2010 increased from 59 to 163 survey days, which was only an increase from eight to 10 surveys, due in part to several longer-term survey efforts (i.e., 2009-2010 Habitat Mapping Program and concentrated surveys near Diablo Canyon Power Plant, San Luis Obispo County).

**Table 2-2. Summary of Low Energy Geophysical Survey Activity, Including Number of Surveys and Survey Days (2008–2012)**

Year	Number of Surveys	Survey Days
2008	4	19
2009	8	59
2010	10	163
2011	14	132
2012	13	128
<b>Total</b>	<b>49</b>	<b>501</b>

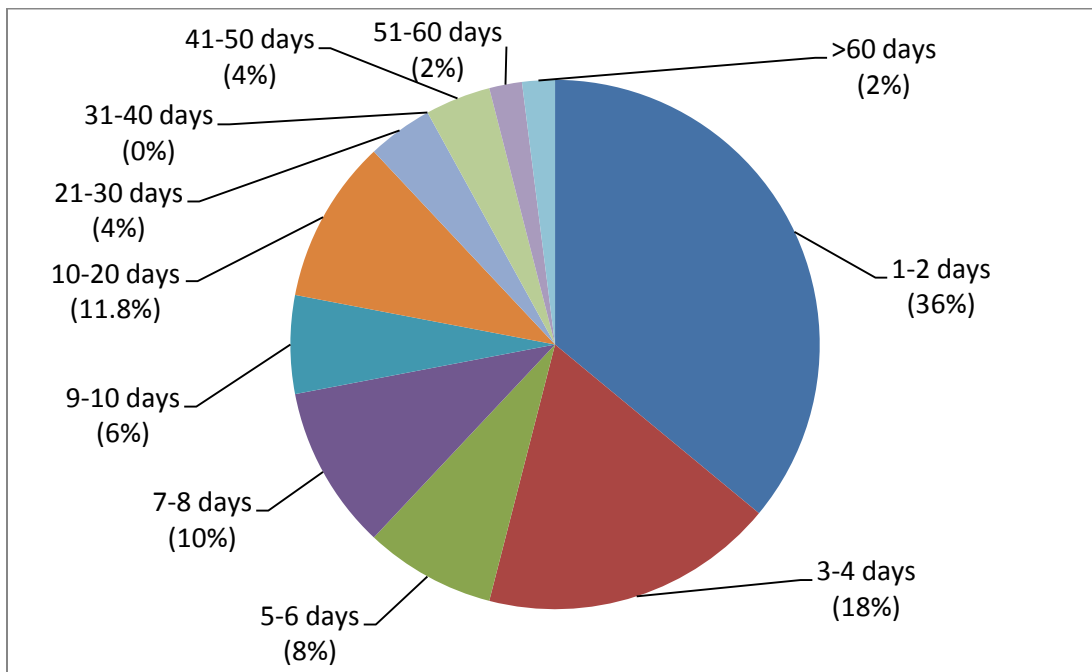
1 **Figure 2-2. Low Energy Geophysical Surveys/Survey Days (2008–2012)**



2 **2.4.4 Survey Duration**

3 Low energy geophysical surveys generally last only a few days, but may be as short as  
 4 one day. Typically, only one or two survey efforts a year extend for one to two months  
 5 or more. During the 2008–2012 period: (1) more than a third of the surveys conducted  
 6 lasted one or two days; (2) more than half lasted only four days or fewer; and (3) more  
 7 than 90 percent lasted one month or less (**Figure 2-3**).

8 **Figure 2-3. Duration of Low Energy Geophysical Surveys (2008–2012)**

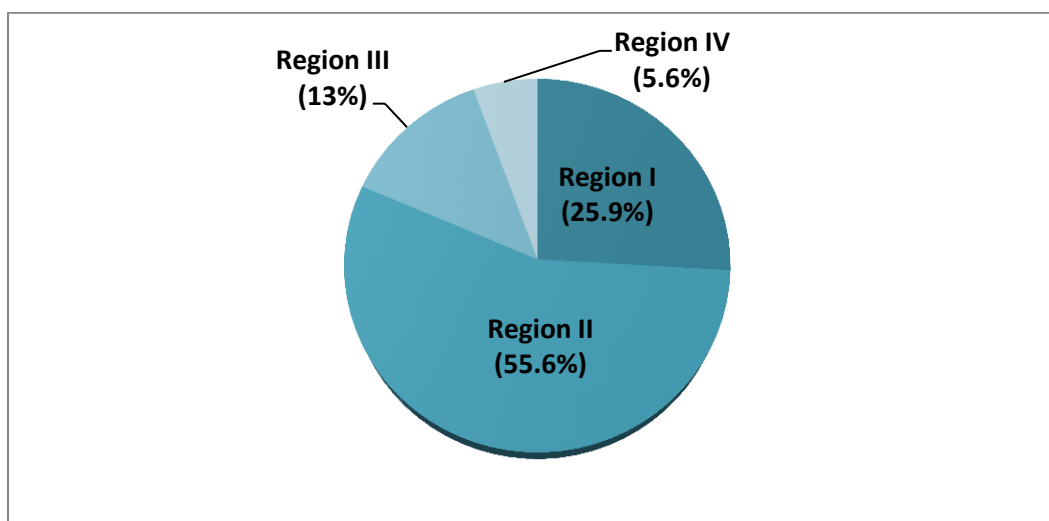




## 2.4.5 Survey Areas

Most operations during the survey period occurred offshore Central and Southern California, including the Santa Barbara Channel, offshore San Luis Obispo County, and Southern California harbors (i.e., in advance of dredging operations). In general, the majority of low energy surveys during the 2008–2012 period were conducted in Region II (55.6%) and Region I (25.9%); less than 20 percent occurred in Regions III and IV (**Figure 2-4**). A similar trend is evident when considering survey days by region. During the 2008-2012 period, Region II realized approximately 73 percent of the survey activity, followed by Region I (15%), Region III (8%), and Region IV (4%).

**Figure 2-4. Low Energy Geophysical Survey Activity by Region (2008–2012)**



## 2.4.6 Survey Vessels

A variety of vessels are employed in low energy geophysical surveys. These vessels are typically in the 30- to 61-meter (m) (100- to 200-foot [ft]) size range, but may be smaller depending on the type of survey being conducted and its location. Vessels are selected based on capabilities (i.e., ability to deploy and retrieve types of equipment, ability to navigate, maximum draft) and cost. For example, smaller, more maneuverable vessels are used in areas of restricted movement, such as bays or navigation channels. Vessels commonly used during low energy geophysical surveys in recent years include the M/V *Pacific Star*, *JAB*, *Blue Fin*, *Julie Ann*, *Michael Uhl*, and *Danny C*; complete specifications for the *Pacific Star*, *JAB*, and *Blue Fin* are provided in **Appendix B**.

## 2.4.7 Low Energy Geophysical Survey Equipment

**Table 2-3** provides specifications for representative equipment used under permit in State waters. While not exhaustive, this list provides important information regarding survey equipment in terms of dominant frequencies, peak output, and pulse duration.



1 **Table 2-3. Characteristics of Equipment Used During Permitted Low Energy Geophysical Surveys<sup>7</sup>**

Type and Representative Equipment	Dominant Frequency or Frequencies	Deployment Depth	Tow Speed	Maximum Output (dB re 1 µPa at 1 m)	Beam Width	Signal Duration
<b>SUBBOTTOM PROFILERS</b>						
<b>Mini-sparkers</b>						
SIG 2Mille mini-sparker	800 Hz (center frequency)	Surface towed	Variable	204 (rms)	Not stated	1 ms (approximate)
<b>Boomers</b>						
Huntec '70 deep tow boomer	0.2–16 kHz	Surface towed	Variable	215 (peak)	H: 8°–105° (>1 kHz) to omnidirectional (≤1 kHz)	180 µsec
AP3000 triple plate boomer system	100-800 Hz	Surface towed	Variable	219 (peak) @ 1.5 kJ	H: 8°–105° @ >1 kHz	60 msec
Geo Acoustics boomer shallow seismic system	0.5–6 kHz	Surface towed	8 kn	227 (peak, est.)	H: 8°–105° @ >1 kHz	180-200 µsec
<b>Subbottom Profilers (general)</b>						
Edgetech X-Star full spectrum digital subbottom profiler	0.4–24 kHz	300–6,000 m maximum	3-4 kn, optional at 6 kn	212 (peak)	10°-30°	20–40 msec
Edgetech SB-424 chirp (subbottom profiler)	4–24 kHz sweep	Surface towed	Variable	198 (rms)	17-24° (frequency dependent)	5-50 msec
GeoAcoustics GeoPulse profiler	2–15 kHz, 4 transducers	Hull mount or over the side	12 kn max (towed)	214 (peak)	55° (3.5 kHz); 40° (5 kHz); 30° (7 kHz);	330 µsec to 330 msec (adjustable)
<b>SIDE-SCAN SONARS</b>						
Edgetech Model 272 Series side-scan sonar towfish	100 kHz (105 ±10 kHz); 500 kHz (390 ±20 kHz)	Surface towed; <50–600 m	12.7 kn (max)	228 (100 kHz); 222 (500 kHz); peak values	H: 1.2° (100 kHz); H: 0.5° (500 kHz); V: 50°, tilted down 10° or 20°	10 µsec (500 kHz); 100 µsec (100 kHz)
Klein System 3000 side-scan sonar	100 kHz (125 ±1%); 500 kHz (445 ±1%)	1.5, 3, 6 km (max); Maximum <sup>1</sup> : 600 m (105 kHz); 150 m (500 kHz);	Variable	220 (estimated)	H: 1° (100 kHz); H: 0.2° (500 kHz); V: 40°	25–400 µsec

<sup>7</sup> Further explanation on the metrics and implications of equipment characteristics such as frequency, peak output, and beam width can be found in **Section 3.3.4** (Biological Resources) and **Appendix G** (Noise Modeling).

Type and Representative Equipment	Dominant Frequency or Frequencies	Deployment Depth	Tow Speed	Maximum Output (dB re 1 µPa at 1 m)	Beam Width	Signal Duration
<b>ECHOSOUNDERS</b>						
<b>Single Beam Echosounders</b>						
Teledyne Odom CV-100 digital single beam echosounder	Low: 10–50 kHz; High: 100–750 kHz; 1 kHz adjustable steps	Hull mounted or over the side; 0-15 m	Variable	230 (rms)	5°	0.1 ms
<b>Multibeam Echosounders</b>						
R2Sonic 2024 multibeam echosounder	200–400 kHz, or 700 kHz	Hull mounted	Variable	221 (p-p) 193 (rms)	0.3° x 0.6° (700 kHz); 0.5° x 1° (400 kHz); 1° x 2° (200 kHz)	15–500 µsec
SeaBat 8101 multibeam echosounder	240 kHz	Hull mounted	Variable	210-220 (peak)	Along track: 1.5° V: 1.5° Cross track: 150°	21–225 µsec
<b>MULTI-COMPONENT SYSTEMS</b>						
Kongsberg GeoSwath Plus/GeoAcoustics wide swath bathymetry shallow water multibeam and side-scan system	125 kHz; 250 kHz; 500 kHz	Maximum <sup>1</sup> : 200 m (125 kHz); 100 m (250 kHz); 50 m (500 kHz) Hull mounted or over the side	Variable	212-218 (estimated)	H: 0.85° (125 kHz); H: 0.75° (250 kHz); H: 0.5° (500 kHz)	128–896 µsec; 64–448 µsec; 32–224 µsec
<sup>1</sup> Maximum = maximum water depth below transducers. Abbreviations: dB = decibel(s); H = horizontal; Hz = Hertz (cycles per second); kHz = kilohertz; kn = knots; m = meter(s); msec = millisecond(s); p-p = peak-to-peak; rms = root mean square; V = vertical; µPa = microPascal(s); µsec = microsecond(s).						

Information presented in **Table 2-3** (i.e., the columns labeled dominant frequencies, maximum output, beam width, signal duration) have been derived from manufacturer's specifications. In some cases, manufacturer's specifications were not complete; in these instances, and when available, field measurements were used. In some cases, the use of manufacturer's equipment specifications represents a conservative metric (e.g., maximum source levels). Equipment sound levels are typically adjusted or tuned during a survey, either by the operator or the equipment, to accommodate initial or changing site-specific conditions.

Factors outlined in **Table 2-3** are of importance in assessing potential impacts of noise sources on sensitive marine resources, and are key characteristics that are considered within the framework of the current OGPP. Equipment use varies by survey and is determined by survey data needs. Consideration of the data end product and its application by the client dictate which piece of equipment is best suited for each survey effort.

Based on recent survey activity and discussions with geophysical survey companies, the equipment (outlined in **Table 2-3**) is representative of systems recently used during low energy geophysical surveys in State waters offshore California:

#### Single beam echosounder

- Odom CV-100 single beam echosounder

#### Multibeam echosounder

- R2Sonic multibeam echosounder
- Reson 8101 multibeam echosounder
- Kongsberg GeoSwath Plus multibeam system

#### Side-scan sonar

- Klein 3000 Digital side-scan sonar
- EdgeTech 272-TD side-scan sonar

#### Subbottom profiler

- EdgeTech X-Star subbottom profiler (SB-216/SB-424)
- GeoAcoustics Boomer
- AP3000 Triple Plate Boomer
- GeoAcoustics GeoPulse

#### Magnetometer

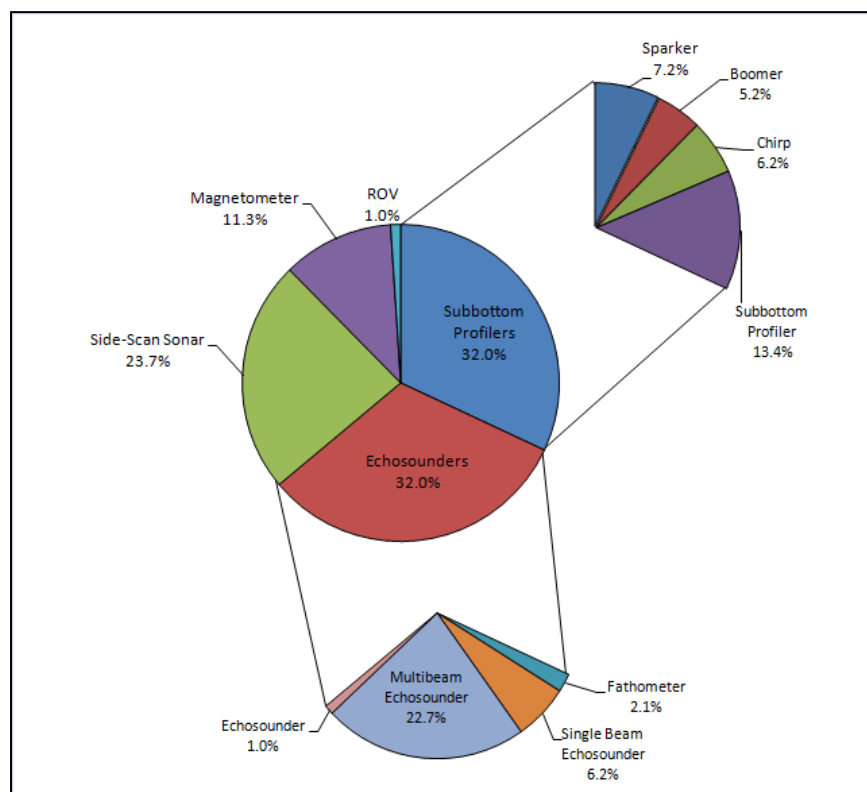
- SeaSpy magnetometer

Single beam echosounders are routinely used concurrently with side-scan sonar and subbottom profilers. However, the use of single beam echosounders is diminishing and being replaced with multibeam echosounder systems. Under these circumstances, multibeam echosounder systems are employed singularly, because side-scan sonar and subbottom profilers cannot be used concurrently due to acoustic interference. It is estimated that single beam or multibeam echosounders are active for approximately 80 percent of a typical low energy geophysical survey; however, duty cycle (i.e., the percent of survey time that equipment is active) can change based on the data demands of individual surveys.

#### 2.4.8 Equipment Use Characteristics – 2008–2012

During the 2008–2012 period, low energy geophysical surveys used 11 different equipment types (based on equipment type reported in the “Geophysical Survey Notification” submitted to the CSLC prior to the commencement of a survey). Predominant equipment types used during the 2008–2012 period included side-scan sonars (23.7%), multibeam echosounders (22.7%), subbottom profilers (13.4%), magnetometers (11.3%), and other systems (<10%) (**Figure 2-5**).

**Figure 2-5. Low Energy Geophysical Survey Equipment Use (2008–2012)**



Discussions with geophysical contractors indicate that, depending on the survey, several pieces of equipment may be used simultaneously during a survey.

Simultaneous equipment use was estimated to occur approximately 12 percent of the time (i.e., based on survey days noted as concurrent operations relative to total survey days) during the 2008–2012 survey period and approximately 20 percent during 2011–2012.

#### 2.4.9 Survey Operations and Tracklines

Low energy geophysical survey vessels typically operate only during daylight hours; 24-hour (hr) operations occur rarely. Daylight-only operations are typically associated with a return to a local port for overnight berthing.

Most surveys are likely to occur within relatively good visibility of the shoreline. If a survey window is broad, geophysical contractors will take into consideration local conditions and, on occasion, long-range weather forecasts. Vessel operations are easier for the crew and geophysical team aboard when ocean conditions are good. On occasion, however, the work window is very narrow, and vessels must operate within that window regardless of conditions.

During a survey, the survey vessel continuously covers a prescribed survey area by transiting along precisely located lines/tracklines, then moving over an appropriate distance and conducting similar operations in the opposite direction. This approach ensures 100 percent coverage of the survey area. Surveys associated with existing infrastructure will traverse along one or more lines dictated by the location of the infrastructure (e.g., along an outfall, pipeline, or fiber optic cable). The precise position of the vessel is known within 1 to 2 m due to the vessel operator's use of highly accurate integrated navigation software combined with differential Global Positioning System (GPS) updates from satellites.

Operational survey speeds vary depending upon the water depth and equipment being used. For example, rapid mapping operations using a multibeam echosounder backscatter system routinely occur at 7 to 8 knots.

#### 2.4.10 Equipment Used and Region(s) Surveyed – 2011 and 2012

Survey efforts conducted under the OGPP during 2011 and 2012, indicative of the most recent trends in low energy geophysical survey activity, are summarized in **Tables 2-4** and **2-5**, and depicted graphically in **Figure 2-6**.

**Table 2-4. Estimated Duration of Equipment Use During Low Energy Geophysical Surveys (2011), Including Estimates of Equipment Use by Region**

Primary Period of Operations	Days of Operation	Region	Simultaneous Operations	Estimated Duration of Equipment Use (Days)										ROV
				Subbottom Profilers				SSS	Echosounders				Passive	
				Spark	Boomer	Chirp	uSBP		Fatho	SBES	MBES	uEcho	Mag	
Dec. 2011	20	II	No	-	20.0	-	-	-	-	-	-	-	-	-
Dec. 2011	2	II	NA	-	-	-	-	-	-	-	-	-	-	2.0
Nov. 2011	1	I	Yes (SBP, SSS)	-	-	-	1.0	1.0	-	-	-	-	-	-
Nov. 2011	1	II	No?	-	-	-	0.5	-	-	-	0.5	-	-	-
Oct. 2011	1	II	NA	-	-	-	-	-	-	-	-	-	Y	-
Sept. 2011	7	II	No?	-	-	-	-	2.3	-	2.3	2.3	-	Y	-
Sept. 2011	5	II	No?	2.5	-	2.5	-	-	-	-	-	-	-	-
Sept. 2011	16	II	Yes (SBP, SSS)	-	-		16.0	16.0	-	-	-	-	-	-
Sept. 2011	6	I	No?	-	-	6.0	-	-	-	-	-	-	-	-
July 2011	3	II	No	-	-	-	-	-	-	-	-	3.0	-	-
June 2011	7	I	No?	2.3	-	2.3	-	-	-	-	2.3	-	-	-
May 2011	3	III	No?	1.5	-	1.5	-	-	-	-	-	-	-	-
April 2011	6	II	Yes (SBP, SSS)	-	-	-	3.0	3.0	-	-	3.0 <sup>a</sup>	-	-	-
Jan. 2011	54	II	No	-	54.0	-	-	-	-	-	-	-	-	-
Equipment Use Days, 2011				6.3	74.0	12.3	20.5	22.3	0.0	2.3	8.2	3.0	--	2.0
Estimated Days in Region I				2.3	0	8.3	1.0	1.0	0	0	2.3	0	NA	0
Estimated Days in Region II				2.5	74.0	2.5	19.5	21.3	0	2.3	5.8	3.0	■	2.0
Estimated Days in Region III				1.5	0	1.5	0	0	0	0	0	0	NA	0
Estimated Days in Region IV				0	0	0	0	0	0	0	0	0	NA	0
Equipment Use – Survey Total, 2011				3/14	2/14	4/14	4/14	4/14	0/14	1/14	4/14	1/14	2/14	1/14

**Abbreviations and Acronyms:**

Fatho = fathometer; Mag = magnetometer; MBES = multibeam echosounder; NA = not applicable; SBES = single beam echosounder; SBP = subbottom profiler (same as Chirp); Spark = sparker; SSS = side-scan sonar; uEcho = unspecified echosounder; uSBP = unspecified SBP.

<sup>a</sup> SBP and SSS operate concurrently; MBES and SBP/SSS each assumed to operate for 3.0 days during the 6-day survey.

Notes: Primary period of operations determined based on survey start month, as specified by the operator in their formal notification. For simultaneous operations, equipment is assumed to be operational concurrently, as denoted by shading. Magnetometers are acoustically passive. Magnetometer entries do not reflect duration of use; however, use within a region is denoted by a "■".

1 **Table 2-5. Estimated Duration of Equipment Use During Low Energy Geophysical Surveys Conducted in 2012,**  
 2 **Including Estimates of Equipment Use by Region**

Primary Period of Operations	Days of Operation	Region	Simultaneous Operations	Estimated Duration of Equipment Use (Days)										
				Subbottom Profilers				SSS	Echosounders				Passive Mag	ROV
				Spark	Boomer	Chirp	uSBP		Fatho	SBES	MBES	uEcho		
Nov. 2012	12	II	No	-	-	-	-	6.0	-	-	6.0	-	-	-
Nov. 2012	1	II	No	-	-	-	-	0.5	-	0.5	-	-	-	-
Oct. 2012	2	II	No?	-	-	-	-	1.0	-	1.0	-	-	Y	-
Oct. 2012	7	II	No?	-	-	-	-	2.3	-	2.3	2.3	-	Y	-
Aug. 2012	47	II	No	-	47.0	-	-	-	-	-	-	-	-	-
July 2012	2	II	No	-	-	-	-	-	-	-	2	-	-	-
July 2012	20	I	No?	-	-	-	-	6.7	-	6.7	6.7	-	-	-
June 2012	4	II	No?	-	-	-	-	1.3	-	1.3	1.3	-	Y	-
May 2012	3	III	No?	1.5	-	1.5	-	-	-	-	-	-	-	-
April 2012	3	I	No?	-	-	3.0	-	-	-	-	-	-	-	-
April 2012	9	I	Yes (SSS, SBP)	-	-	-	4.5	4.5	-	-	4.5 <sup>a</sup>	-	Y	-
April 2012	9	II	Yes	-	-	-	9.0	9.0	-	-	-	-	-	-
Jan. 2012	9	I	Yes (SSS, SBP)	-	-	-	4.5	4.5	-	-	4.5 <sup>a</sup>	-	Y	-
Equipment Use Days, 2012				1.5	47.0	4.5	18.0	35.8	0	11.8	27.3	0	--	0
Estimated Days in Region I				0	0	3.0	9.0	15.7	0	6.7	15.7	0	■	0
Estimated Days in Region II				0	47.0	0	9.0	20.1	0	5.1	11.6	0	■	0
Estimated Days in Region III				1.5	0	1.5	0	0	0	0	0	0	NA	0
Estimated Days in Region IV				0	0	0	0	0	0	0	0	0	NA	0
Equipment Use – Survey Total, 2012				1/13	1/13	2/13	3/13	9/13	0/13	5/13	7/13	0/13	5/13	0/13

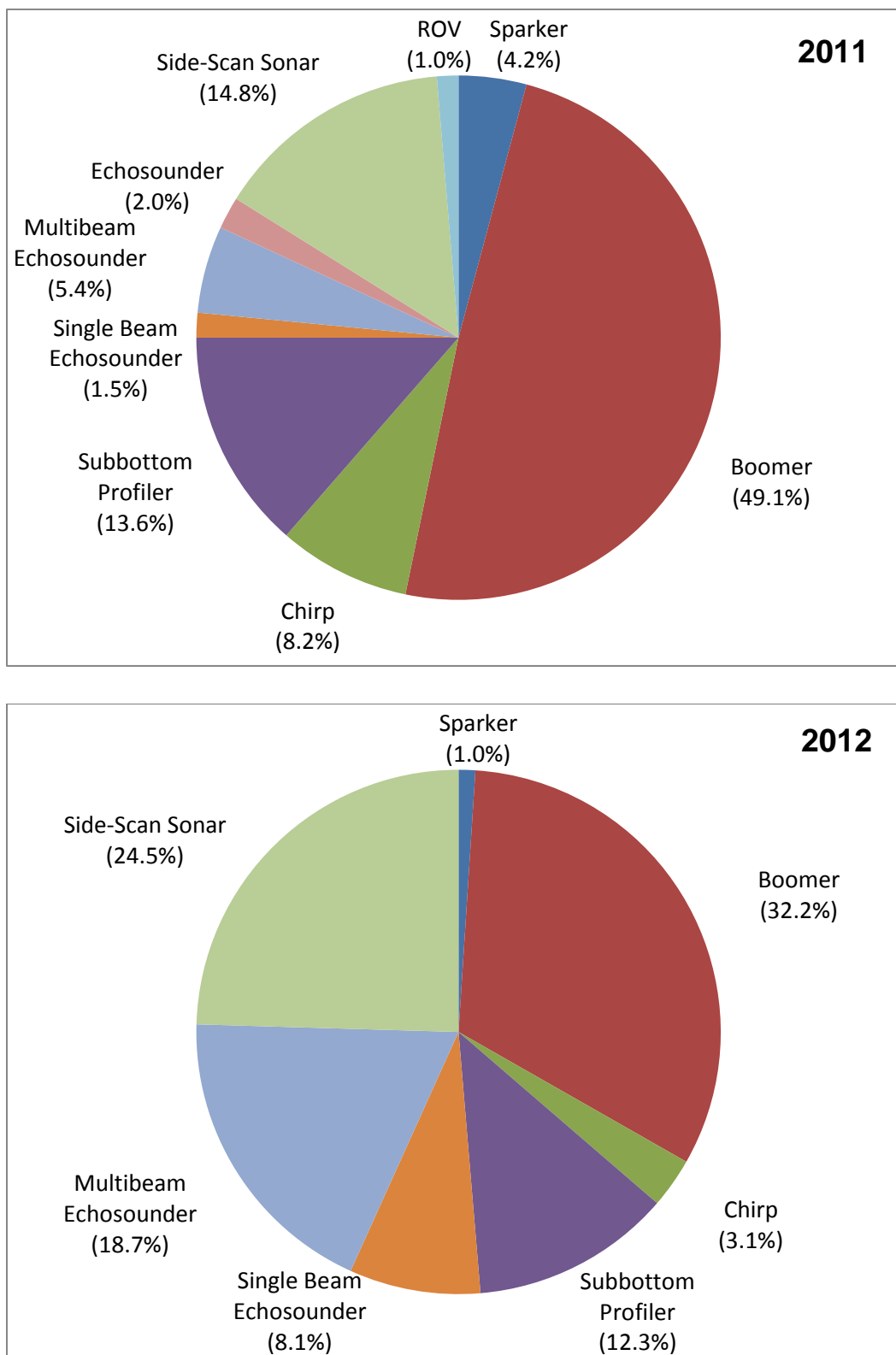
Abbreviations and Acronyms:

Fatho = fathometer; Mag = magnetometer; MBES = multibeam echosounder; NA = not applicable; SBES = single beam echosounder; SBP = subbottom profiler (same as Chirp); Spark = sparker; SSS = side-scan sonar; uEcho = unspecified echosounder; uSBP = unspecified SBP.

<sup>a</sup> SBP and SSS operate concurrently; MBES and SBP/SSS each assumed to operate for 4.5 days during the 9-day survey.

Notes: Primary period of operations determined based on survey start month, as specified by the operator in their formal notification. For simultaneous operations, equipment is assumed to be operational concurrently, as denoted by shading. Magnetometers are acoustically passive. Magnetometer entries do not reflect duration of use; however, use within a region is denoted by a "■".

**Figure 2-6. Equipment Used During Low Energy Geophysical Surveys (2011-2012), Including %Total Survey Days Each Piece of Equipment was Used**





Trends evident in survey activity and equipment used during 2011 and 2012 are included below:

- Boomers were prevalent among equipment types, particularly during longer surveys, and represented nearly half of the equipment use days in 2011, and greater than 32 percent of the equipment use days in 2012; this is in contrast to their relatively limited use prior to 2011. During low energy geophysical surveys off California, permittees did not report using boomers simultaneously with other equipment.
- In addition to boomers, multibeam echosounders, single beam echosounders, subbottom profilers, chirp, side-scan sonar, and sparkers were the most commonly used pieces of equipment; limited use was evident for magnetometers and ROVs. This trend for 2011–2012 is generally consistent with equipment use trends noted for the entire 2008–2012 period.
- Based on survey days, more than 88 percent of the surveys in 2011 occurred in Region II, with nearly 10 percent occurring in Region I, and less than 2 percent occurring within Region III; no survey activity occurred in Region IV in 2011.
- Based on survey days, more than 63 percent of the survey activity in 2012 occurred in Region II, with more than 34 percent occurring in Region I, and 2 percent occurring within Region III; no survey activity occurred in Region IV in 2012.
- The predominance of survey activity in Regions I and II during 2011 and 2012 is consistent with that noted for the 2008–2012 period.
- During 2011 and 2012, the concurrent use of equipment (e.g., use of subbottom profiler and side-scan sonar) occurred during approximately 20 percent of the surveys (12 to 15 percent of the time based on total survey days).

## **2.5 Predicted Activity Scenario**

To provide additional context for this analysis, the past survey activity discussed above was extrapolated in an effort to predict what survey patterns are expected to occur under the updated OGPP. Based on the survey activity trends identified for the 2008-2012 period, including detailed analysis of the 2011–2012 surveys, coupled with CSLC and geophysical operator expectations on expected future survey activity, the following predicted activity scenario was developed for 2013 and 2014.

- 1 • Surveys are expected to typically last one to four days, with minor exceptions;  
2 most surveys will continue to be associated with infrastructure (i.e., surveys of  
3 outfalls, pipelines, or cables). A limited number of longer-term surveys (i.e.,  
4 approximately 10 days) may be possible.
- 5 • A total of 10 to 12 surveys representing 70 to 80 survey days are anticipated,  
6 although the implementation of longer duration surveys may push the total  
7 survey days to 100 or more; a prevalence of daytime surveys is expected.
- 8 • Multibeam echosounders, single beam echosounders, subbottom profilers  
9 (including chirp and sparkers), and side-scan sonar will continue to represent the  
10 most commonly used pieces of equipment, in addition to boomers. Concurrent  
11 use of equipment (e.g., use of subbottom profiler and side-scan sonar) will  
12 continue and may be expected to occur approximately 15 percent of the time.
- 13 • Boomer use, while generally limited to longer (duration) surveys, is expected to  
14 continue; its use relative to other equipment types will be dependent upon the  
15 nature and duration of future surveys.
- 16 • The vast majority of future survey work (i.e., 90 percent to 95 percent) is  
17 expected to occur in Regions I and II, with limited activity (i.e., 5 percent to  
18 10 percent) expected in Regions III and IV.
- 19 • Survey vessels will mobilize and will overnight/berth at the closest suitable port.

## 20 **2.6 Individual Survey Scenario Used for Impact Analysis**

21 Based on prior permit-related low energy geophysical survey activities and the summary  
22 of predicted permit-related survey activities discussed above, a hypothetical “typical”  
23 survey, designed to reflect the most conservative survey scenario, was established as a  
24 basis for impact assessment. The scenario assumes the survey is compliant with  
25 current OGPP requirements. Other parameters include the following:

- 26 • Duration: 12 hrs of daylight (maximum), with 10 hrs maximum of equipment use  
27 time;
- 28 • Trackline Orientation: from shallow water perpendicular to shore, or a direct line  
29 from just beyond the surf zone (approximately 100 m to several hundred meters  
30 from the beach) to the 3 nm line;
- 31 • Tracklines: three tracklines total (center line, two flanking lines, one per side of  
32 the center line); assumes investigation of a pipeline, discharge line, or cable  
33 corridor; tracklines are spaced 75 m apart;

- Vessel speed: estimated to average 4 knots, but variable between 2 and 8 knots depending upon equipment in use; and
- Equipment pulse rate: estimated at four-second intervals.

For resource areas potentially impacted by a survey vessel's size and components, the analysis assumes use of a representative survey vessel, the *M/V Pacific Star*, whose key specifications are provided below and further detailed in **Appendix B**:

- Dimensions: length 172 ft length overall (LOA); draft 10.2 ft
- Tonnage: 195 gross register tonnage (GRT)
- Fuel consumption: 75 gallons per hour (gph) at 10 knots
- Prime movers: (2) Detroit diesel EMD 12-567-c; 3000 total horse power (hp)
- Generators: (1) Detroit diesel 400 kilowatts (kW); (2) Mitsubishi 360 kW

Acoustic modeling was also conducted using representative equipment for each of the five most prevalent active equipment types: single beam echosounder; multibeam echosounder; side-scan sonar; general subbottom profiler; and boomer (subbottom profiler). Sound source levels employed in the modeling analysis (**Appendix G**) were based on one of two sources, manufacturer's specifications or, where available, field measurements. Use of manufacturer's equipment specifications represents a conservative metric (i.e., maximum source levels), as equipment sound output is typically adjusted/tuned to accommodate site-specific conditions. Use of actual field measurements provides a more representative modeling situation when physical conditions are similar (e.g., water depth, water column characteristics, substrate types). Among the equipment types, the acoustic modeling of the single beam and multibeam echosounder, subbottom profiler, and side-scan sonar used manufacturer's specifications; the boomer was modeled based on field measurements. Modeling results were used to assess the potential impacts associated with low energy geophysical survey equipment noise, considering current regulatory noise exposure thresholds, alternative sound exposure criteria, and recent scientific findings regarding noise impacts.

The approach taken in this analysis is based on a single survey activity scenario developed through review of recent survey history. Use of a single survey scenario approach is appropriate for two reasons: (1) multi-day surveys conducted during daytime typically return to port for overnight berthing, removing survey-associated impact producing factors (e.g., acoustic sources) for a 12- to 14-hr period; and (2) interruptions in exposure effectively reset the cumulative exposure analysis, consistent with incidental take analysis methodology (e.g., Science Applications International Corporation 2011).

1 While this MND uses, as stated above, a hypothetical “typical” survey scenario, impact  
2 discussions in **Section 3** also consider how impacts may differ for atypical but possible  
3 surveys, such as those that continue operations at night. Other variables in survey  
4 operations that may affect impacts to certain resource areas, such as vessel lighting,  
5 cable length, and operation in shipping lanes, are described and evaluated in the  
6 relevant resource area subsections.

## 3.0 ENVIRONMENTAL ANALYSIS AND CHECKLIST

### 3.1 Introduction

This Section contains the Initial Study that was completed for the proposed Offshore Geophysical Permit Program Update (OGPP or Project) in accordance with the requirements of the California Environmental Quality Act (CEQA). The Initial Study identifies the scope and nature of survey activities anticipated under the OGPP and the expected impacts associated with those activities, evaluates the potential significance of the identified impacts, and discusses ways to avoid or lessen impacts that are potentially significant. The information, analysis, and conclusions included in the Initial Study provide the basis for determining the appropriate document needed to comply with CEQA. For the OGPP, based on the analysis and information contained herein, the California State Lands Commission (CSLC) finds there is evidence that the Project may have a significant effect on the environment, but revisions to the OGPP and implementation of specified mitigation measures would avoid the effects or mitigate the effects to a point where clearly no significant effect on the environment would occur. As a result, the CSLC has concluded that an MND is the appropriate CEQA document for the Project.

The evaluation of environmental impacts provided in **Section 3.3** is based, in part, on the impact questions provided in Appendix G of the State CEQA Guidelines. These questions, which are included in an impact assessment matrix for each environmental category (Aesthetics, Agriculture and Forest Resources, Air Quality, Biological Resources, Cultural Resources, etc.), are “intended to encourage thoughtful assessment of impacts.” Each question is followed by a check-marked box with column headings that are defined below.

- **Potentially Significant Impact.** This column is checked if there is substantial evidence that a Project-related environmental effect may be significant. If there are one or more “Potentially Significant Impacts” a Project Environmental Impact Report (EIR) would be prepared.
- **Less than Significant with Mitigation.** This column is checked when the Project may result in a significant environmental impact, but the incorporation of identified project revisions or mitigation measures would reduce the identified effect(s) to a less than significant level.
- **Less than Significant Impact.** This column is checked when the Project would not result in any significant effects. The Project’s impact is less than significant even without the incorporation of a project-specific mitigation measure.

- 1 • **No Impact.** This column is checked when the Project would not result in any  
2 impact in the category or the category does not apply.

3 The environmental factors checked below would be potentially affected by this Project;  
4 a checked box indicates that at least one impact would be a “Potentially Significant  
5 Impact” except that the Project revisions, including the implementation of mitigation  
6 measures, have been incorporated that reduce the impact to “Less than Significant with  
7 Mitigation.” Detailed descriptions and analyses of impacts from low energy geophysical  
8 surveys conducted under the OGPP and the basis for the below significance  
9 determinations are provided in **Section 3.3.**

<input type="checkbox"/> Aesthetics	<input type="checkbox"/> Agriculture and Forest Resources	<input checked="" type="checkbox"/> Air Quality/Greenhouse Gas Emissions
<input checked="" type="checkbox"/> Biological Resources	<input type="checkbox"/> Cultural Resources	<input type="checkbox"/> Geology and Soils
<input checked="" type="checkbox"/> Hazards and Hazardous Materials	<input type="checkbox"/> Hydrology and Water Quality	<input type="checkbox"/> Land Use and Planning
<input type="checkbox"/> Mineral Resources	<input type="checkbox"/> Noise	<input type="checkbox"/> Population and Housing
<input type="checkbox"/> Public Services	<input checked="" type="checkbox"/> Recreation	<input type="checkbox"/> Transportation/Traffic
<input type="checkbox"/> Utilities and Service Systems	<input checked="" type="checkbox"/> Commercial and Recreational Fisheries	<input checked="" type="checkbox"/> Mandatory Findings of Significance

## 10 3.2 Agency Determination

11 Based on the environmental impact analysis provided by this Initial Study:

- ☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.
- ☒ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.
- ☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

Signature

Date

Cy R. Oggins, Chief  
Division of Environmental Planning and Management  
California State Lands Commission

### 3.3 Environmental Checklist

#### 3.3.1 Aesthetics

<b>I. AESTHETICS:</b> Would the Project:	<b>Potentially Significant Impact</b>	<b>Less Than Significant with Mitigation</b>	<b>Less Than Significant Impact</b>	<b>No Impact</b>
a) Have a substantial adverse effect on a scenic vista?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

##### 3.3.1.1 Environmental Setting

While the California Environmental Quality Act (CEQA) does not provide a definition of a scenic vista or resource explicitly, for purposes of this analysis, a scenic vista or scenic resource includes viewpoints that provide expansive views of highly valued landscapes that uniquely contribute to a public benefit upon individuals or communities, whether those viewpoints are officially designated by public agencies, or informally designated by tourist guides or other sources. In this case, scenic vistas and resources include not only views of the coastline shores and beaches, but also the aesthetic and scenic value of the ocean itself. A substantial adverse effect to such a scenic vista is one that would degrade the view from such a designated view spot.

#### Onshore

The California coastline supports a vast array of highly scenic vistas, including beaches, wildlife viewing areas, recreation areas, state parks, and national seashores, as well as residential and tourist areas that benefit from the coastline's appealing natural attributes. Additionally, residents and tourists use State Route (SR) 1, considered one of the most scenic highways in the world, to enjoy the views and to see wildlife along much of the California coastline. Approximately 2.5 million people participated in wildlife viewing, and more than 4 million people took photos at the beaches throughout the State in 1999 (California Department of Fish and Game [CDFG] 2009).<sup>8</sup>

Region I, from south of San Diego to the Los Angeles/Ventura County line, offers dozens of popular beaches and coastal tourist sites that, when combined with dense

<sup>8</sup> The CDFG was renamed the California Department of Fish and Wildlife (CDFW) on January 1, 2013.

1 urban areas and tourist populations, have large numbers of viewing visitors. Heavily  
2 used beaches and coastal attractions in Region I include Santa Monica State Beach,  
3 Newport Beach, Venice Beach, Corona Del Mar, Manhattan Beach, Laguna Beach,  
4 Dana Point, San Clemente, and Hermosa Beach.

5 Similarly, Region II, while less populated, attracts visitors for wildlife viewing, particularly  
6 whale watching, and nature observing, such as tidepooling. Along certain portions of the  
7 Region II coastline, SR 1 offers viewing opportunities for marine mammals, redwood  
8 forests, and the San Luis Obispo North Coast Byway, which passes through rural  
9 ranchlands (CDFG 2005). Beaches near Ventura, Santa Barbara, and Pismo Beach are  
10 popular tourist destinations.

11 The coastline in Region III traverses both rural and dense urban areas and provides  
12 many popular beaches and recreation areas, including highly popular tourist  
13 destinations such as Big Sur, Carmel, Monterey, Santa Cruz, Half Moon Bay, and Point  
14 Reyes. Residents and tourists use SR 1 to see the views and observe wildlife along the  
15 coastline in San Mateo, San Francisco, and Sonoma Counties.

16 SR 1 in Region IV also provides exceptional coastal views along the Mendocino,  
17 Humboldt, and Del Norte County coastline. Mendocino Headlands State Park is the  
18 most visited state park in the study region, with over one million visitors in 2007 and  
19 2008 (Horizon Water and Environment 2011). The State, county, and city beaches in  
20 the study region attract visitors for wildlife viewing and natural scenery observations.

## 21 **Offshore**

22 Offshore views of the ocean and shoreline are generally similar to the views provided  
23 from the onshore areas described above. Marine Protected Areas (MPAs) have been  
24 established along the California coast and offer visual resources including whales, sea  
25 lions, sea otters, and other marine wildlife (refer to **Section 3.3.9, Land Use and**  
26 **Planning**, for additional information on California MPAs). Whale watching and scenic  
27 boat cruises frequent offshore areas, particularly near ports and popular tourist areas.  
28 Additionally, recreational fishing occurs in offshore areas in all four study regions.

### 29 3.3.1.2 Regulatory Setting

30 Federal and State laws and regulations pertaining to this issue and relevant to the  
31 Project are identified in **Table 3-1**.



**Table 3-1. Federal and/or State Laws, Regulations, and Policies Potentially Applicable to the Project (Aesthetics)**

CA	California Scenic Highway Program	The California Scenic Highway Program, managed by the California Department of Transportation, was created to preserve and protect scenic highway corridors from change that would diminish the aesthetic value of lands adjacent to highways. State highways identified as scenic, or eligible for designation, are listed in California Streets and Highways Code section 260 et seq.
CA	California Coastal Act Chapter 3 policies	The Coastal Act is concerned with protecting the public viewshed, including views from public areas, such as roads, beaches, coastal trails, and access ways. Section 30251 states: "Permitted development shall be sited and designed to protect views to and along the ocean and scenic coastal areas, to minimize the alteration of natural landforms, to be visually compatible with the character of the surrounding area, and, where feasible, to restore and enhance visual quality in visually degraded areas."

Counties adjacent to the California coast manage and maintain county beaches, public parks, and coastal access areas. These areas are regulated through general plans and Local Coastal Programs (LCP). Policies within these plans often address visual resources, particularly in coastal areas. More information concerning aesthetic resources and local planning in coastal regions can be found in the land use sections of the following documents:

- **Region I:** South Coast Marine Protected Areas Project Environmental Impact Report (EIR) (United Research Services [URS] 2010a,b);
- **Region II:** South Coast Marine Protected Areas Project EIR (URS 2010a,b) and California Marine Life Protection Act Initiative Central Coast Marine Protected Areas Project EIR (Jones & Stokes 2006, 2007);
- **Region III:** California Marine Life Protection Act Initiative Central Coast Marine Protected Areas Project EIR (Jones & Stokes 2006, 2007) and California Marine Life Protection Act Initiative North Central Coast Marine Protection Areas Project EIR (ICF Jones & Stokes 2009a,b); and
- **Region IV:** Marine Life Protection Act – North Coast Study Region EIR (Horizon Water and Environment LLC 2012a,b).

### 3.3.1.3 Impact Analysis

#### ***a) Would the Project have a substantial adverse effect on a scenic vista?***

**Less than Significant Impact.** Aesthetic or visual resources include the natural scenic features of the landscape that can be seen and that contribute to the public's appreciation and enjoyment of the environment. Visual resource/aesthetic impacts are generally evaluated in the context of a project's physical characteristics, potential visibility, and the extent to which the project's presence would change the perceived

1 visual character and quality of the environment in which it would be located. As  
2 discussed in **Section 3.3.1.1, Environmental Setting**, scenic resources in this case  
3 include not only shore-based features such as beaches, tourist-serving businesses, and  
4 coastal highways, but also the ocean itself and the aesthetically valuable marine  
5 resources (e.g., wildlife viewing) visible from boat cruises, whale watching boats, and  
6 private recreational vessels such as sport fishing boats.

7 Geophysical surveys permitted under the OGPP could affect onshore and offshore  
8 scenic vistas through the nearshore presence of survey vessels that generate light or  
9 glare. This would be particularly true in Regions I and II, where 90 to 95 percent of  
10 surveys are anticipated to occur, and where several heavily used beaches and tourist  
11 areas are located. However, the OGPP would not result in the placement of any  
12 equipment onshore that would disrupt the visual character or aesthetic value of onshore  
13 scenic vistas.

14 As discussed in **Section 2.5, Predicted Activity Scenario**, approximately 10 to 12  
15 surveys, representing 70 to 80 survey days, are anticipated to occur annually under the  
16 OGPP although the implementation of longer duration surveys may push the total  
17 survey days to 100 or more. These surveys, while concentrated in Regions I and II,  
18 would be spread over a relatively large coastal area with some beyond the visibility of  
19 the shoreline, which would limit visual impacts on any specific location. Additionally,  
20 covered surveys, with minor exceptions, are typically expected to last fewer than five  
21 days, with some (more than 30 percent in recent years) lasting only a day or two. As a  
22 result, aesthetic impacts due to vessel operation in a survey area, including disruption of  
23 scenic resources important to wildlife viewing and other marine aesthetic values would  
24 be minor and short-term.

25 The presence of intermediate-size survey vessels (typically 100 to 200 feet [ft] in length)  
26 in the marine environment would not be unusual in most locations, considering that  
27 other vessels (commercial vessels, fishing boats, and large and small pleasure boats)  
28 already operate in offshore waters. The potential for survey operations to generate  
29 levels of light and glare above existing levels would be substantially limited by the short  
30 duration of survey operations. Also, most survey operations would occur during daylight  
31 hours when any light generated by vessels would be diminished by natural light.

32 In light of the above circumstances, the OGPP would not result in a substantial adverse  
33 effect on scenic vistas in the study regions, and therefore, the impact is less than  
34 significant.

35 ***b) Would the Project substantially damage scenic resources, including but not***  
36 ***limited to, trees, rock outcroppings, and historic buildings with a state scenic***  
37 ***highway?***

1 **No Impact.** As stated above, geophysical surveys permitted under the OGPP would not  
2 result in physical damage to scenic resources, as no onshore structures or equipment  
3 would be used. Therefore, no impacts would occur.

4 ***c) Would the Project substantially degrade the existing visual character or quality***  
5 ***of the site and its surroundings?***

6 **Less than Significant Impact.** As discussed in (a) above, surveys permitted under the  
7 OGPP are not expected to substantially degrade the existing visual character or quality  
8 of the marine environment. Therefore, the impact is less than significant.

9 ***d) Would the Project create a new source of substantial light or glare which would***  
10 ***adversely affect day or nighttime views in the area?***

11 **Less than Significant Impact.** Most survey operations would occur during daylight  
12 hours, when any light generated by vessels would be diminished by natural light, and  
13 glare produced by boats would be no more severe than glare generated by vessels  
14 already operating daily in nearshore waters. Additionally, as discussed in (a) above, any  
15 light or glare effects of surveys would be short-term and would not substantially affect  
16 day or nighttime views from any one particular viewpoint. Therefore, the lighting-related  
17 impact of the OGPP is less than significant.

#### 18 3.3.1.4 Mitigation and Residual Impact

19 **Mitigation.** The OGPP would not result in significant aesthetic impacts, and no  
20 mitigation is required.

21 **Residual Impacts.** The impacts of the OGPP on aesthetics/scenic resources are less  
22 than significant; therefore, no mitigation is required and no residual impacts would  
23 occur.

### 1 3.3.2 Agriculture and Forest Resources

II. AGRICULTURE AND FOREST RESOURCES: Would the Project:	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code Section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Result in the loss of forest land or conversion of forest land to non-forest use?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f) Result in long-term adverse impacts to existing mariculture operations?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

#### 2 3.3.2.1 Environmental Setting

3 The area covered by the California State Lands Commission's (CSLC) Offshore  
 4 Geophysical Permit Program (OGPP or Project) is located within State waters along the  
 5 California coast, exclusive of San Francisco Bay. Agricultural and forested lands are  
 6 located adjacent to the coastline in many areas; however, low energy geophysical  
 7 surveys will not directly or indirectly affect agricultural or forested lands located onshore.

8 Related to this resource area, however, are various existing mariculture operations  
 9 located in marine and estuarine waters along the California coast. While not strictly  
 10 agricultural, they are sites for the rearing of marine species, such as vertebrate fish and  
 11 shellfish, destined for human consumption. Consequently, the following analysis  
 12 considers an additional significance threshold (category [f] above), above those  
 13 specified explicitly in the State CEQA Guidelines Appendix G Checklist, to account for  
 14 potential impacts to mariculture.

15 California is the second leading shellfish producer on the U.S. west coast, producing  
 16 approximately 1.72 million pounds of shellfish in 2011 (Ramey, 2013). Dominant

species under mariculture include Pacific oysters (*Crassostrea gigas*), Manila clams (*Venerupis philippinarum*), and mussels (*Mytilus* spp.). Ramey (2013) notes that approximately 5,900 acres of state submerged tidelands are used for mariculture, involving 17 commercial businesses. Of that total, 1,952 acres are leased by the California Department of Fish and Wildlife (CDFW) as state-water bottoms, while all remaining acres are granted tidelands or privately owned tidelands (i.e., Humboldt Bay and southern California). Major growing areas include Humboldt and Tomales Bays, Drakes Estero, Morro Bay, and southern California.

**Region I.** Shellfish aquaculture operations with active state water bottom leases cover 106.7 acres within the Marine Life Protection Act's South Coast region, which covers all of Region I and part of Santa Barbara County in Region II, of which 36 acres have been in use through 2010 (URS 2010a,b).

**Region II.** Three active shellfish aquaculture leases are located off Santa Barbara County. Cultured species include oysters, clams, mussels, scallops, and abalone for commercial sale. In San Luis Obispo County, shellfish mariculture occurs in Cayucos and Morro Bay (oysters). Kelp is also harvested from beds within the region (California Department of Fish and Game [CDFG] 2005).

**Region III.** In Region III, only one company has a state water bottom lease for mariculture, located in Drakes Estero estuary (inshore of the Project area).

**Region IV.** The only existing mariculture operations identified in Region IV are located in Humboldt Bay (oysters and clams), which is not part of the Project area.

#### 3.3.2.2 Regulatory Setting

Federal and State laws and regulations pertaining to this issue and relevant to the Project are identified in **Table 3-2**. No local laws and regulations relevant to agriculture and forest resources are applicable to the Project.

**Table 3-2. Federal and/or State Laws, Regulations, and Policies Potentially Applicable to the Project (Agriculture and Forest Resources)**

CA	Williamson Act (Gov. Code §§ 51200-51207)	This Act enables local governments to enter into contracts with private landowners to restrict specific parcels of land to agricultural or related open space use, and provides landowners with lower property tax assessments in return. Local government planning departments are responsible for the enrollment of land into Williamson Act contracts. Generally, any commercial agricultural use would be permitted within any agricultural preserve. In addition, local governments may identify compatible uses permitted with a use permit.
CA	California Coastal Act Chapter 3 policies	Coastal Act policies applicable to agriculture and forest resources are: <ul style="list-style-type: none"> <li>• Section 30241 (Prime agricultural land; maintenance in agricultural production);</li> <li>• Section 30241.5 (Agricultural land; determination of viability of uses; economic feasibility evaluation);</li> <li>• Section 30242 (Lands suitable for agricultural use; conversion); and</li> <li>• Section 30243 (Productivity of soils and timberlands; conversions).</li> </ul>

1 3.3.2.3 Impact Discussion

2 The Project area is located in the Pacific Ocean offshore of the California coastline.  
3 Although agricultural and forested lands are located adjacent to the coastline in many  
4 areas, the Project area includes no agricultural or forested lands. Mariculture leases in  
5 State waters are located within the Project area, and the potential exists for impacts  
6 from low energy geophysical surveys.

7 ***a) Would the Project convert Prime Farmland, Unique Farmland, or Farmland of***  
8 ***Statewide Importance (Farmland), as shown on the maps prepared pursuant to***  
9 ***the Farmland Mapping and Monitoring Program of the California Resources***  
10 ***Agency, to non-agricultural use?***

11 **No Impact.** Survey activities permitted under the Offshore Geophysical Permit Program  
12 (OGPP), which would occur in ports and marine waters, would convert no farmlands  
13 and would have no impacts on farmland.

14 ***b) Would the Project conflict with existing zoning for agricultural use, or a***  
15 ***Williamson Act contract?***

16 **No Impact.** Permitted survey activities, which would occur in ports and marine waters,  
17 would not conflict with existing zoning for agricultural uses or with Williamson Act  
18 contracts. As a result, no impacts to agricultural land uses would occur.

19 ***c) Would the Project conflict with existing zoning for, or cause rezoning of, forest***  
20 ***land (as defined in Public Resources Code section 12220(g)), timberland (as***  
21 ***defined by Public Resources Code section 4526), or timberland-zoned Timberland***  
22 ***Production (as defined by Government Code section 51104(g))?***

**No Impact.** Permitted survey activities, which would occur in ports and marine waters, would not conflict with existing zoning for forest lands or timberlands. As a result, no impacts on forest land uses would occur.

***d) Would the Project result in the loss of forest land or conversion of forest land to non-forest use?***

**No Impact.** Permitted survey activities, which would occur in ports and marine waters, would not result in the loss of forest land to non-forest uses. As a result, no impacts on forest lands would occur.

***e) Would the Project involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?***

**No Impact.** Because survey activities would occur in ports and marine waters, the OGPP would not result in the conversion of any forested lands to non-forested uses, nor would any other changes occur that could result in conversions of existing agricultural uses. As a result, no impacts on forest lands or agricultural uses would occur.

***f) Would the Project result in long-term adverse impacts to existing mariculture operations?***

**Less than Significant Impact.** Impacts to invertebrates grown for mariculture operations from low energy geophysical equipment will be limited, with only localized startle reactions evident when equipment is active, and only within several hundred meters of mariculture operations. Please see **Section 3.3.3.4, Biological Resources** for a detailed discussion and analysis of the Project's impacts on invertebrates. As a result of the limited scope of mariculture operations in the Project area and the expected location and duration of surveys relative to those operations, impacts of low energy geophysical surveys to mariculture are less than significant.

**3.3.2.3 Mitigation and Residual Impact**

**Mitigation.** The OGPP would have less than significant impacts on agriculture and forest resources and no mitigation measures are required.

**Residual Impacts.** No significant impacts have been identified, and no residual impacts would occur.

### 1 3.3.3 Air Quality and Greenhouse Gas (GHG) Emissions

<b>III. AIR QUALITY:</b> Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the Project:	<b>Potentially Significant Impact</b>	<b>Less Than Significant with Mitigation</b>	<b>Less Than Significant Impact</b>	<b>No Impact</b>
a) Conflict with or obstruct implementation of the applicable air quality plan?	<input type="checkbox"/>	San Luis Obispo, Ventura, Los Angeles, Orange	All other coastal counties	<input type="checkbox"/>
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the Project region is nonattainment under an applicable Federal or State ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	<input type="checkbox"/>	San Luis Obispo, Ventura, Los Angeles, Orange	All other coastal counties	<input type="checkbox"/>
d) Expose sensitive receptors to substantial pollutant concentrations?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
e) Create objectionable odors affecting a substantial number of people?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
f) Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
g) Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

#### 2 3.3.3.1 Environmental Setting

3 Ambient air quality is determined by the quantity and type of pollutants released into the  
 4 air in combination with the meteorology of the local area. Meteorology is influenced  
 5 heavily by local topography and other features such as the local land-sea interface. The  
 6 long-term meteorological trends define the overall climate of the area.

#### 7 Climate

8 California's coastal climate is generally described as Mediterranean, with warm, dry  
 9 summers and mild, wet winters. Specific conditions vary depending on the location  
 10 along the coast, as well as local climate forcing features. Rainfall is highest in the north  
 11 and generally lessens to the south. Along the entire coast, rainfall occurs primarily in the  
 12 later fall to early spring months (e.g., November to April). Average temperatures are  
 13 lowest along the north coast and increase to the south. Average coastal cloud cover is



1 typically below one-half of the sky, although some areas experience greater cover  
2 depending on local conditions. Average wind speeds are generally in the 6 to 7 miles  
3 per hour (mph) range along the coast.

4 Dispersion of air pollutants is primarily a function of airflow and turbulence. Coastal  
5 winds generally have a westerly, or onshore, component during the day. These are  
6 attributable largely to the zonal westerlies found globally in the middle latitudes and the  
7 land-sea temperature difference along the coast. The Pacific High pressure system in  
8 the mid-Pacific Ocean, which is strongest during the summer, can add a northwesterly  
9 component to the winds. Other factors, such as coastal orientation, can also modify the  
10 onshore wind direction. Winds often reverse to an offshore flow at night as the land  
11 surface cools, causing the sign of the land-sea temperature gradient to reverse. This  
12 reversal of wind direction from day to night is referred to as the land-sea breeze effect.

### 13 **Air Quality**

14 Air quality is characterized by the ambient concentrations of air pollutants that are  
15 known to cause adverse health effects. For regulatory purposes, air pollutants are  
16 generally recognized as “criteria pollutants” or as “toxic air pollutants” (or hazardous air  
17 pollutants). For most criteria pollutants, regulations and standards have been in effect  
18 for more than 40 years, and control strategies are designed to ensure that the ambient  
19 concentrations do not exceed defined air quality standards. For toxic air emissions,  
20 however, the regulatory process usually assesses the potential impacts to public health  
21 in terms of “risk” (such as the Air Toxics “Hot Spots” Program in California), and  
22 emissions are usually controlled by prescribed technologies.

#### 23 *Criteria Pollutants*

24 Criteria pollutants include carbon monoxide (CO), hydrogen sulfide (H<sub>2</sub>S), lead (Pb),  
25 nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), particulate matter less than 10 and 2.5 microns in  
26 aerodynamic diameter (PM<sub>10</sub> and PM<sub>2.5</sub>, respectively), sulfates (SO<sub>4</sub>), and sulfur dioxide  
27 (SO<sub>2</sub>). Ambient air quality standards have been set for these pollutants on a State and  
28 national level by the California Air Resources Board (CARB) and U.S. Environmental  
29 Protection Agency (USEPA), respectively.

#### 30 *Existing Air Quality*

31 The USEPA has designated all areas of the U.S. as having air quality generally either  
32 better than (attainment) or worse than (nonattainment) the National Ambient Air Quality  
33 Standards (NAAQS). However, some areas are listed as “unclassified” with regard to  
34 certain pollutants, generally due to a lack of measurement data. The NAAQS are  
35 Federal air quality standards established under the U.S. Clean Air Act (CAA).

The CARB has independently set State air quality standards (California Ambient Air Quality Standards [CAAQS]) that are often more stringent than NAAQS. Thus, attainment and nonattainment designations are given separately in relation to the separate California and national standards. These designations are made on the basis of air quality measurements from monitoring networks maintained by all of the air quality regulatory districts in the State.<sup>9</sup> **Table 3-3** shows the short-term air quality standards (CAAQS and NAAQS) for relevant pollutants. Most of the standards listed may be exceeded either once or not at all in a year. The NAAQS for PM<sub>2.5</sub>, NO<sub>2</sub>, and SO<sub>2</sub> (1-hour [hr]) are based on a percentile approach as described in the footnotes.

**Table 3-3. Short-Term Ambient Air Quality Standards**

Pollutant	Averaging Period (hr)	Concentration (µg/m <sup>3</sup> )	
		CAAQS	NAAQS
Ozone (O <sub>3</sub> )	1	180	none
	8	none	150
PM <sub>10</sub>	24	50	150
PM <sub>2.5</sub>	24	none	35 <sup>a</sup>
CO	1	23,000	40,000
	8	10,000	none
NO <sub>2</sub>	1	339	188 <sup>a</sup>
SO <sub>2</sub>	1	655	196 <sup>b</sup>
	3	none	1300

<sup>a</sup> Standard violated if it is exceeded by the annual 98th percentile concentration, averaged over 3 years.

<sup>b</sup> Standard violated if it is exceeded by the annual 99th percentile concentration, averaged over 3 years.

Abbreviations: CAAQS = California Ambient Air Quality Standards; NAAQS = National Air Quality Standards; CO = carbon monoxide; hr = hour; NO<sub>2</sub> = nitrogen dioxide; O<sub>3</sub> = ozone; PM<sub>2.5</sub> = particulate matter <2.5 µm in aerodynamic diameter; PM<sub>10</sub> = particulate matter <10 µm in aerodynamic diameter; SO<sub>2</sub> = sulfur dioxide.

**Table 3-4** shows the attainment status designations in the coastal counties at California and national levels. The table is arranged by county, north to south. The corresponding physical air basins and air districts are also indicated.

<sup>9</sup> Each air district is designated either an Air Pollution Control District (APCD) or an Air Quality Management District (AQMD), although the two designations have essentially the same responsibilities.

1

**Table 3-4. Coastal Attainment Designations**

Air Basin	Air District	County	California Attainment Status <sup>a</sup>						Federal Attainment Status <sup>a</sup>					
			O <sub>3</sub>	PM <sub>2.5</sub>	PM <sub>10</sub>	CO	NO <sub>2</sub>	SO <sub>2</sub>	O <sub>3</sub>	PM <sub>2.5</sub>	PM <sub>10</sub>	CO	NO <sub>2</sub>	SO <sub>2</sub>
North Coast	North Coast Unified AQMD	Del Norte	A	U	N	U	A	A	U	U	U	A	A	U
	Mendocino County AQMD	Humboldt	A	U	N	A	A	A	U	U	U	A	A	U
		Mendocino	A	U	N	U	A	A	U	U	U	A	A	U
		Sonoma – North <sup>b</sup>	A	U	A	A	A	A	U	U	U	A	A	U
San Francisco Bay Area	Bay Area AQMD	Marin	N	N	N	A	A	A	N	U	N	A	A	A
		San Francisco	N	N	N	A	A	A	N	U	N	A	A	A
		San Mateo	N	N	N	A	A	A	N	U	N	A	A	A
North Central Coast	Monterey Bay Unified AQMD	Santa Cruz	N	A	N	U	A	A	U	U	U	A	A	U
		Monterey	N	A	N	A	A	A	U	U	U	A	A	U
South Central Coast	San Luis Obispo County APCD	San Luis Obispo	N	A	N	A	A	A	U	U	U	A	A	U
	Santa Barbara County APCD	Santa Barbara	N	U	N	A	A	A	U	U	U	A	A	U
	Ventura County APCD	Ventura	N	N	N	A	A	A	N	U	U	A	A	A
South Coast	South Coast AQMD	Los Angeles	N	N	N	A	N	A	N	N	N	A	A	A
		Orange	N	N	N	A	N	A	N	N	N	A	A	A
San Diego County	San Diego County APCD	San Diego	N	N	N	A	A	A	N	U	U	A	A	A

<sup>a</sup> Attainment status designations are: A = Attainment; N = Nonattainment; U = Unclassifiable. Attainment designations are also set for sulfates, hydrogen sulfate, and visibility reducing particles (California only), and for lead (California and Federal). With the exception of a Federal nonattainment finding for lead in Los Angeles County, all of these designations are either attainment or unclassifiable.

<sup>b</sup> Southern Sonoma County is in the San Francisco Bay Area Air Basin, but does not extend to the coast.

Abbreviations: APCD = Air Pollution Control District; AQMD = Air Quality Management District; CO = carbon monoxide; NO<sub>2</sub> = nitrogen dioxide; O<sub>3</sub> = ozone; PM<sub>2.5</sub> = particulate matter <2.5 µm in aerodynamic diameter; PM<sub>10</sub> = particulate matter <10 µm in aerodynamic diameter; SO<sub>2</sub> = sulfur dioxide.

## 1 Global Climate Change

2 Global climate change is a change in the average weather of the Earth, which can  
3 potentially be measured by changes in wind and storm patterns, precipitation, and  
4 temperature. Common greenhouse gases (GHGs; gases that trap heat in the  
5 atmosphere), include water vapor, carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxides  
6 (N<sub>2</sub>O), hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride. GHGs are emitted  
7 by both natural processes and human activities, and the accumulation of GHGs in the  
8 atmosphere regulates the Earth's temperature. Without the natural heat trapping effect  
9 of GHGs, the Earth's surface would be significantly cooler. However, the scientific  
10 community generally agrees that emissions from human activities, such as electricity  
11 production and vehicle use, have elevated the concentration of these gases in the  
12 atmosphere beyond naturally occurring levels.

13 The California State Legislature adopted Assembly Bill (AB) 32, the California Global  
14 Warming Solutions Act of 2006, which focuses on reducing GHGs in California. As  
15 defined under AB 32, GHGs include CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, hydrofluorocarbons,  
16 perfluorocarbons, and sulfur hexafluoride. AB 32 requires CARB, the State agency  
17 charged with regulating statewide air quality, to adopt rules and regulations that would  
18 by 2020 achieve GHG emissions equivalent to statewide levels in 1990.

19 Section 15064.4 of the State California Environmental Quality Act (CEQA) Guidelines  
20 provides regulatory direction on how to determine the significance of potential impacts  
21 from GHGs. Under this section, lead agencies are required to describe, calculate, or  
22 otherwise characterize GHG emissions. Where feasible, lead agencies should strive to  
23 quantify emissions, but State CEQA Guidelines section 15064.4 provides that a  
24 qualitative analysis or reliance on performance based standards is allowed, as long as  
25 the lead agency makes a "good-faith effort" based on scientific, factual data, to disclose  
26 and analyze GHG impacts.

### 27 3.3.3.2 Regulatory Setting

28 Federal and State laws and regulations pertaining to this issue and relevant to the  
29 Project are identified in **Table 3-5**.

30 Air quality at the local level (one or several counties) is regulated by the air districts, with  
31 authority from the CARB. These districts are primarily responsible for attaining the  
32 CAAQS and NAAQS. The air districts implement programs and regulations to control air  
33 pollution released from stationary sources within their jurisdictions. They may also  
34 implement programs to encourage alternative means of transportation. Air districts with  
35 jurisdiction over the various coastal counties are identified in **Table 3-4**.

**Table 3-5. Federal and/or State Laws, Regulations, and Policies Potentially Applicable to the Project (Air Quality and GHGs)**

U.S.	Federal Clean Air Act (CAA) (42 U.S.C. § 7401 et seq.)	<p>The CAA requires the USEPA to identify NAAQS to protect public health and welfare. National standards are established for O<sub>3</sub>, CO, NO<sub>2</sub>, SO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub>, and lead (Pb). In 2007, the U.S. Supreme Court ruled that carbon dioxide (CO<sub>2</sub>) is an air pollutant as defined under the CAA, and that the USEPA has authority to regulate GHG emissions. Pursuant to the 1990 CAA Amendments, USEPA classifies air basins (or portions thereof) as in “attainment” or “nonattainment” for each criteria air pollutant, based on whether or not the NAAQS are achieved. The classification is determined by comparing monitoring data with State and Federal standards.</p> <ul style="list-style-type: none"> <li>• An area is classified as in “attainment” for a pollutant if the pollutant concentration is lower than the standard.</li> <li>• An area is classified as in “nonattainment” for a pollutant if the pollutant concentration exceeds the standard.</li> <li>• An area is designated “unclassified” for a pollutant if there are not enough data available for comparisons.</li> </ul>
CA	California Clean Air Act of 1988 (CCAA), AB 2595)	<p>The CCAA requires all air districts in the State to endeavor to achieve and maintain State ambient air quality standards for O<sub>3</sub>, CO, SO<sub>2</sub>, NO<sub>2</sub>, and PM; attainment plans for areas that did not demonstrate attainment of State standards until after 1997 must specify emission reduction strategies and meet milestones to implement emission controls and achieve more healthful air quality. The 1992 CCAA Amendments divide O<sub>3</sub> nonattainment areas into four categories of pollutant levels (moderate, serious, severe, and extreme) to which progressively more stringent requirements apply. State ambient air standards are generally stricter than national standards for the same pollutants; California also has standards for sulfates, H<sub>2</sub>S, vinyl chloride, and visibility-reducing particles.</p>
CA	California Global Warming Solutions Act of 2006 (AB 32)	<p>Under AB 32, CARB is responsible for monitoring and reducing GHG emissions in the State and for establishing a statewide GHG emissions cap for 2020 based on 1990 emission levels. CARB (2009) adopted the AB 32 Climate Change Scoping Plan, which contains the main strategies for the State to implement to reduce CO<sub>2</sub> equivalent (CO<sub>2</sub>e) emissions by 169 million metric tons (MMT) from projected 2020 emissions level of 596 MMT CO<sub>2</sub>e under a business-as-usual scenario. The Scoping Plan breaks down the amount of GHG emissions reductions CARB recommends for each emissions sector of the State’s GHG inventory, but does not directly discuss GHG emissions generated by construction activities.</p>
CA	Senate Bills (SB) 97 and 375	<ul style="list-style-type: none"> <li>• Pursuant to SB 97, the State Office of Planning and Research prepared and the Natural Resources Agency adopted amendments to the State CEQA Guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions. Effective as of March 2010, the revisions to the CEQA Environmental Checklist Form (Appendix G) and the Energy Conservation Appendix (Appendix F) provide a framework to address global climate change impacts in the CEQA process; State CEQA Guidelines section 15064.4 was also added to provide an approach to assessing impacts from GHGs.</li> <li>• SB 375 requires CARB to develop regional reduction targets for GHG emissions, and prompted the creation of regional land use and transportation plans to reduce emissions from passenger vehicle use throughout the State. The targets apply to the regions covered by California’s 18 metropolitan planning organizations, which must develop regional land use and transportation plans and demonstrate an ability to attain the proposed reduction targets by 2020 and 2035.</li> </ul>
CA	Coastal Act Chapter 3 policies	<p>Section 30253, subdivision (c) requires that new development shall be consistent with requirements imposed by an air pollution control district or CARB as to each particular development.</p>

CA	Executive Orders (EOs)	<ul style="list-style-type: none"> <li>• Under EO S-01-07, which set forth a low carbon fuel standard for California, the carbon intensity of California's transportation fuels is to be reduced by at least 10 percent by 2020.</li> <li>• EO S-3-05 established statewide GHG emission targets of reducing emissions to 2000 levels by 2010, to 1990 levels by 2020, and to 80 percent below the 1990 level by 2050.</li> </ul>
CA	Other	<ul style="list-style-type: none"> <li>• Under California's Diesel Fuel Regulations, diesel fuel used in motor vehicles, except harbor craft, has been limited to 500 parts per million (ppm) sulfur since 1993. The sulfur limit was reduced to 15 ppm beginning September 1, 2006, and harbor craft were included starting in 2009.</li> <li>• CARB's Heavy Duty Diesel Truck Idling Rule (Cal. Code Regs., tit. 13, § 2485) prohibits heavy-duty diesel trucks from idling for longer than 5 minutes at a time (except while queuing, provided the queue is located beyond 100 feet from any homes or schools).</li> <li>• The Statewide Portable Equipment Registration Program (PERP) regulates portable engines/engine-driven equipment units. Once registered in the PERP, engines and equipment units may operate throughout California without the need to obtain individual permits from local air districts.</li> </ul>

Each air district also publishes rules and regulations designed in part to meet the goal of air quality attainment for all criteria pollutants due to emissions from stationary sources. Mobile sources are primarily in the purview of the CARB, which can and does set emission limits for vehicles. The emission sources associated with the Project are mobile sources (marine vessels), and therefore not subject to air district rules that apply to stationary sources.

Air districts also have the responsibility to recommend air quality guidelines to help local governments analyze and mitigate Project-specific air quality impacts reviewed under CEQA. Guidelines are primarily in the form of significance criteria, which are a set of emission rate thresholds below which air quality impacts are judged to be insignificant. Significance levels are generally pollutant-specific, and may only apply to pollutants for which the local area is classified as nonattainment.

These thresholds may, but do not always, make a distinction between short-term construction emissions and long-term operational emissions. Where construction-related thresholds are given, they would apply to the current Project as short-term episodes over operational thresholds. If these thresholds are exceeded, mitigation measures may be required under CEQA.

### 3.3.3.3 Impact Analysis

#### **Local Air District Significance Criteria**

As stated above, local air districts are encouraged to establish air quality guidelines that can be used in CEQA analyses. Some, but not all, coastal air districts have provided these thresholds, which are identified and discussed below, ordered from north to south. Criteria may be applicable for criteria pollutants, toxic air contaminants (TACs), and GHGs. Where no specific criteria apply, the criteria are listed as "None." Specific

criteria, published by the air districts which have set a threshold, serve to augment the questions in the **Section 3.3.3** checklist above. Taken together, these criteria indicate a significant impact would occur if emissions would cause or substantially contribute to exceedances of NAAQS or CAAQS as predicted by air quality modeling, or if an acute hazard index >1.0 is predicted by modeling for TAC emissions. Air quality modeling is discussed in the Impact Discussion section.

#### *North Coast Unified AQMD*

On the web page titled, “Air Quality Planning and CEQA” (accessed March 2013), the North Coast Unified AQMD states that “the District has not formally adopted significance thresholds, but rather utilizes the Best Available Control Technology (BACT) emission rates for stationary sources listed in North Coast Unified AQMD Rule and Regulations, Rule 110.” No numerical criteria have been adopted for construction or mobile emissions.

#### *Mendocino County AQMD*

The Mendocino County AQMD currently has no numerical significance criteria for short-term emissions (Bob Scaglione, Mendocino County AQMD, April 1, 2013, personal communication).

#### *Bay Area AQMD*

The Bay Area AQMD last adopted CEQA significance thresholds in June 2010. However, as explained in the California Environmental Quality Act, Air Quality Guidelines (Bay Area AQMD 2012), these thresholds were set aside in March 2012 by the Alameda County Superior Court after a lawsuit challenge. New thresholds have not yet been adopted. Therefore, no numerical significance criteria apply.

#### *Monterey Bay Unified AQMD*

As described in its 2008 CEQA air quality guidelines, Monterey Bay Unified AQMD (2008) has adopted a construction emissions significance threshold only for PM<sub>10</sub>. For other pollutants, an impact is significant if it may cause or substantially contribute to a violation of CAAQS or NAAQS, or that could emit TACs that could result in temporary significant impacts.”

- PM<sub>10</sub> – 82 pounds per day (lb/d).
- Other criteria pollutants – cause or substantially contribute to exceedances of NAAQS or CAAQS.
- TACs – acute hazard index >1.0.
- GHGs – none.

*San Luis Obispo County APCD*

The San Luis Obispo County APCD (2012) has published the following thresholds of significance for construction operations in the April 2012 CEQA Air Quality Handbook:

- Reactive organic compounds (ROCs) + NO<sub>x</sub> combined – 137 lb/d.
- Diesel particulate matter (DPM) – 7 lb/d.
- TACs – limited to diesel particulate matter.
- GHGs – amortize construction GHGs into operational emissions. The GHG criterion is generally not applicable to the current Project because there will be no operational phase to amortize with.

For projects exceeding these thresholds, the San Luis Obispo APCD prescribes a set of Standard Mitigation Measures that would ensure potential impacts are less than significant. The following Standard Mitigation Measures are relevant for the current Project, which consists, for air quality purposes, of diesel-powered marine vessel engines:

- Maintain all construction equipment in proper tune according to manufacturers' specifications;
- Fuel all off-road and portable diesel-powered equipment with CARB-certified motor vehicle diesel fuel;
- Use diesel construction equipment meeting CARB's Tier 2 certified engines or cleaner off-road heavy-duty diesel engines and comply with the State off-Road Regulation;
- All on- and off-road diesel equipment shall not idle for more than 5 minutes (min). Signs shall be posted in the designated queuing areas and or job sites to remind drivers and operators of the 5-min idling limit (note that when a vessel is not in a work mode, the engine is not simply idling, as it is needed to maintain position in the water);
- Diesel idling within 1,000 feet (ft) of sensitive receptors is not permitted;
- Substitute gasoline-powered equipment in place of diesel-powered equipment, where feasible; and
- Use alternatively fueled construction equipment on-site where feasible, such as compressed natural gas (CNG), liquefied natural gas (LNG), propane, or biodiesel.



1    *Santa Barbara County APCD*

2    Significance criteria are described in the “Santa Barbara County Environmental  
3    Threshold and Guidelines Manual” (County of Santa Barbara Planning and  
4    Development Department 2008). Santa Barbara County has established no quantitative  
5    thresholds for construction emissions because, in general, short-term construction  
6    impacts are considered insignificant.

7    *Ventura County APCD*

8    Significance criteria are described in the “Ventura County Air Quality Assessment  
9    Guidelines” (Ventura County APCD 2003). No distinction is made between construction  
10   and operational emissions. The following thresholds are applicable:

- 11        • ROC, NO<sub>x</sub> – 25 lb/d each.
- 12        • Other criteria pollutants – cause or substantially contribute to exceedances of  
13        NAAQS or CAAQS.
- 14        • TACs – acute hazard index >1.0.
- 15        • GHGs – none.

16   For projects exceeding these thresholds, APCD recommends the following measures to  
17   mitigate ozone precursor emissions (NO<sub>x</sub> and ROC) from construction motor vehicles:

- 18        • Minimize equipment idling time;
- 19        • Maintain equipment engines in good condition and in proper tune as per  
20        manufacturers’ specifications;
- 21        • During smog season (May through October), lengthen the construction period to  
22        minimize the number of vehicles and equipment operating at the same time (note  
23        that this measure does not apply to a single vessel); and
- 24        • Use alternatively fueled construction equipment, such as CNG, LNG, or electric,  
25        if feasible.

26   *South Coast AQMD*

27   Applicable significance thresholds for construction in the South Coast AQMD, as  
28   published March 2011 in “SCAQMD Air Quality Significance Thresholds” (South Coast  
29   AQMD 2011), are as follows:

- 30        • NO<sub>x</sub> – 100 lb/d.
- 31        • ROC (VOC) – 75 lb/d.

- 1 • PM<sub>10</sub> – 150 lb/d.
- 2 • PM<sub>2.5</sub> – 55 lb/d.
- 3 • SO<sub>x</sub> – 150 lb/d.
- 4 • CO – 550 lb/d.
- 5 • TACs – acute hazard index >1.0.
- 6 • GHGs – not applicable for construction projects.

#### 7 *San Diego County APCD*

8 Applicable significance criteria are published in the “County of San Diego, Guidelines for  
9 Determining Significance and Report Format and Contents Requirements, Air Quality”  
10 (County of San Diego, 2007). No distinction is made between construction and  
11 operational emissions. The following significance criteria are applicable:

- 12 • NO<sub>x</sub>, SO<sub>x</sub> – 25 pounds per hour (lb/hr), 250 lb/d each.
- 13 • CO – 100 lb/hr, 550 lb/d.
- 14 • ROC (VOCs) – 75 lb/d.
- 15 • PM<sub>10</sub> – 100 lb/d.
- 16 • PM<sub>2.5</sub> – 55 lb/d.
- 17 • TACs – acute hazard index >1.0.
- 18 • GHGs – none.

19 Hourly or daily emission rate thresholds indicate a potentially significant impact. Where  
20 an emission-based significance threshold may be exceeded by Project emissions,  
21 further review, based on consequent air quality impacts, will be done to determine if the  
22 particular air quality impact may cause or substantially contribute to a violation of a  
23 NAAQS or CAAQS. If it does, the impact would be potentially significant. However, if it  
24 does not, a less than significant impact determination may be possible.

#### 25 **Impact Discussion**

##### 26 *Emissions*

27 The Project would generate emissions through the use of marine vessels when  
28 conducting surveying activities. For purposes of this analysis, the survey vessel is  
29 assumed to operate for 12 hr on a survey day consuming 75 gallons per hour (gph) of  
30 diesel fuel, which is the estimated fuel rate for a vessel moving at 10 knots (kn). This  
31 representative fuel rate is based on specifications for the M/V *Pacific Star*, as given in  
32 **Appendix B**. Other vessels of a similar size would use fuel at a similar rate in order to

provide the work energy needed to move the boat through the water. The normal survey speed of 3 kns would consume considerably less fuel. However, the 75 gph rate was used as a worst-case assumption since higher vessel speeds may occur under certain circumstances. Vessels currently identified for the survey are equipped with Tier 2 diesel engines, which have significantly lower emission rates than earlier uncontrolled (Tier 0) engines. However, it is possible that a vessel with Tier 0 engines may be called into service if a Tier 2 vessel is not available for a given survey need. As a basis for comparison, emissions have been calculated for both Tier 0 and Tier 2 engines as shown in **Table 3-6**. The table shows estimated emissions of criteria pollutants and precursors (NO<sub>x</sub>, ROC, PM<sub>10</sub>, CO, and SO<sub>2</sub>). Note that NO<sub>x</sub> is a precursor to the criteria pollutants NO<sub>2</sub> and ozone. ROCs are also a precursor to ozone. GHG emissions are represented by CO<sub>2</sub> emissions. Other GHGs from diesel engines are negligible relative to CO<sub>2</sub>, even when adjusted for global warming potential.

**Table 3-6. Vessel Emissions**

Engine Type	Pollutant					
	NO <sub>x</sub>	ROC	PM <sub>10</sub>	CO	SO <sub>2</sub>	CO <sub>2</sub>
<b>Emission Factors (lb/1,000 gal)</b>						
Tier 0 <sup>a</sup>	386.4	17.4	32.4	77.4	0.21	22,338
Tier 2 <sup>b</sup>	170.7	19.0	5.9	102.7	0.21	22,338
<b>Emissions Factors (lb/d)<sup>c</sup></b>						
Tier 0	347.8	15.6	29.2	69.7	0.2	20,105
Tier 2	153.6	17.1	5.3	92.5	0.2	20,105

<sup>a</sup> Tier 0 emission factors for NO<sub>x</sub>, ROC, PM<sub>10</sub> and CO are from Santa Barbara County Form-24 for small vessels and converted to lb/1,000 gal units. SO<sub>2</sub> factor is based on CARB diesel fuel at 15 parts per million sulfur. CO<sub>2</sub> is from 40 Code of Federal Regulations (C.F.R) 98 (GHG Reporting Regulation).

<sup>b</sup> Tier 2 emission factors for NO<sub>x</sub>, ROC, PM<sub>10</sub> and CO are USEPA- and CARB-certified factors for Tier 2 engines, converted to lb/1,000 gal units. The NO<sub>x</sub>/ROC split for the NO<sub>x</sub> + NMHC (ROC) factor is 90/10. SO<sub>2</sub> and CO<sub>2</sub> factors are same as for Tier 0.

<sup>c</sup> Emissions based on 75 gal/hr and 12 hr/day.

Abbreviations: CO = carbon monoxide; CO<sub>2</sub> = carbon dioxide; NO<sub>x</sub> = nitrogen oxide; PM<sub>2.5</sub> = particulate matter <2.5 µm in aerodynamic diameter; PM<sub>10</sub> = particulate matter <10 µm in aerodynamic diameter; ROC = reactive organic compound; SO<sub>2</sub> = sulfur dioxide.

### Air Quality Modeling – Criteria Pollutants

A USEPA air quality screening model was used with a worst-case operating scenario to provide insight into potential shoreline impacts from vessel emissions. The worst-case operating scenario is described as follows: the vessel transect begins 1,000 meters (m) from the nearest shore and travels perpendicular to and away from the shoreline. The surveyed segment length is 2,000 m. Upon reaching the end of the segment, the vessel turns around and follows the same course in the other direction. The same segment is followed for the duration of the calculation. The wind blows perpendicular to and toward

the shoreline at all times such that vessel emissions are always released into the same air streamline and always impact the same spot on the shoreline.

Dispersion calculations were made with the USEPA screening air quality model AERSCREEN. AERSCREEN allows input of only a single source, but with multiple downwind receptors. The model determines worst-case meteorological conditions by looping through a range of conditions involving wind speed and atmospheric stability and determining the conditions with the highest downwind impact. Receptor spacing is automatically set by the model at 25 m (receptor to receptor) for the range of distances involved here. The source-to-receptor distance is generally considered for a stationary source and various distances downwind from the source. However, in this case, it is equivalent to considering a fixed receptor location (at the shoreline) and variable source locations (moving vessel). The worst-case shoreline concentration was calculated as the average impact calculated by the model at downwind distances ranging from 1,000 to 3,000 m (nearest and farthest vessel distances from shore). AERSCREEN calculates 1-hr average pollutant concentrations. Scaling factors less than or equal to unity are prescribed to convert these results to longer averaging periods. AERSCREEN modeling results are provided in **Appendix C**.

Modeling results are shown in **Table 3-7** for pollutants, and averaging periods that are consistent with the air quality standards in **Table 3-3**.

**Table 3-7. Modeling Results**

Averaging Period (hr)	Maximum Shoreline Concentrations ( $\mu\text{g}/\text{m}^3$ )			
	NO <sub>2</sub>	PM <sub>2.5/10</sub>	CO	SO <sub>2</sub>
<b>Tier 0 Engines</b>				
1	128		26	0.1
3				0.1
8			23	
24		1.1		
<b>Tier 2 Engines</b>				
1	35		34	0.1
3				0.1
8			31	
24		0.2		
<b>Most-Stringent Air Quality Standards<sup>a</sup></b>				
1	339		23,000	655
3				1,300
8			10,000	
24		50		

<sup>a</sup>California Ambient Air Quality Standards (CAAQS) are considered most stringent for NO<sub>2</sub> and PM<sub>2.5</sub>, even though the corresponding National Ambient Air Quality (NAAQS) standards are numerically lower. This is because these NAAQS are based on 98th and 99th percentile concentrations, which will generally be significantly less than the maximum concentrations.

Abbreviations: CO = carbon monoxide; NO<sub>2</sub> = nitrogen dioxide; O<sub>3</sub> = ozone; PM<sub>2.5</sub> = particulate matter <2.5  $\mu\text{m}$  in aerodynamic diameter; PM<sub>10</sub> = particulate matter <10  $\mu\text{m}$  in aerodynamic diameter; SO<sub>2</sub> = sulfur dioxide.

1 Results are shown for both Tier 0 and Tier 2 engines. In the case of PM<sub>2.5</sub> and PM<sub>10</sub>  
2 (24-hr standards), the modeled 1-hr concentrations are multiplied by both the scaling  
3 factor and 0.5 to reflect that emissions occurred for one-half of the 24-hr period  
4 addressed by the standards. PM<sub>10</sub> and PM<sub>2.5</sub> results are identical because essentially all  
5 of diesel particulate matter falls into both categories. The most stringent air quality  
6 standards from **Table 3-3** are shown for comparison purposes.

7 Air quality standards address the total concentration of a pollutant resulting from all  
8 sources. Since the wind in this analysis is presumed to be coming from offshore, it can  
9 reasonably be assumed that background concentrations (i.e., from other sources) are  
10 relatively small and will not add a significant amount to the calculated worst-case  
11 impacts that are based on vessel emissions alone. Therefore, a direct comparison of  
12 shoreline impacts with air quality standards is not unreasonable. As can be seen from  
13 the results in **Table 3-6**, there are no cases, either for Tier 0 engines or Tier 2 engines,  
14 where an air quality standard is threatened. A vessel operating parallel to shore, rather  
15 than perpendicular as assumed for modeling, would have much smaller impacts  
16 because the pollutants would be greatly dispersed in the horizontal plane when  
17 averaged over a 1-hr period or longer (consistent with air quality standards). On the  
18 basis of air quality modeling, it can be determined that the Project will not cause or  
19 contribute to a violation of an air quality standard for the pollutants addressed in the  
20 table.

#### 21 *Air Quality Monitoring – Air Toxics*

22 A significant air toxics impact for a short-term project would generally be creation of an  
23 acute hazard index (AHI) greater than 1.0. An AHI for a TAC is calculated as the 1-hr  
24 average ambient concentration due to the target source divided by the reference  
25 exposure level for the same TAC, as published by CARB. An overall AHI, for  
26 comparison to the threshold of 1.0, is determined by summing the TAC-specific AHI  
27 over all TACs emitted. Of the short-term TACs emitted with diesel combustion, acrolein  
28 and formaldehyde (both aldehydes) are responsible for about 98 percent of the AHI  
29 impact. Considering just these two TACs with an AERSCREEN model run indicated a  
30 maximum 1-hr average onshore AHI of 0.001 of the significance threshold for AHI.  
31 Thus, air toxic impacts are considered negligible and less than significant.

#### 32 *Significance of Impacts – Air District Thresholds*

33 As discussed above, no exceedances of air quality NAAQS or CAAQS or toxics  
34 thresholds are predicted or expected; however, the significance of impacts can also be  
35 judged based on each coastal air district's significance criteria, as described earlier in  
36 this Section, along with the questions in the **Section 3.3.3** checklist. The significance of  
37 impacts based on emission levels and modeling is discussed below for each air district.

1 North Coast Unified AQMD (Del Norte County) – No significance criteria are prescribed  
2 for construction activities. Further, no exceedances of air quality standards or toxics  
3 thresholds are predicted or expected. Therefore, the impact is less than significant.

4 Mendocino County (Humboldt, Mendocino and Sonoma Counties) – No significance  
5 criteria are prescribed for construction activities. Further, no exceedances of air quality  
6 standards or toxics thresholds are predicted or expected. Therefore, the impact is less  
7 than significant.

8 Bay Area AQMD (Marin, San Francisco and San Mateo Counties) – No significance  
9 criteria are prescribed for construction activities. Further, no exceedances of air quality  
10 standards or toxics thresholds are predicted or expected. Therefore, the impact is less  
11 than significant.

12 Monterey Bay Unified AQMD (Santa Cruz and Monterey Counties) – Emissions  
13 calculations in **Table 3-4** show that the PM<sub>10</sub> significance threshold for the district would  
14 not be approached or exceeded. Also, no exceedances of air quality standards or toxics  
15 thresholds are predicted or expected. Therefore, the impact is less than significant.

16 San Luis Obispo County APCD (San Luis Obispo County) – When compared to  
17 San Luis Obispo County published significance thresholds, vessel emissions, as shown  
18 in **Table 3-4**, could exceed these criteria for NO<sub>x</sub> + ROC combined (threshold is  
19 137 lb/d) and for diesel particulate matter (equivalent to PM<sub>10</sub> in this case; threshold is  
20 7 lb/d). NO<sub>x</sub> and ROC emissions are based on worst-case fuel use assumptions as  
21 discussed above. If Tier 2 engines are used, and fuel use does not exceed 80 percent  
22 of the worst-case assumption used, then the NO<sub>x</sub> + ROC threshold would not be  
23 exceeded. The PM<sub>10</sub> threshold is only exceeded if Tier 0 (uncontrolled) engines are  
24 used. As discussed previously, however, San Luis Obispo County APCD considers  
25 implementation of its Standard Mitigation Measures sufficient to reduce potentially  
26 significant impacts to a less than significant level. To reduce the Project's impacts to  
27 less than significant in San Luis Obispo, then, all relevant Standard Mitigation Measures  
28 have been incorporated into Mitigation Measure (MM) **AIR-1**, listed in **Section 3.3.3.4**,  
29 below. With implementation of **MM AIR-1**, the impact is less than significant.

30 Santa Barbara County APCD (Santa Barbara County) – No significance criteria are  
31 prescribed for construction activities. Further, no exceedances of air quality standards  
32 or toxics thresholds are predicted or expected. Therefore, the impact is less than  
33 significant.

34 Ventura County APCD (Ventura County) – Based on emissions calculations in  
35 **Table 3-4**, daily NO<sub>x</sub> emissions would exceed the Ventura County significance threshold  
36 of 25 lb/d. As discussed previously, however, Ventura County APCD recommends  
37 implementation of specific measures to mitigate ozone precursor emissions, such as  
38 NO<sub>x</sub>, from motor vehicles. To reduce the Project's impacts to less than significant in

Ventura County, then, all recommended measures have been incorporated into **MM AIR-1**, listed in **Section 3.3.3.4**. With implementation of **MM AIR-1**, listed in **Section 3.3.3.4**, the impact is less than significant.

South Coast AQMD (Los Angeles and Orange Counties) – Based on emissions calculations in **Table 3-4**, daily NO<sub>x</sub> emissions could exceed the South Coast AQMD significance threshold of 100 lb/d. Implementation of the following measure, which has been incorporated in **MM AIR-1**, will reduce the impact to less than significant:

San Diego County APCD (San Diego County) – Emissions calculations in **Table 3-4** show that San Diego County significance thresholds would not be exceeded by the Project. Further, no exceedances of air quality standards or toxics thresholds are predicted. Therefore, the impact is less than significant.

The CEQA checklist shown at the beginning of this section further informs the analysis of whether the OGPP would result in a significant impact on air quality. The discussions below explain the determinations identified in the checklist.

***a) Would the Project conflict with or obstruct implementation of the applicable air quality plan?***

Each air district is required to have an air quality plan to demonstrate how it will either come into attainment for nonattainment areas, or maintain existing attainment of air quality standards. Project impacts would be potentially significant if the Project would conflict with or obstruct implementation of the applicable air quality plan. Based on this criterion and the above district-specific criteria, the OGPP's impact would be less than significant with mitigation for San Luis Obispo, Ventura, Los Angeles, and Orange Counties, and less than significant for all other counties.

***b) Would the Project violate any air quality standard or contribute substantially to an existing or projected air quality violation?***

Modeling has been completed which shows that the Project would not violate any air quality standard or contribute substantially to an existing or projected air quality violation, as summarized in **Table 3.7**. Thus, the impact would be less than significant for all counties.

***c) Would the Project result in a cumulatively considerable net increase of any criteria pollutant for which the Project region is in nonattainment under an applicable Federal or State ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?***

Based on the criteria provided by the respective air quality districts and explained in the above discussions, the impact would be less than significant with mitigation for San Luis

1 Obispo, Ventura, Los Angeles, and Orange Counties, and less than significant for all  
2 other counties.

3 ***d) Would the Project expose sensitive receptors to substantial pollutant***  
4 ***concentrations?***

5 Project emissions would be released in ocean waters and no sensitive receptors are  
6 located within the Project area. By not causing or contributing to air quality standards  
7 violations, impacts to onshore receptors, sensitive or otherwise, would be less than  
8 significant in all counties.

9 ***e) Would the Project create objectionable odors affecting a substantial number***  
10 ***of people?***

11 Planned vessel surveys would slightly and temporarily increase ambient air pollutant  
12 concentrations offshore due to the combustion of diesel fuel. Some individuals consider  
13 diesel combustion odors to be objectionable, although quantifying the odor impacts of  
14 such emissions is difficult. The offshore location of the Project ensures that only workers  
15 associated with survey activities onboard the vessel would be exposed to any odors.  
16 The mobile nature of the marine engine emission sources would help disperse those  
17 emissions. Therefore, any temporary impact would be less than significant in all  
18 locations.

19 ***f) Would the Project generate GHG emissions, either directly or indirectly, that***  
20 ***may have a significant impact on the environment?***

21 None of the coastal counties or local air districts has established significance thresholds  
22 for GHG emissions. Estimated emissions of CO<sub>2</sub>, as shown in **Table 3-6**, would be  
23 approximately 20,000 lb/d, or about 9 metric tons per day (MT/d). For the sake of  
24 comparison, GHG thresholds for long-term operational projects are typically around  
25 10,000 MT per year (MT/yr). For example, the BAAQMD adopted 10,000 MT/yr as a  
26 GHG significance threshold in its “Air Quality Guidelines” document before the entire set  
27 of significance thresholds were set aside. This level has also been suggested by the  
28 California Air Pollution Control Officer’s Association (CAPCOA) in its analysis of CEQA  
29 and climate change (CAPCOA 2008). Using 10,000 MT/yr as a benchmark, then, even  
30 if OGPP survey activities took place every day of the year, which is not anticipated, CO<sub>2</sub>  
31 emissions would be well below typical. Therefore, the GHG emissions generated under  
32 the OGPP will result in a less than significant impact in all counties of the survey area.

33 ***g) Would the Project conflict with an applicable plan, policy or regulation***  
34 ***adopted for the purpose of reducing the emissions of GHGs?***

35 No plans, policies or regulations have been adopted in the subject counties that would  
36 conflict with the proposed Project. Therefore, the Project will not produce impacts to



1 GHG-related plans, policies, or regulations in all counties of the survey area (i.e., no  
2 impact).

3 3.3.3.4 Mitigation and Residual Impacts

4 The following mitigation measure will reduce Project-related Air Quality impacts.

5 **MM AIR-1: Engine Tuning, Engine Certification, and Fuels.** The following  
6 measures will be required to be implemented by all permittees under the  
7 Offshore Geophysical Permit Program (OGPP), as applicable depending  
8 on the county offshore which a survey is being conducted:

- 9 • All Counties – Maintain all construction equipment in proper tune according to  
10 manufacturers' specifications; fuel all off-road and portable diesel-powered  
11 equipment with California Air Resources Board (CARB)-certified motor vehicle  
12 diesel fuel limiting sulfur content to 15 parts per million or less (CARB Diesel);
- 13 • Los Angeles and Orange Counties – Use vessel engines meeting CARB's Tier 2-  
14 certified engines or cleaner; the survey shall be operated such that daily NO<sub>x</sub>  
15 emissions do not exceed 100 pounds based on engine certification emission  
16 factors. This can be accomplished with Tier 2 engines if daily fuel use is 585  
17 gallons or less, and with Tier 3 engines if daily fuel use is 935 gallons or less;
- 18 • San Luis Obispo County – Use vessel engines meeting CARB's Tier 2-certified  
19 engines or cleaner; all diesel equipment shall not idle for more than 5 minutes;  
20 engine use needed to maintain position in the water is not considered idling;  
21 diesel idling within 300 meters (1,000 feet) of sensitive receptors is not permitted;  
22 use alternatively fueled construction equipment on site where feasible, such as  
23 compressed natural gas, liquefied natural gas, propane or biodiesel; and
- 24 • Ventura County – Use alternatively fueled construction equipment on site where  
25 feasible, such as compressed natural gas, liquefied natural gas, propane or  
26 biodiesel.

27 **Residual Impacts.** With the incorporation of the recommended mitigation measures,  
28 there will be no residual impacts to air quality or associated with GHG emissions.

### 1 3.3.4 Biological Resources

<b>IV. BIOLOGICAL RESOURCES:</b> Would the Project:	<b>Potentially Significant Impact</b>	<b>Less Than Significant with Mitigation</b>	<b>Less Than Significant Impact</b>	<b>No Impact</b>
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Wildlife or US Fish and Wildlife Service?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal) through direct removal, filling, hydrological interruption, or other means?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or State habitat conservation plan?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### 2 3.3.4.1 Environmental Setting

3 This section evaluates the potential for surveys conducted under the Low Energy  
4 Offshore Geophysical Permit Program (OGPP) to affect marine biological resources,  
5 either directly or indirectly, within State waters. The analysis considers underwater noise  
6 from survey equipment operation, vessel operation and presence, densities  
7 (as appropriate), and vulnerabilities of marine species. For the purposes of this analysis,  
8 marine biological resources are defined as marine habitats, and the flora and fauna that

occupy them, within the scope of permitted low energy geophysical activity (i.e., State waters, from the mean high tide line to 3 nautical miles [nm] offshore, exclusive of San Francisco, San Pablo, and Suisun Bays and marine waters overlying tidelands and submerged lands legislatively granted in trust to local jurisdictions; see **Sections 1 and 2, Project and Agency Information and Project Description**).

The descriptions of marine biological resources in this section are based on peer-reviewed and grey literature and relevant public documents, with particular emphasis on the State Marine Life Protection Act (MLPA) Initiative and the characterizations and data syntheses developed from these efforts. Major sources of information used to compile the biological resources section are listed in **Table 3-8**.

**Table 3-8. Major Sources of Information, Biological Resources**

Document	Year	General Area	Citation
MLPA, North Coast Study Region, Environmental Impact Report (EIR)*	2012	California/Oregon Border to Alder Creek, Point Arena	Horizon Water and Environment LLC 2012a,b
California MLPA Initiative, North Central Coast Marine Protected Areas (MPAs) Project EIR*	2009	Point Arena to Pigeon Point	ICF Jones & Stokes 2009a,b
California MLPA Initiative, Central Coast MPAs Project EIR*	2006, 2007	Pigeon Point to Point Conception	Jones & Stokes 2006, 2007
South Coast MPAs Project EIR*	2010	Point Conception to the U.S.-Mexico Border	URS 2010a b
Central Coastal California Seismic Imaging Project Final EIR	2012	San Luis Obispo County region	CSLC 2012a
Point Buchon Ocean Bottom Seismometer Mitigated Negative Declaration (MND)	2012	San Luis Obispo County region	CSLC 2012b
San Onofre Nuclear Generating Station Large Organism Exclusion Device Initial Study and MND	2012	San Diego County region	CSLC 2012c

\* Information can be found in the Final EIR or the separate volume for the Draft EIR, which became part of the certified Final EIR.

## Major Habitats

### *Benthic Marine Habitats*

Benthic, or seafloor marine habitats and their associated fauna are dictated by both substrate type and water depth, and are influenced by physical processes (e.g., oceanographic currents, upwelling, exposure and wave shock). Five separate depth zones have been defined within the Marine Protected Area (MPA) analyses, including:

- Intertidal: higher high water to lower low water; includes sandy beaches, rocky shores, tidal flats, and coastal marsh;
- Intertidal to 30 meter (m) water depth; the shallow subtidal zone; euphotic zone, supporting attached algae and macrophytes;
- 30 to 100 m water depth: encompasses the inner continental shelf, where light penetration diminishes, and the relative contribution of marine algae and macrophytes decreases significantly;
- 100 to 200 m water depth: encompasses the outer continental shelf (OCS); typically includes the shelf-slope break, where communities and assemblages exhibit the highest diversity; and
- Greater than 200 m water depth: may include upper slope or submarine canyon environments.

The regions delineated under the MLPA program are different from the OGPP regions, as outlined in **Table 3-9**.

**Table 3-9. Relationship Between OGPP Regions and MLPA Regions**

OGPP		MLPA		Relationship
Region	Geographic Extent	Region	Geographic Extent	
IV	California-Oregon Border to the Sonoma/Mendocino County Line	North Coast	California/Oregon Border to Alder Creek, Point Arena	OGPP Region IV encompasses all of the North Coast region, and a small portion (c.a. 25 kilometers [km]) of the northern portion of the North Central Coast region
III	Sonoma/Mendocino County Line to the San Luis Obispo/ Monterey County Line (excluding San Francisco/ San Pablo/Suisun Bays)	North Central Coast	Point Arena to Pigeon Point	OGPP Region III encompasses most of the North Central Coast region and the northern half of the Central Coast region
II	San Luis Obispo/Monterey County Line to the Los Angeles/Ventura County Line	Central Coast	Pigeon Point to Point Conception	OGPP Region II encompasses portions of the Central Coast region and a small portion (c.a. 50 km) of the South Coast region
I	Los Angeles/Ventura County Line to the U.S. (California)-Mexico Border	South Coast	Point Conception to the U.S.-Mexico Border	OGPP Region I encompasses the remainder of the South Coast region

Because the information is largely derived from the MLPA program efforts, this section presents the environmental setting using the MLPA region boundaries rather than the OGPP region boundaries.

Intertidal habitats may be comprised of sandy beaches, exposed rocky coasts, as well as human-made structures (e.g., jetties, seawalls). Subtidal habitats may consist of soft

1 bottom (e.g., sand, mud), rocky reefs, seasonally exposed hard bottom, and artificial  
2 structures (e.g., infrastructure, including pipelines, outfalls, platforms, artificial islands).

3 In the North Coast region, marine ecosystems and habitats include continental shelf  
4 habitats, rocky nearshore reefs with kelp forests, sandy beaches, estuarine eelgrass  
5 beds, and open waters. In this region, the majority of the habitats occur 100 m or  
6 shallower (i.e., habitats between 0 to 100 m comprise approximately 93 percent of the  
7 North Coast region). Along this portion of California's coast, habitats greater than 200 m  
8 are extremely rare.

9 In the North Central Coast region, ecosystems and habitats include the continental shelf  
10 habitats, rocky nearshore reefs with kelp forests, sandy beaches, estuarine eelgrass  
11 beds, and open waters. In addition, specific depth zones, estuaries, upwelling areas,  
12 retention areas, and freshwater plumes from coastal rivers and the San Francisco  
13 estuarine complex are habitats for consideration in the North Central Coast study  
14 region. Seamounts are not found in State waters in the North Central Coast study  
15 region, and are only found in deeper waters farther offshore; submarine canyons and  
16 soft and hard bottom habitats greater than 200 m depth are not found in State waters;  
17 pinnacles exist in the study region, but have not been mapped.

18 In the Central Coast region, a wide variety of marine habitats are present, including  
19 sandy beaches, rocky shorelines, deep marine canyons, estuarine eelgrass beds, and  
20 open waters. Rocky shores and sandy beaches dominate the shoreline, with marsh and  
21 tidal flat habitats being relatively rare. The Central Coast study region intertidal habitat  
22 has a higher percentage of rocky shores and sandy beaches and a lower percentage of  
23 coastal marsh and tidal flats than the rest of the State.

24 In the South Coast region, a diversity of marine habitats are present, including estuarine  
25 and sandy and rocky intertidal environments, biogenic habitats (e.g., kelp forests;  
26 seagrass beds), mainland shelf and slope environments, deep ocean basins, and  
27 offshore islands and ridges. Further, geologic processes (e.g., oil seeps) create unique  
28 ecological conditions and associated fauna, and human-made structures (i.e., hardened  
29 shorelines) are prevalent. The linear and areal extent of various habitat types, by MPA  
30 study region, is shown in **Table 3-10**.

1 **Table 3-10. Existing Habitat Representation, By MPA Study Region**

Habitat	Measure	Habitat Length or Area by Region			
		North Coast	North Central Coast	Central Coast	South Coast
Intertidal					
Sandy/Gravel Beaches	Linear (mi)	180.4	188.3	223.7	440.8
Rocky Intertidal/Cliff	Linear (mi)	159.1	169.5	209.2	280.7
Coastal Marsh	Linear (mi)	88.6	51.8	36.5	59.5
Tidal Flats	Linear (mi)	66.5	60.6	23.5	34.7
Surfgrass	Linear (mi)	0.0	68.8	161.1	72.4
Eelgrass	Area (mi <sup>2</sup> )	7.1	6.0	1.1	4.7
Estuary	Area (mi <sup>2</sup> )	43.5	19.5	9.8	42.9
Hardened Shore	Linear (mi)	22.1	-	-	339.2
Soft Bottom					
0–30 m	Area (mi <sup>2</sup> )	302.9	221.9	270.3	437.2
30–100 m	Area (mi <sup>2</sup> )	456.0	338.4	562.4	672.1
100–200 m	Area (mi <sup>2</sup> )	62.8	5.5	57.8	158.4
>200 m	Area (mi <sup>2</sup> )	7.7	0.0	105.5	234.3
Hard Bottom					
0–30 m	Area (mi <sup>2</sup> )	32.2	37.0	73.6	111.7
30–100 m	Area (mi <sup>2</sup> )	33.6	48.4	40.3	47.8
100–200 m	Area (mi <sup>2</sup> )	0.7	0.0	14.6	3.9
>200 m	Area (mi <sup>2</sup> )	0.1	0.0	16.2	2.2
Unknown-bottom Habitats					
0–30 m	Area (mi <sup>2</sup> )	127.9	0.0	-	-
30–100 m	Area (mi <sup>2</sup> )	3.1	0.0	-	-
100–200 m	Area (mi <sup>2</sup> )	0.2	0.0	-	-
>200 m	Area (mi <sup>2</sup> )	0.2	0.0	-	-
Kelp Forest					
Kelp	Area (mi <sup>2</sup> )	2.3 (1989); 1.5 (1999); 0.4 (2002); 0.2 (2003); 0.6 (2004); 0.1 (2005); 3.2 (2008); 1.2 (avg)	1.8 (avg) (1989, 1999, 2002-2005)	10.8 (avg) (1989, 1999, 2002, 2003)	17.8 (1989); 11.6 (1999); 13.1 (2002); 26.3 (2003); 31.1 (2004); 30.4 (2005); 21.7 (avg)
Canyon Habitat					
Canyons	Area (mi <sup>2</sup> )	7.6	-	53.9 (total)	-
0–30 m	Area (mi <sup>2</sup> )	-	-	0.6	-
30–100 m	Area (mi <sup>2</sup> )	-	-	4.4	-
100–200 m	Area (mi <sup>2</sup> )	-	-	6.1	-
>200 m	Area (mi <sup>2</sup> )	-	-	42.8	-

Sources: Horizon Water and Environment LLC 2012a,b; ICF Jones & Stokes 2009a,b; Jones & Stokes 2006, 2007; URS 2010a,b.

Note: Central Coast and South Coast dimensions rounded to nearest tenth.

Marine habitats found within State waters are represented by both intertidal and subtidal areas, the latter of which include primarily continental shelf habitats (i.e., 0 to 30 m water depth). However, in certain areas along the California coast (e.g., Monterey Bay), deeper water habitats are present, including continental slope and canyon environments.

Detailed characterizations of each habitat type, as derived from the MPA analyses for each of the four California regions (i.e., North Coast, North Central Coast, Central Coast, and South Coast) and other key references, are provided in **Appendix D**. Summary descriptions are provided in the following sections.

### Intertidal Zone

Within the intertidal zone, daily tidal fluctuations result in diurnal exposure of the intertidal environment. Within this zone, wave action influences the type of habitats present, with corresponding effects on species presence. Species equipped to withstand the stresses of changing tides and waves tend to be resilient and these intertidal zones host a diverse number of species.

The intertidal zone is broadly divided into sandy beaches and rocky shores. Several additional intertidal habitats have also been described under the MPA process, including hardened shorelines; coastal marshes and tidal flats; and estuaries and lagoons. While OGPP survey operations may be limited, or restricted, in one or more of these shallower habitats, they lie adjacent to shallow subtidal habitats where low energy surveys may occur. Consequently, these habitats are characterized for purposes of completeness.

Sandy beach communities are structured in large part by grain size, slope of the beach, and wave energy. Beaches are dynamic systems, changing with wind and wave action. Generally, sand erodes from beaches in the winter and is redeposited in the summer, resulting in annual changes in beach slope and width. Seasonal fluctuations in sand abundance are affected by the development of hardened shores and human-made sand-retention structures. Beach sand, decaying seaweed, and other detritus support a variety of invertebrate animals. Snails, bivalves, crustaceans, insects, spiders, isopods, amphipods, and polychaetes are among the organisms that inhabit sandy beaches, and several of these provide nourishment for larger vertebrate animals. Many other species, including pinnipeds, use sandy beaches for resting and rearing young.

Beach types include:

- Fine- to medium-grained sand beach – characterized by a flat, wide, and hard-packed beach that experiences significant seasonal changes in width and slope. Upper beach fauna are scarce; lower beach fauna include sand crabs;

- 1 • Coarse-grained sand beach – characterized by a moderate-to-steep beach of  
2 variable width with soft sediments, which may be backed by dunes or cliffs, and  
3 scarce fauna. They are often located near river mouths and estuaries;
- 4 • Mixed sand and gravel beach – characterized by a moderately sloping beach  
5 with a mix of sand and gravel, which may have zones of pure sand, pebbles, or  
6 cobbles. Sand fraction may get transported offshore in winter. More stable  
7 substrata support algae, mussels, and barnacles; and
- 8 • Gravel beach – includes beaches composed of sediments ranging from pebbles  
9 to boulders; often steep with wave-built berms. Attached algae, mussels, and  
10 barnacles are present on lower stable substrata.

11 Rocky shore habitats and their associated ecological assemblages are found  
12 throughout California, although they are absent in significant stretches of the coast in  
13 certain areas. Rocky intertidal communities, from the splash zone to the lower intertidal  
14 zone, vary in composition and structure with tidal height and wave exposure. Intertidal  
15 boulders, platforms, and cliffs, as well as tidepools, are home to many hundreds of  
16 species of algae, fishes, and invertebrates, including barnacles, anemones, snails,  
17 mussels, crabs, and sea stars. Mussel beds, sea palm, algal beds, and surfgrass are  
18 patchily distributed along rocky shores, but support a very diverse fauna. In addition to  
19 the tidal height and steepness of the shore, the underlying geology of a rocky coast can  
20 affect the ecological communities present. Prominent of the shoreline types include:

- 21 • Exposed rocky cliff – this shoreline type is characterized by a steep, narrow  
22 intertidal zone (greater than 30° slope) and little sediment accumulation. It also  
23 has strong vertical zonation of intertidal communities; barnacles, mussels,  
24 limpets, sea stars, anemones, crabs, and macroalgae are abundant.
- 25 • Exposed wave cut rocky platform – this shoreline type includes flat rocky  
26 benches of variable width with irregular surface and tidepools. The shore may be  
27 backed by a scarp or bluff with sediments or boulders at its base. Some sediment  
28 accumulation occurs in pools and crevices. This habitat supports rich tidepool  
29 and intertidal communities with algae, sponges, anemones, barnacles, snails,  
30 mussels, sea stars, brittle stars, bryozoans, tunicates, crabs, isopods,  
31 amphipods, and polychaetes.
- 32 • Sheltered rocky shore – this shoreline type includes bedrock shores of variable  
33 slope (cliffs to ledges) that are sheltered from wave exposure. This habitat  
34 supports rich tidepool and intertidal communities with algae, sponges,  
35 anemones, barnacles, snails, mussels, sea stars, brittle stars, bryozoans,  
36 tunicates, crabs, isopods, amphipods, and polychaetes.

37 Rocky intertidal habitats are often rich in species diversity and abundance. Algae, as  
38 well as benthic and sessile organisms, attach themselves to permanent, hard substrate,



1 which allows for the establishment of long-lived complex communities. In general, rocky  
2 intertidal habitats throughout California are considered sensitive.

3 Jetties, seawalls, and other human-made structures are present around major ports and  
4 harbors, and along stretches of coastline requiring fortification from wave exposure and  
5 erosional loss. Structures such as jetties and seawalls provide habitat for intertidal algal  
6 (e.g., *Fucus*, *Mastocarpus*, *Polysiphonia* spp.) and invertebrate (e.g., *Anthopleura* spp.  
7 *Cancer productus*, *Pachygrapsus crassipes*) assemblages similar to those found in  
8 naturally occurring, rocky intertidal areas.

9 Tidal flats and coastal marshes are recognized as a significant component of  
10 California's intertidal zone. Coastal marshes support high levels of biological  
11 productivity and provide habitat for many species. Marshes also regulate the amount of  
12 fresh water, nutrient, and sediment inputs into the estuaries and play an important role  
13 in filtration for estuarine water quality. Marshes along estuarine margins contribute to  
14 the stabilization of shorelines and store floodwaters during coastal storms. Vegetation  
15 patterns and dominant species in coastal marshes vary with levels of salinity, which is  
16 determined by precipitation patterns and changes in freshwater inputs. Tidal flats are  
17 associated with coastal rivers as well as bays and estuaries. These areas provide  
18 essential foraging grounds for migratory bird species because of the presence of  
19 invertebrates, including clams, snails, crabs, worms, and the burrowing ghost shrimp  
20 (*Neotrypaea californiensis*), as well as eelgrass (*Zostera* spp.). Eelgrass also provides  
21 habitat for juvenile rockfish species (e.g., *Sebastes* spp.) and Dungeness crab (*Cancer*  
22 *magister*), among other species. Soft sediments support large populations of worms,  
23 clams, and snails, among other species, and are important foraging areas for  
24 shorebirds.

25 Estuaries provide critical ecosystem services, including filtering sediments and nutrients  
26 from adjacent watersheds, stabilizing shorelines, and providing flood and storm  
27 protection. Their condition is closely tied to the condition of the surrounding watershed.  
28 Estuaries are also used for many interpretation/education and recreational activities  
29 (e.g., fishing, boating, kayaking, wildlife viewing). Estuaries form at the mouths of rivers  
30 and streams, where freshwater and saltwater meet. Specific characteristics of estuaries  
31 vary, based on salinity. The salinity may change seasonally and over longer time  
32 frames, depending on freshwater inputs and creation or removal of barriers between the  
33 estuary and the open coast. Estuaries contain open water and soft-bottom habitats,  
34 coastal marsh, and tidal flats, and in some cases, eelgrass beds. Lagoons generally  
35 have a low level of freshwater input. In general, lagoons and estuaries that are open, at  
36 least periodically, and are characterized by estuarine vegetation and tidal influence,  
37 were included in the MLPA planning process.

1    Subtidal Habitats

2    Subtidal habitats of the California coast can be divided into depth strata (**Table 3-10**),  
3    and further classified according to substrate type or major faunal component (e.g., kelp  
4    forests, grassbeds). In total, soft bottom represents 84.6 percent of the subtidal marine  
5    habitat in California waters; hard bottom comprises 10.0 percent, while canyons and  
6    unknown seafloor types contribute 2.5 percent and 2.9 percent, respectively. Nearly all  
7    (99.87 percent) of the subtidal habitats within State waters, including soft bottom, hard  
8    bottom, canyons, and unknown bottom areas, are in waters less than 200 m deep.

9    Soft bottom environments, both within nearshore and offshore waters, range from flat  
10    expanses (e.g., inner and outer continental shelf) to slopes and basin areas. Soft  
11    bottom habitats lack the complex, three-dimensional structure of hard bottom substrates  
12    and exhibit reduced species diversity when compared to rocky reefs. However, soft  
13    bottom habitats can vary, depending on sediment grain size. In deeper waters, oxygen  
14    availability may represent a limiting factor. Soft bottom habitats can also be highly  
15    dynamic in nature as sediments shift because of wave action, bottom currents, and  
16    geological processes. Soft sediment communities reach their peak in diversity of  
17    invertebrate epifauna and infauna around 70 to 230 m, especially in areas where the  
18    shelf is wide and riverine input is present. Organisms typically found in the sandy  
19    subtidal environments include, but are not limited to: tube worms (*Diopatra ornata*),  
20    sand dollars (*Dendraster excentricus*), and various species of crabs, sea stars, snails,  
21    and bottom-dwelling fish. Sandy and soft bottoms provide essential habitat for  
22    commercially important species such as Pacific halibut (*Hyppoglossus stenolepis*) and  
23    Dungeness crab. Available data indicate that soft bottom habitats are much more  
24    common than hard bottom habitats at all depth zones. Salient references for soft bottom  
25    habitats, with an emphasis on southern California and broad, regional characterizations,  
26    include Allan Hancock Foundation (1965), Dailey et al. (1993), Jones (1969), Fauchald  
27    and Jones (1979a,b; 1983), Ranasinghe et al. (2010; 2012), and Thompson et al.  
28    (1987; 1993).

29    Hard bottom habitats, or rocky reefs, are much less common than soft substrata along  
30    the California coast at all depth zones. Species that associate with hard bottoms differ  
31    greatly with depth and type of substratum; the amount of topographic relief changes  
32    with gravel, cobble, boulders, and smooth rock outcrop. Rocky reefs provide hard  
33    substratum to which kelp and other alga can attach in the nearshore (less than 30 m  
34    water depths). In addition, many invertebrates such as deep sea corals, sponges, and  
35    anemones require hard substratum for attachment in deeper waters. In addition to  
36    attached organisms, the structural complexity of rocky reefs provides habitat and  
37    protection for mobile invertebrates and fish. The ecological assemblages associated  
38    with rocky habitats can also be influenced by the type of rock (e.g., sedimentary versus  
39    granitic reefs or size of substrata, such as cobble versus boulder). Rocky subtidal  
40    habitats are characterized as having conspicuous algal cover with scattered clumps of

1 rockweeds (e.g., *Fucus* and *Silvetia*) and turfy red alga (*Endocladia muricata*). Marine  
2 algae flourish in the nutrient-rich waters along the coast of California.

3 Seagrass beds are found in water depths up to 37 m throughout much of the Central  
4 California coast. One type of seagrass, surf grass (*Phyllospadix* spp.), is the dominant  
5 plant in the transition zone between the low intertidal and the shallow subtidal zones.  
6 Surf grass is considered an important habitat for commercial invertebrates and fish.

7 Kelp beds are formed by two predominant canopy-forming, brown, macroalgae species:  
8 giant kelp (*Macrocystis pyrifera*) and bull kelp (*Nereocystis lutkeana*). These two types  
9 of kelp forests differ in their biological productivity (i.e., giant kelp forests are more  
10 productive) and species assemblages. Kelp beds are quasi-permanent features; the  
11 extent of their canopies changes seasonally and annually in response to seasonal  
12 growing conditions, winter storm activity, and oceanographic conditions (e.g., Southern  
13 Oscillation [El Niño] events). Kelp beds grow along most of the California coast on  
14 nearshore hard substrate, but can be found in select protected areas anchored in soft  
15 substrates (e.g., Santa Barbara Channel). In general, kelp beds can extend to a  
16 maximum depth of about 30 m.

#### 17 *Pelagic and Neritic Habitats*

18 Pelagic and neritic habitats comprise the surface waters to about 200 m in depth. This  
19 habitat is influenced by oceanographic currents and various processes, including  
20 upwelling, retention centers, tidal flow, and freshwater outflow from major rivers. Within  
21 this zone, particularly in the upper portions of the water column, primary production and  
22 the initial stages of energy transfer occur. The combination of sunlight and nutrients,  
23 particularly in upwelling areas, provide conditions conducive to seasonally high  
24 phytoplankton growth.

#### 25 **Oceanographic Influences on Biological Resources**

26 Several key oceanographic features create and influence habitat along the California  
27 coast. In the North Coast region, two large-scale currents dominate alongshore  
28 oceanographic conditions. The California Current is a southward-flowing surface current  
29 which may extend 100 miles (mi) or more offshore. The Davidson Current is a  
30 northward-flowing subsurface current that remains closer to shore. During the winter,  
31 the California Current tends to move offshore, allowing the Davidson Current to  
32 dominate in the nearshore surface waters.

33 In the North Central Coast region, three large-scale currents have been identified. The  
34 California Current along this portion of the coast has a weak southerly mean flow  
35 (i.e., approximately 3 centimeters per second [cm/s]), characterized by strong variability  
36 (e.g., large eddies with typical current speeds faster than the mean southward flow).  
37 The North Pacific Gyre is comprised of southward flowing surface waters and extends

1 more than 100 mi offshore. The Davidson Current is typically deeper than 100 m,  
2 located immediately offshore of the shelf-slope break. During winter, the flow of the  
3 California Current and wind-driven currents are reduced, allowing the Davidson Current  
4 to surface nearshore. Strongest currents in this region are directly wind-driven and are  
5 located over the shelf (i.e., coastal upwelling jets). These currents move primarily  
6 alongshore towards the south, but have an important offshore movement of near-  
7 surface waters (i.e., Ekman transport). Movement of surface waters offshore produces  
8 localized upwelling, where cold, subsurface, nutrient-rich waters surface. There is also a  
9 significant tidal component in this region, where water over the shelf moves with the  
10 tides. Strongest tidal currents are observed in and near enclosed waters (e.g., San  
11 Francisco Bay, Tomales Bay). Currents are also affected, on a smaller scale, by local  
12 topographic variability and with the convergence of waters of different density (e.g., low-  
13 salinity bay outflow interacting with ocean waters).

14 Along the Central California coast, two main currents are noted. The California Current  
15 continues its southward, surface, cold water flow in this region. Below the surface, the  
16 northward-flowing, warmer Davidson Current is also present. As described previously,  
17 the flow of the California Current is reduced in winter, allowing the Davidson Current to  
18 dominate oceanographic conditions. The California and Davidson Currents converge at  
19 Point Conception, creating a major biogeographic boundary. North of Point Conception,  
20 the countercurrent may surface as a nearshore northward flowing current, especially in  
21 fall and winter. Ocean circulation patterns along the Central California coast are affected  
22 by winds, ocean temperatures and salinities, tides, coastal topography, and  
23 ocean-bottom features.

24 The South Coast region of California is located in the northern portion of the Southern  
25 California Bight (SCB), a curving section of coastline that extends from Point  
26 Conception to Baja California in Mexico. Oceanographic currents within the majority of  
27 the Bight are dominated by a counterclockwise circulating gyre – the Southern  
28 California Eddy. This feature comprises a complicated set of seasonally varying  
29 currents, but generally forms when the southward-moving California Current bends  
30 shoreward near San Diego and northward along the SCB, forming the  
31 northward-moving Southern California Counter Current. This feature is most developed  
32 in the summer and fall months, and less developed during winter and spring. Point  
33 Conception represents the northern limits of the SCB, delineates a separation point  
34 where cold waters from Central California meet warmer waters from Southern  
35 California, and marks the interface between two biogeographic provinces – the  
36 Oregonian province to the north and the San Diegan (or Californian) province to the  
37 south.

38 The North, North Central, and Central Coast regions are characterized by a three-  
39 season oceanographic regime: the upwelling season, the relaxation season, and the  
40 storm season. From April through July (generally peaking in May and June), these

1 regions are dominated by strong upwelling episodes during which persistent northwest  
2 winds drive surface waters offshore and toward the equator, while deeper waters move  
3 onshore and poleward. Upwelling tends to be associated with coastal features  
4 (e.g., headlands) and bathymetric features (e.g., shelf-slope break, offshore banks).  
5 There is significant variability in upwelling among years and with latitude.

6 The relaxation season, extending from August through November, is characterized by  
7 light winds and calm seas, with occasional upwelling events and early winter storms.  
8 The storm season lasts through winter and early spring and brings strong winds, large  
9 waves, and increased northward flow along the coast.

10 In the South Coast region, seasonal fluctuations generally increase in intensity through  
11 the summer. During winter, the region experiences southerly wind events and  
12 downwelling during the passage of cold fronts; winds turning westerly behind the cold  
13 front may produce downcoast (i.e., southward) transport of runoff plumes. During fall,  
14 the relaxation of winds along the coast north of Point Conception becomes more  
15 frequent, with westward flow more prominent through the Santa Barbara Channel and  
16 up the mainland coast past Point Conception. The strongest northward flow around  
17 Point Conception is observed in El Niño years, when SCB waters may be transported  
18 as far north as San Francisco. Internal tides are also important due to shallow thermal  
19 stratification in this region. Over the inner shelf, the energy of internal tidal flow energy  
20 is observed routinely as packets of higher frequency internal waves that lead to cold  
21 sub-thermocline waters moving shoreward, reaching the surface nearshore. This  
22 process has been shown to be important in nearshore larval dispersal, nearshore  
23 productivity, and nearshore water quality.

#### 24 *Upwelling Zones*

25 In the North Coast region, Cape Mendocino represents an important upwelling center.  
26 At this location, southward-flowing currents are deflected offshore as upwelling jets,  
27 allowing cold, nutrient-rich subsurface waters to reach the surface. At the boundary  
28 between the North and North Central Coast region is the most prominent upwelling  
29 center off California – Point Arena. The upwelling center at Point Arena is one of the  
30 largest and most persistent in the world, being active year-round, but strongest in the  
31 upwelling and relaxation seasons. Waters upwelled at Point Arena are likely to move  
32 south and offshore, crossing over Cordell Bank several days later. During stronger  
33 winds, upwelling occurs along the entire coast from Point Arena to Bodega Bay, with  
34 water upwelled closer to Bodega Head being deflected offshore at Point Reyes and  
35 moving past the Farallon Islands. For the remainder of the North Central Coast region,  
36 another major upwelling center is found at Pigeon Point. In the Central Coast region,  
37 major upwelling centers have been characterized at Davenport (Santa Cruz County),  
38 Point Sur, and Point Conception. In addition, frequent upwelling occurs along the Big  
39 Sur coast. In the South Coast region, the previously noted upwelling center at Point

1 Conception produces cold nutrient-rich surface waters within the Santa Barbara  
2 Channel and around the westernmost northern Channel Islands (San Miguel, Santa  
3 Cruz, and Santa Rosa). Cold surface temperatures are also observed in the wakes of  
4 many islands, as well as in headland wakes at Point Dume, Palos Verdes, and Point  
5 Loma, and more extensive upwelling is observed at times along the mainland southern  
6 California coast.

#### 7 *Retention Areas*

8 Along the California coast, longshore coastal currents interact with headlands or other  
9 coastal features, causing the formation of headland eddies, or upwelling shadows, on  
10 the lee side of headlands, especially where embayments occur. These eddies and  
11 upwelling shadows increase the retention (or reduce the dispersion) of planktonic  
12 organisms, and areas where they occur are considered retention areas. Even small  
13 embayments in the lee of small headlands can be localized retention zones (ICF Jones  
14 & Stokes 2009a,b). No prominent retention areas were noted along either the North or  
15 Central Coast regions. In the North Central Coast region, retention areas were identified  
16 at Drakes Bay (i.e., retention area for larvae), Point Reyes (i.e., high concentrations of  
17 rockfish and crab larvae), Bodega Bay/Bodega Harbor, Bolinas Bay, Pillar Point, and  
18 Tomales Bay. In the South Coast region, the counterclockwise circulating gyre  
19 (Southern California Eddy) present within the SCB acts as a widespread retention zone.

#### 20 *River and Estuarine Plumes*

21 Freshwater flow originating from large coastal rivers produces a surface lens of lighter,  
22 warmer water when it reaches coastal waters. In nearshore waters, this flow is observed  
23 as a distinct plume. Throughout California where rivers reach the ocean, coastal rivers  
24 and streams introduce freshwater, sediment, nutrients, and potential pollutants into  
25 nearshore waters. Typically limited to a local impact, these plumes have the potential to  
26 reach hundreds of kilometers offshore following El Niño or other large storm events.  
27 These plumes play a potentially significant role in nearshore coastal nutrient dynamics  
28 and larval dispersal and settling.

29 Large rivers along the California coast include the Russian, Smith, Klamath, Eel,  
30 Mattole, Navarro, Salinas, Santa Maria, Santa Ynez, Ventura, Santa Clara, Los  
31 Angeles, San Gabriel, Santa Margarita, San Luis Rey, San Dieguito, and San Diego  
32 Rivers, and a variety of smaller creeks and estuaries. The San Francisco Bay estuarine  
33 complex – the largest estuary on the west coast – receives freshwater from the entire  
34 Central Valley, primarily from the San Joaquin and Sacramento River systems.  
35 Low-salinity waters exit San Francisco Bay on the outgoing or ebb tide, while ocean  
36 waters enter the bay at depth and specifically on the incoming or flood tide. Although  
37 tidal currents dominate in the vicinity of Golden Gate, amidst significant mixing, there is  
38 a net outflow of waters, which forms a low-salinity plume. The low density outflow from

1 San Francisco Bay turns either north (in the absence of winds and offshore currents) or  
2 south (during the upwelling season).

3 Mesoscale oceanographic processes, upwelling and retention centers, and localized  
4 freshwater and estuarine flow influence both primary and secondary productivity, the  
5 latter of which provide the basis for energy flow through the nearshore marine  
6 ecosystem. This complex set of ecological linkages and relationships was summarized  
7 as part of the MLPA process (e.g., Horizon Water and Environment LLC, 2012a,b), with  
8 revisions as follows:

- 9 • Coastal and estuarine vegetation: includes plants such as macroalgal mats,  
10 cordgrass, pickleweed, and eelgrass. Macroalgal mats (e.g., *Ulva*, *Enteromorpha*  
11 spp.) may be carried on tides or currents to the open ocean, where they provide  
12 shelter and food for numerous organisms, notably juvenile fishes. Eventually,  
13 these mats may wash up on shore, where they supply nutrients to sandy beach  
14 and rocky intertidal communities.
- 15 • Plankton and Ichthyoplankton: high rates of phytoplankton growth (e.g., within  
16 upwelling areas) allows fixed carbon to be passed onto other larger consumers in  
17 the complex coastal food web; in conjunction with contributions from attached  
18 benthic algae, this primary production supports higher trophic levels, including  
19 zooplankton, forage fishes, large fishes, seabirds, turtles, and marine mammals.
- 20 • Marine fish: live as adults in nearshore coastal waters, on the continental shelf  
21 and slope, or in submarine canyons. They produce pelagic larvae that recruit to  
22 estuaries, bays, kelp forests, rock outcrops, and cobble fields. Eelgrass beds are  
23 important for spawning and juvenile habitat for certain species. The structure of  
24 eelgrass beds provides protection from predation for juvenile invertebrates and  
25 fishes. Bat rays, leopard and smoothhound sharks, plainfin midshipman,  
26 staghorn sculpin, several surf perch, jacksmelt, and topsmelt mate and bear their  
27 young in estuarine habitats.
- 28 • Anadromous fish: produce eggs and juveniles in fresh water. Juveniles pass  
29 through estuarine environments to mature at sea and return through the  
30 estuaries as adults to migrate upstream in coastal rivers to reproduce. Due to  
31 habitat degradation within watersheds and freshwater ecosystems, coupled with  
32 the presence of barriers to fish passage, stocks of native anadromous fish  
33 (e.g., steelhead trout, coho and Chinook salmon, Pacific lamprey, sturgeon) have  
34 been seriously affected.
- 35 • Shorebirds and waterfowl: inhabit coastal lagoons, estuaries, and salt marshes  
36 as well as areas near sandy beaches. Large numbers of shorebirds and diving  
37 ducks are attracted to eelgrass beds, where they feed on the eelgrass, fish, and  
38 invertebrate eggs and young. Many bird species use salt marshes, shallow  
39 intertidal flats, and lagoons during their annual migrations. The estuaries, bays,

1 and sandy beaches of coastal California form part of the Pacific Flyway, one of  
2 the four principal bird migration routes in North America.

- 3 • Marine mammals: present in nearshore and offshore waters, as residents or  
4 seasonal migrants. Several marine mammal species (e.g., California sea lions,  
5 Steller sea lions, northern elephant seals, harbor seals) utilize coastal haul-out  
6 sites, as well as a few rookeries, on secluded rocks and sand beaches, tidal flats,  
7 and estuaries along the California coast.

## 8 **Plankton and Ichthyoplankton**

9 One of the prominent ecosystem features of the California Current System is the spring  
10 phytoplankton bloom along a narrow coastal band, within 20 to 50 km of the shore. This  
11 phenomenon results in strong seasonality and an inshore-offshore gradient of primary  
12 production (e.g., see Strub et al. 1990; Thomas et al. 1994; Leggard and Thomas 2006;  
13 Kim 2008). Seasonal wind-driven upwelling supplies abundant nutrients to support  
14 increased phytoplankton productivity.

15 The magnitude and variability of primary productivity in nearshore waters of the SCB is  
16 not yet well known (Kim et al. 2009); however, in spite of the absence of a long-term  
17 historical database on phytoplankton, recent research findings are available. Ormand et  
18 al. (2012) and Kim et al. (2009) characterized the seasonal phytoplankton cycle in the  
19 SCB, noting that it generally begins with a large spring bloom, followed by a series of  
20 episodic blooms during the rest of the year. Dense blooms observed nearshore, in  
21 water depths less than 20 m, may last only a few days. Harmful algal blooms (HABs)  
22 may also occur, producing adverse effects such as toxins, fish gill damage, or anoxia  
23 (Smayda 1997; Anderson et al. 2008). HABs that occur in the nearshore are particularly  
24 damaging because of the high exposure to coastal and benthic habitats (Ormand et al.  
25 2012). Picophytoplankton is composed of three groups and includes the cyanobacteria  
26 *Prochlorococcus* spp., *Synechococcus* spp., and small eukaryotic algae.  
27 Picophytoplankton contributes greater than 50 percent of the biomass and production in  
28 warm oligotrophic tropical and subtropical open oceans (Agawin et al. 2000).  
29 *Prochlorococcus* spp. has been found to be more abundant in oligotrophic water than in  
30 eutrophic water, and *Synechococcus* spp. is ubiquitous in the upper layers of temperate  
31 and warm oceans (Zhao et al. 2010); however, in one study in Southern California, the  
32 composition of the *Synechococcus* communities was found to generally change with the  
33 nitricline, thermocline, and chlorophyll maximum depths, each of which deepens with  
34 distance from shore (Tai and Palenik 2009).

35 During spring and summer off the Central California coast (Central Coast region),  
36 upwelling brings high-nutrient water to the surface of Monterey Bay. Nutrients, sunlight,  
37 and some degree of water column stratification lead to high primary production and  
38 elevated chlorophyll values during the upwelling period. During the upwelling period,  
39 flora within the Bay are dominated by diatoms, especially *Chaetoceros* spp.



In the North Central Coast region, Wilkerson et al. (2006) analyzed a three-year data set (2000–2003) of nearshore upwelling events off Bodega Bay. As part of the CoOP WEST study, nutrients, carbon dioxide (CO<sub>2</sub>), size-fractionated chlorophyll, and phytoplankton community structure were measured. The ability of the ecosystem to assimilate nitrate and silicic acid/silicate (Si(OH)<sub>4</sub>) and accumulate particulate material (i.e., phytoplankton) was realized in all three years, following short events of upwelling-favorable winds with subsequent periods of relaxed winds. This was observed as phytoplankton blooms, dominated by chlorophyll in cells greater than 5 micrometers (µm) in diameter that reduced ambient nutrient levels to below detection limits (i.e., reported as zero by Wilkerson et al. 2006).

Studies of nearshore zooplankton tend to be site-specific. Barnett and Jahn (1987) characterized nearshore zooplankton off San Onofre (Southern California), identifying distinguishable nearshore and offshore assemblages. Nearshore, in water depths less than 30 m, the copepods *Acartia clausi* and *Oithona oculata*, and barnacle larvae were present. Offshore assemblages included the copepods *Calanus pacificus*, *Eucalanus californicus*, and *Rhincalanus nasutus*, occupying water having less chlorophyll and less near-surface nutrients (i.e. of more oceanic character). Throughout the year, nearshore and offshore assemblages were distinguishable, the change occurring at about the 30-m contour. In spring and summer, most nearshore taxa shifted slightly seaward, leaving a third assemblage, characterized by a very high abundance of *Acartia* spp. copepodids and maximum abundances of *A. clausi* and *O. oculata* near the beach.

**Appendix E** contains more detailed information on available data on plankton and ichthyoplankton in State waters.

## Invertebrates

Invertebrates represent a significant component in all marine habitats – as encrusting, burrowing, tube-building, and/or motile forms on sandy beaches, rocky intertidal, human-made structures, soft bottom subtidal, hard bottom subtidal, and canyon environments. Invertebrates are also represented by species that have either been formally listed or are recognized as being species of concern, including several abalone species, red sea urchins, and several clam and crab species. Invertebrates of concern are discussed in the following section.

### *Abalone*

Seven species of abalone (*Haliotis* spp.) are found in California. Their distribution, preferred depth distribution, and current status are as follows:

- White (*H. sorensenii*): Point Conception to central Baja California, Mexico; preferred depth range: 25 to 30 m; federally endangered.

- 1 • Black (*H. cracherodii*): Point Arena, California to Bahia Tortugas and Isla  
2 Guadalupe, Mexico, with rare sightings in Oregon; preferred depth range: low  
3 intertidal to 7 m; federally endangered.
- 4 • Green (*H. fulgens*): Point Conception to Bahia de Magdalena (Gulf of California),  
5 Mexico; preferred depth range: low intertidal to 18 m; California Species of  
6 Special Concern (SSC) and National Marine Fisheries Service (NMFS) Species  
7 of Concern.
- 8 • Pink (*H. corrugata*): Point Conception south to Bahia de Tortuga, Baja California,  
9 Mexico; preferred depth range: 3 to 36 m; California SSC and NMFS Species of  
10 Concern.
- 11 • Pinto (*H. kamtschatkana kamtschatkana*): Sitka, Alaska to Point Conception;  
12 preferred depth range: low intertidal to 9 m, but found as deep as 100 m;  
13 California SSC and NMFS Species of Concern.
- 14 • Flat (*H. walallensis*): British Columbia, Canada to La Jolla, California; preferred  
15 depth range: low intertidal to 21 m; California SSC.
- 16 • The red abalone (*H. rufescens*) is the only abalone species found in California  
17 that is not listed or identified as a species of concern. This species is found from  
18 southern Oregon to Baja California, Mexico, with a preferred depth range  
19 extending from the low intertidal to 30 m.

20 In the North Coast region, black abalone is rare, but has been documented as far north  
21 as Mendocino County. Four species of abalone – black, flat, pinto, and red – may occur  
22 within the North Central Coast region. Black, flat, and pinto abalone are thought to be  
23 relatively rare, while red abalone are more abundant. While red abalone populations are  
24 fairly robust and continue to support a viable recreational fishery, some concern  
25 remains about the concentration of fishery effort in Sonoma and Mendocino Counties.  
26 Additionally, evidence of low abundance of juveniles at Bodega State Marine Reserve,  
27 Salt Point State Marine Conservation Area, and Fort Ross State Marine Conservation  
28 Area over the last 10 years suggests low recruitment in these areas (ICF Jones &  
29 Stokes 2009a,b). Within the Central Coast region, several key invertebrate species are  
30 present, including abalone. In the South Coast region, black abalone populations  
31 remain severely depressed since the closure of the fishery in 1993. Black abalone has  
32 been documented at several of the offshore islands, including San Clemente, San  
33 Nicolas, and Santa Cruz islands.

34 Green, pink, pinto, and flat abalone have been federally designated as Species of  
35 Concern. White abalone was federally listed as endangered in 2001. Black abalone is  
36 classified as depleted and was federally listed as an endangered species in 2009. The  
37 commercial and recreational abalone fishery south of San Francisco Bay was closed in  
38 1997 due to the effects of withering foot syndrome and a decline in population size.

1 California Department of Fish and Wildlife's (CDFW) Abalone Recovery and  
2 Management Plan, adopted in December 2005, outlines restoration strategies for  
3 depleted abalone stocks in Central and Southern California, and describes the  
4 management approach to be used for Northern California red abalone and eventually  
5 for other recovered abalone stocks.

6 In addition to these special status species, key invertebrate species noted for the  
7 Central Coast region include red sea urchin, crab, and clams. Species descriptions are  
8 as follows:

9 *Red Sea Urchin*

10 The red sea urchin (*Strongylocentrotus franciscanus*) is an echinoderm that feeds  
11 primarily on algae, including kelp. They are found from Baja California, Mexico to Alaska  
12 in relatively shallow water (low tide line to 100-m depths). Red sea urchins prefer rocky  
13 habitat near kelp and seaweeds. Sea urchins have been shown to reduce kelp  
14 abundance in certain areas, creating urchin barrens. This localized reduction in kelp  
15 abundance may affect local red abalone abundance.

16 *Dungeness Crab*

17 Dungeness crab (*Cancer magister*) range from the eastern Aleutian Islands, Alaska to  
18 around Santa Barbara; the species is considered rare south of Point Conception.  
19 Dungeness crab prefer sandy and sand-mud substrates, but may be encountered in  
20 hard bottom areas as well. This species may be found in depths ranging from the  
21 intertidal zone to depths of approximately 230 m; highest densities for this species are  
22 in water depths of less than 100 m. The Dungeness crab population off California is  
23 comprised of five subpopulations: Avila-Morro Bay, Monterey, San Francisco, Fort  
24 Bragg, and Eureka-Crescent City. Subpopulations do not interbreed. Limited migration  
25 (inshore-offshore) has been observed, typically within distances of less than 10 mi.

26 *Clams*

27 Three species of clam are targeted by recreational clammers in California – the razor  
28 clam, the gaper clam, and the Washington clam. Pacific razor clams (*Siliqua patula*),  
29 which range from western Alaska to Pismo Beach, are typically found on flat or gently  
30 sloping sandy beaches with a moderate to heavy surf. Razor clam shells are long and  
31 thin, with fragile, shiny valves. Razor clams attain their maximum rate of growth during  
32 their first year of life. The growth rate remains high through the second or third year,  
33 after which it slows markedly.

34 Gaper clams are represented by two species – the Pacific gaper (*Tresus nuttalli*) and fat  
35 gaper (*Tresus capax*). Both species range from Alaska to Scammon's Lagoon, Baja  
36 California, inhabiting fine sand or firm sandy-mud bottoms in bays, estuaries, and more

sheltered outer coast areas. The preferred depth range of this species extends from the intertidal to depths of at least 50 m. The Pacific gaper is the most commonly taken gaper clam in California. Its congener, the fat gaper, is the predominant gaper clam taken in Humboldt Bay, where it is very common in the intertidal zone. Gaper clams live to a maximum age of 17 years and can attain a length of 10 inches [in], with a weight of approximately 5 pounds (lb).

Washington clams range from Humboldt Bay to San Quentin Bay, Baja California. Two species of Washington clam are found in California – the Washington clam (*Saxidomus nuttalli*) and the butter clam (*Saxidomus giganteus*). Washington clams live 12 to 18 in into the sediment (i.e., mud, sandy mud, or sand) of California's bays, lagoons, and estuaries.

## **Fish**

Fish assemblages along the California coast are comprised of both year-round residents and migratory species. To organize a baseline description, fish resources are broadly categorized to reflect preferred environments of individual species and life stages; these broad categories are: hard bottom; soft bottom; and coastal pelagic. Fish assemblages for hard bottom, kelp, soft bottom, and coastal pelagic were derived from Allen and Pondella (2006a,b) and Allen (2006) as well as Eschmeyer et al. (1983) and Miller and Lea (1972). Information on aerial coverage of habitats came from MPLA summaries (ICF Jones & Stokes 2006, 2007; Jones & Stokes 2009a,b; URS 2010a,b; Horizon Water and Environment LLC 2012a,b).

Not all species will precisely fit any one category, and many species and their life stages will certainly overlap in their use of habitats. Many of the species discussed in the following sections have pelagic egg and larval stages that remain in the plankton for varying periods of time. This section pertains to juveniles or adults that have passed through the planktonic larval stage and either settled to the seafloor (soft bottom or hard bottom species) or taken up residence in the water column (coastal pelagic species).

Hard bottom habitats include rocky intertidal and subtidal areas from nearshore to the outer shelf. When possible, fishes are described from within cross-shelf depth zones: intertidal, inner shelf (0 to 30 m), middle shelf (30 to 100 m), and outer shelf (100 to 200 m). These areas are inhabited by rockfishes, sculpins, surfperches, wrasses, seabasses, gunnels, clingfishes, blennies, and others. Kelp forests support an assemblage of fishes with hard bottom affinities. Such assemblages are variably composed of rockfishes, surfperches, greenlings, damselfishes, and wrasses. Kelp forests also attract some pelagic species and support a number of small cryptic fishes (e.g., blennies, clingfishes, pricklebacks, gunnels, kelpfishes).

Soft bottom is bare sedimentary bottom that extends variably from sandy beaches across shelf to the upper continental slope. Fishes associated with soft bottom, also

1 referred to as groundfishes, form multi-species assemblages that on a large spatial  
2 scale are distributed in relation to environmental factors such as water depth,  
3 temperature, and sediment type. Soft bottom is also subdivided into intertidal (surf zone  
4 beaches), inner shelf, middle shelf, and outer shelf. Common species include rays,  
5 demersal sharks, lizardfishes, drums, surfperches, poachers, sculpins, and flatfishes.

6 The distribution of coastal pelagic species depends upon water temperature, salinity,  
7 and other factors that vary spatially and seasonally. Smaller members of this  
8 assemblage such as anchovies, smelts, herrings, and jack mackerel, are planktivorous,  
9 whereas larger members such as mackerels, tunas, jacks, and barracudas tend to be  
10 carnivorous. Salmon are also part of the coastal pelagic assemblage.

11 Species may be listed as threatened or endangered under the Federal Endangered  
12 Species Act (FESA), the California Endangered Species Act (CESA), or both. Federal  
13 listing of fishes is based on naturally occurring runs in particular river systems  
14 designated as Evolutionarily Significant Units (ESUs). Another designation is the distinct  
15 population segment (DPS). As important subsets of a particular species total  
16 geographic range, ESUs and DPSs can be listed as endangered or threatened under  
17 the FESA and CESA.

18 For fishes and invertebrates subject to recreational and commercial harvest, the  
19 Magnuson-Stevens Fishery Conservation and Management Act  
20 (16 U.S.C. § 1801-1882) established regional Fishery Management Councils (FMCs)  
21 and mandated that Fishery Management Plans (FMPs) be developed to responsibly  
22 manage exploited fish and invertebrate species in Federal waters of the U.S. When  
23 Congress re-authorized this Act in 1996 as the Sustainable Fisheries Act, several  
24 reforms and changes were made. One change was to charge the NMFS with  
25 designating and conserving Essential Fish Habitat (EFH) for species managed under  
26 existing FMPs. The most recent re-authorization of the Act was in 2006, which stressed  
27 the need for ecosystem-based management that leads to the formation of EFH closure  
28 areas to further protect habitat from the adverse effects of fishing.

29 EFH is defined as “those waters and substrate necessary to fish for spawning, breeding,  
30 feeding or growth to maturity” (16 U.S.C. § 1801(10)). The final rule summarizing EFH  
31 regulations (50 Code of Federal Regulations [C.F.R.] Part 600) outlines additional  
32 interpretation of the EFH definition. “Waters”, as previously defined, include aquatic  
33 areas and their associated physical, chemical, and biological properties that are used by  
34 fish, and may include aquatic areas historically used by fish. Substrate includes  
35 “sediment, hard bottom, structures underlying the waters, and associated biological  
36 communities.” “Necessary” is defined as “the habitat required to support a sustainable  
37 fishery and the managed species’ contribution to a healthy ecosystem.” Fish include  
38 finfishes, mollusks, crustaceans, and all other forms of marine animal and plant life

1 other than marine mammals and birds, whereas “spawning, breeding, feeding or growth  
2 to maturity” covers the complete life cycle of species of interest.

3 The Pacific Fishery Management Council (PFMC) is the FMC responsible for managing  
4 fisheries and habitat in State waters. PFMC has produced FMPs for groundfish, coastal  
5 pelagic fishes, and salmon that encompass Washington, Oregon, and California. The  
6 groundfish management plan covers 83 species and their life stages (PFMC 2011a).  
7 The managed species include sharks, lingcod (*Ophiodon elongates*), and over  
8 50 rockfish species (*Sebastes* spp.). EFH for the species and their life stages expands  
9 to over 400 EFH descriptions. Collectively, these EFH designations extend from the  
10 mean high water line offshore to the seaward boundary of the Exclusive Economic Zone  
11 (EEZ). Composite EFH definitions include rocky shelf, non-rocky shelf, canyon,  
12 continental slope/basin, neritic zone, and oceanic zone. The coastal pelagic FMP  
13 covers Pacific bonito, Pacific mackerel, northern anchovy, Pacific herring (*Clupea*  
14 *pallasii*), and market squid (PFMC 2011b). The salmon FMP discusses Chinook  
15 (*Oncorhynchus tshawytscha*), coho (*Oncorhynchus kisutch*), and steelhead  
16 (*Oncorhynchus mykiss*) salmon that utilize California coastal and ocean waters (PFMC  
17 2011b).

18 Each of these FMPs describes EFH for each managed species within the region, and  
19 most of the designations are the same for each of the regions discussed in this report.  
20 Within the EFH designated for various species, particular areas termed Habitat Areas of  
21 Particular Concern (HAPC) are also identified. HAPCs either play important roles in the  
22 life history (e.g., spawning areas) of federally managed fish species or are especially  
23 vulnerable to degradation from fishing or other human activities. The relevant HAPCs  
24 for the California regions discussed are rocky, non-rocky, canopy kelp, and rock reef  
25 habitats. An EFH assessment has been provided as **Appendix F**.

26 In addition to the Federal FMPs, California developed a nearshore FMP to manage 19  
27 species: cabezon, California scorpionfish, California sheephead (*Semicossyphus*  
28 *pulcher*), kelp greenling (*Hexagrammos decagrammus*), rock greenling (*Hexagrammos*  
29 *lagocephalus*), monkeyface prickleback (*Cebidichthys violaceus*), black rockfish  
30 (*Sebastes melanops*), black-and-yellow rockfish (*Sebastes chrysomelas*), blue rockfish  
31 (*Sebastes mystinus*), brown rockfish (*Sebastes auriculatus*), calico rockfish (*Sebastes*  
32 *dalli*), China rockfish (*Sebastes nebulosus*), copper rockfish (*Sebastes caurinus*),  
33 gopher rockfish (*Sebastes carnatus*), grass rockfish (*Sebastes rastrelliger*), kelp rockfish  
34 (*Sebastes atrovirens*), olive rockfish (*Sebastes serranoides*), quillback rockfish  
35 (*Sebastes maliger*), and treefish (*Sebastes serriceps*). The species for this FMP were  
36 selected using criteria such as changes in catch levels, special biological  
37 characteristics, and special habitat needs. The State also prepared the white seabass  
38 management plan to help manage fisheries and recovery of depleted white seabass  
39 populations.

The following descriptions of fish assemblages, sensitive species, and EFH (where applicable) are summarized for the North, North Central, Central, and South Coast MPA regions.

#### *North Coast Region*

##### Hard Bottom Fishes

In the North Coast region an estimated 66.5 square miles (mi<sup>2</sup>) (172.4 square kilometers [km<sup>2</sup>]) or about 6 percent of the seafloor in water depths less than 200 m is hard bottom (Horizon Water and Environment LLC 2012a,b). Most of this habitat is divided between two water depth zones: 0 to 30 m (0 to 98.4 feet [ft]) and 30 to 100 m (98.4 to 328.1 ft). In addition, rocky shorelines, equating to rocky intertidal habitat is found along 159.1 linear miles (256.0 km) of coastline. Fishes associated with rocky intertidal habitat include bald sculpin (*Clinocottus recalvus*), rockweed gunnel (*Apodichthys fucorum*), penpoint gunnel (*Apodichthys flavidus*), northern clingfish (*Gobiesox maeandricus*), crevice kelpfish (*Gibbonsia montereyensis*), striped kelpfish (*Gibbonsia metzi*), tidepool snailfish (*Liparis florae*), and grass rockfish. In deeper waters, rocky subtidal habitats support assemblages typified by blue rockfish, gopher rockfish, painted greenling (*Oxylebius pictus*), and wolf eel (*Anarrhichthys ocellatus*). Other species found in this habitat are tubesnout (*Aulorhynchus flavidus*), silver surfperch (*Hyperprosopon ellipticum*), rainbow surfperch (*Hypsurus caryi*), and olive rockfish. The aforementioned species are visually conspicuous and readily observed by divers or cameras when water clarity is adequate. Another component of the assemblage is composed of secretive species that remain hidden during daylight hours. Such cryptic species found in rocky subtidal and reef habitats include coralline sculpin (*Artedius corallinus*), scalyhead sculpin (*Artedius harringtonensis*), sailfin sculpin (*Nautichthys oculofasciatus*), crisscross pricklyback (*Plagiogrammus hopkinsii*), snubnose sculpin (*Orthonopias triacis*), longfin sculpin (*Jordania zonope*), brown Irish lord (*Hemilepidotus spinosus*), and mosshead warbonnet (*Chirolophis nugator*).

The areal extent of kelp beds in the region has ranged from 0.1 to 3.2 mi<sup>2</sup> (0.26 to 8.3 km<sup>2</sup>) in recent decades (Horizon Water and Environment LLC 2012a,b). In northern kelp beds, the most common species are blue rockfish, olive rockfish, black rockfish, kelp rockfish, gopher rockfish, black and yellow rockfish, painted greenling, kelp greenling, and lingcod.

##### Soft Bottom Fishes

Soft bottom habitat in water depths less than 200 m accounts for 821.7 mi<sup>2</sup> (2,128.2 km<sup>2</sup>) or over 80 percent of the seafloor (Horizon Water and Environment LLC 2012a,b). Fish species inhabiting the soft sedimentary habitats form broad recognizable assemblages across the shelf beginning at the sandy surf zone (Allen and Pondella 2006b; Allen 2006). Sandy surf zone species found in this region include pricklybreast

poacher (*Stellerina xyosterna*), calico surfperch (*Amphistichus koelzi*), speckled sanddab (*Citharichthys stigmaeus*), English sole (*Parophrys vetulus*), and sand sole (*Psettichthys melanostictus*). In surf zone areas, drifting accumulations of algae attract cabezon (*Scorpaenichthys marmoratus*), silverspotted sculpin (*Blepsias cirrhosus*), and bay pipefish (*Syngnathus leptorhynchus*). Many of the fishes found in the surf zone are juveniles. In inner shelf waters of the region, fishes commonly associated with soft bottom include big skate (*Raja binoculata*), butter sole (*Isopsetta isolepis*), Pacific tomcod (*Microgadus proximus*), and Pacific staghorn sculpin (*Leptocottus armatus*). Other species occurring in this habitat but are not restricted to the North Coast region are shiner perch (*Cymatogaster aggregata*), white seaperch (*Phanerodon furcatus*), speckled sanddab, and English sole. The middle shelf soft bottom habitats supports assemblages consisting of spiny dogfish (*Squalus acanthias*), big skate, Pacific electric ray (*Torpedo californica*), Pacific tomcod, Pacific hake (*Merluccius productus*), plainfin midshipman (*Porichthys notatus*), stripetail rockfish (*Sebastes saxicola*), lingcod, Pacific sanddab (*Citharichthys sordidus*), Dover sole (*Microstomus pacificus*), rex sole (*Glyptocephalus zachirus*), petrale sole (*Eopsetta jordani*). The outer shelf soft bottom assemblage of the North Coast region includes Pacific tomcod, Pacific hake, sablefish, Pacific electric ray, longnose skate (*Raja rhina*), spotted ratfish (*Hydrolagus colliei*), lingcod, plainfin midshipman, blackbelly eelpout (*Lycodes pacificus*), shortspine thornyhead (*Sebastolobus alascanus*), Dover sole, slender sole (*Lyopsetta exilis*), rex sole, and petrale sole.

## Coastal Pelagic Fishes

Coastal pelagic species in the Northern region are represented by the widespread northern anchovy (*Engraulis mordax*), Pacific sardine (*Sardinops sagax*), and Pacific pompano (*Peprilus simillimus*). Chinook salmon, coho salmon, and Pacific herring inhabit the neritic zone during portions of their life cycles. In addition to these three species the northern region supports smaller species such as topsmelt (*Atherinops affinis*), surf smelt (*Hypomesus pretiosus*), night smelt (*Spirinchus starksi*), spotfin surfperch (*Hyperprosopon anale*), and walleye surfperch (*Hyperprosopon argenteum*).

## Special Status Species

Special status species found in coastal and offshore waters of Northern California are salmon (*Oncorhynchus* spp.), green sturgeon (*Acipenser medirostris*), longfin smelt (*Spirinchus thaleichthys*), and eulachon (*Thaleichthys pacificus*). Salmon species of the region are Chinook, coho, steelhead, and cutthroat trout (*Oncorhynchus clarkii*). For the Chinook salmon, the California coastal ESU consisting of the natural spring and fall runs that occur between Redwood Creek, Humboldt County and the Russian River, Sonoma County is listed as federally threatened. The Southern Oregon and Northern California coastal Chinook salmon ESU (Cape Blanco, Oregon south to Klamath River, California) is not presently listed. Coho salmon are the second most common salmonid in the



1 region, and are listed by the State as threatened from the Oregon border south to Punta  
2 Gorda, and endangered from Punta Gorda south to San Francisco. A Southern Oregon-  
3 Northern California ESU that extends from Cape Blanco, Oregon to Punta Gorda is also  
4 federally listed as threatened. For steelhead, the Northern California ESU is listed as  
5 federally threatened, and includes coastal basins from Redwood Creek, Humboldt  
6 County to the Gualala River, Mendocino County.

7 The green sturgeon is an anadromous species that only spawns in coastal rivers and  
8 spends most of its life in the coastal ocean. Currently, green sturgeon are known to  
9 spawn in the Sacramento, Klamath, and Trinity Rivers. A southern DPS that includes  
10 spawning populations south of the Eel River is listed as federally threatened. A northern  
11 DPS from the Eel River north to the Klamath River is listed as a species of special  
12 concern.

13 Longfin smelt, which is listed by the State as threatened, spawns in freshwater, but  
14 spends most of its life in the coastal ocean. The southern DPS, which extends from  
15 British Columbia to the Mad River, is federally listed as threatened.

#### 16 Essential Fish Habitat

17 Composite EFH definitions that apply to the Northern region groundfish and coastal  
18 pelagic species are rocky shelf, non-rocky shelf, continental slope/basin, and neritic  
19 zone. EFH conservation areas in the Northern region are Blunts Reef, Mendocino  
20 Ridge, Delgada Canyon, and Tolo Bank.

21 Pacific salmon EFH relevant to the Northern region extends from the nearshore low  
22 water line to the full extent of the EEZ. Salmon EFH includes all streams, lakes, ponds,  
23 wetlands, and other currently visible water bodies, as well as most habitat historically  
24 available to salmon. HAPCs for Pacific salmon are estuaries, canopy kelp, and rocky  
25 reef habitats. HAPCs either play important roles in the life history (e.g., spawning areas)  
26 of federally managed fish species or are especially vulnerable to degradation from  
27 fishing or other human activities. For the Northern California region, the relevant HAPCs  
28 are canopy kelp and rock reef habitats.

#### 29 *North Central Coast Region*

#### 30 Hard Bottom Fishes

31 The shelf in the North Central Coast region is relatively broad within the 0 to 30 m and  
32 30 to 100 m depth zones, and is comprised primarily of soft bottom. Hard bottom  
33 represents a small portion of this area, with exception of the Farallon Islands. Kelp  
34 forest cover ranges from less than 1 to 34 mi<sup>2</sup>.

1 The composition of the hard bottom fish assemblage in North Central Coast region  
2 varies across the shelf with water depth (ICF Jones & Stokes 2009a,b). The most  
3 common species in rocky intertidal assemblages are monkeyface prickleback, rock  
4 prickleback (*Xiphister mucosus*), black prickleback (*Xiphister atropurpureus*), high  
5 cockscomb (*Anoplarchus purpureus*), saddleback sculpin (*Oligocottus rimensis*),  
6 fluffy sculpin (*Oligocottus snyderi*), smoothhead sculpin (*Radulinus vinculus*), northern  
7 clingfish, crevice kelpfish, tidepool snailfish, grass rockfish, reef perch (*Micrometrus*  
8 *aurora*), rockweed gunnel, and penpoint gunnel (Allen and Pondella 2006a). Rocky  
9 subtidal assemblages support many of the same species found in the North Coast  
10 region: black rockfish gopher rockfish, black and yellow rockfish, kelp greenling, painted  
11 greenling, cabezon, and tidepool sculpin (*Oligocottus maculosus*).

12 Fishes associated with kelp forests in the region are similar to those listed for rocky  
13 subtidal habitats: blue rockfish, kelp rockfish, olive rockfish, black rockfish, gopher  
14 rockfish, black and yellow rockfish, striped sea perch, painted greenling, and kelp  
15 greenling. Cryptic species found in North Central Coast region kelp forests include  
16 coralline sculpin, scalyhead sculpin, kelp clingfish (*Rimicola muscarum*), bluebanded  
17 ronquil (*Rathbunella hypoplecta*), blackeye goby (*Rhinogobiops nicholsii*), and  
18 mosshead warbonnet.

#### 19 Soft Bottom Fishes

20 Demersal soft bottom species composition changes from nearshore (surf zone) to the  
21 outer shelf. Several species are distributed widely and overlap depth zones, whereas  
22 others are most common within inner, middle, or outer shelf strata. In the North Central  
23 Coast region, widespread species were represented by white croaker (*Genyonemus*  
24 *lineatus*), plainfin midshipman, and lingcod. Species generally restricted to the inner  
25 shelf include shiner perch, white seaperch, staghorn sculpin, curlfin sole, speckled  
26 sanddab, and sand sole. The only species overlapping between inner and middle shelf  
27 groups was the English sole. The middle shelf assemblage is distinguished by spiny  
28 dogfish, big skate, longspine combfish (*Zaniolepis latipinnis*), and copper rockfish.  
29 Species such as Pacific argentine (*Argentina sialis*), shortbelly rockfish (*Sebastes*  
30 *jordanii*), pink seaperch (*Zalemibus rosaceus*), Pacific hake, lingcod, spotted cusk eel,  
31 threadfin sculpin (*Icelinus filamentosus*), petrale sole, Pacific electric ray, Dover sole,  
32 and rex sole occur over middle and outer shelf strata. Common species inhabiting the  
33 outer shelf soft bottom include spotted ratfish, greenspotted rockfish (*Sebastes*  
34 *chlorostictus*), longnose skate, blackbelly eelpout, and slender sole.

#### 35 Coastal Pelagic Fishes

36 Coastal pelagic species common to the North Central Coast region are northern  
37 anchovy, Pacific sardine, Pacific herring, jack mackerel, and Pacific pompano. Chinook  
38 salmon, coho salmon, and Pacific herring are part of the coastal pelagic assemblage.

Special Status Species

Two Chinook salmon ESUs have been identified as threatened for the North Central Coast region: the California Coastal ESU which includes the Russian River and the Central Valley Spring Run ESU. The Sacramento River Winter Run is listed federally as endangered (2009). For Coho salmon, the Central California ESU from Punta Gorda to the San Lorenzo River is listed as endangered. The California Central Valley steelhead trout DPS is listed as threatened.

White sharks (*Carcharodon carcharias*) occur in the region and feed around the Farallon Islands and off the Marin Headlands. White sharks are circumglobally distributed apex predators with at least three genetically distinct populations (Chapple et al. 2011). In the northeastern Pacific Ocean, white sharks display philopatric behaviors that result in a genetically discernible, separate population. These sharks migrate seasonally between discrete coastal areas in North American shelf waters, primarily involving sites off central California (i.e., Farallon Islands, Marin Headlands) and Guadalupe Island, Mexico, and locations in the central Pacific (off Hawaii and eastern Pacific offshore waters). Tagging data have shown that white sharks are present off central California from August to January and that the central California and Guadalupe groups primarily remain separate (Chapple et al. 2011). While there is recognized congregation areas off California (in the North Central California MLPA region), this species may occur anywhere along the California coast, albeit in smaller numbers than is noted for congregation areas.

The Northeastern Pacific Ocean population of white shark was designated as a candidate species under CESA effective March 1, 2013, after the California Fish and Game Commission (CFGF) determined that listing the white shark as threatened or endangered may be warranted. After a 12-month review process, the CFGF will make a decision on whether to list the white shark as threatened or endangered. Additionally, the State of California has an existing prohibition on the take of white sharks in State waters, and on the attraction of white sharks in the Gulf of the Farallones National Marine Sanctuary. NMFS also determined in September 2012 that the Northeastern Pacific Ocean population of white shark warranted listing under FESA, and is expected to make a final listing decision in 2013.

*Central Coast Region*

Hard Bottom Fishes

Rocky intertidal shoreline extends for 209.2 linear miles (336.7 km) along the Central California shoreline. Rocky subtidal hard bottom in less than 200 m from the Central Coast region covers about 128 mi<sup>2</sup>. Over half of this (73.6 mi<sup>2</sup>) is in the 0 to 30 m depth zone and over 40 mi<sup>2</sup> is in the 30 to 100 m depth zone (Jones & Stokes 2006, 2007). Fishes associated with rocky intertidal and rocky subtidal hard bottom in the Central

Coast region are similar to those reported in the North Central Coast region. Rocky intertidal assemblages include widespread rockweed gunnel, high cockscomb, monkeyface prickleback, black prickleback, rock prickleback, penpoint gunnel, striped kelpfish, and black and yellow rockfish. Species such as tubesnout, silver surfperch, olive rockfish, rainbow surfperch, black rockfish, kelp greenling, black and yellow rockfish, and rosytip sculpin (*Ascelichthys rhodorus*) associate with rocky subtidal areas. Kelp forests are inhabited by striped seaperch (*Embiotoca lateralis*), brown rockfish (*Sebastes auriculatus*), kelp perch (*Brachyistius frenatus*), señorita (*Oxyjulis californicus*), kelp rockfish (*Sebastes atrovirens*), copper rockfish (*Sebastes caurinus*), and lavender sculpin (*Leiocottus hirundo*).

#### Soft Bottom Fishes

The extent of soft bottom habitat in the Central Coast region, in less than 200 m water depths, has been estimated at 832.7 mi<sup>2</sup>; more than half of this total (562.4 mi<sup>2</sup>) occurs in the 30 to 100 m depth zone. Surf zone fishes overlap several of the species described for the North Coast area. The Central Coast region fishes overlap somewhat with species present in the adjacent North Central Coast region. Common soft bottom species found across all depth zones are white croaker, lingcod, and plainfin midshipman. Species common on the inner shelf of the region are shiner perch, white seaperch, white croaker, staghorn sculpin, curlfin sole, speckled sanddab, and sand sole. The middle shelf assemblage of the Central Coast region is characterized by widespread species such as Pacific argentine, Pacific hake, plainfin midshipman, stripetail rockfish, shortbelly rockfish, and spotted cusk eel. Species restricted to the Central Coast region are spiny dogfish, big skate, longspine combfish, Pacific sand dab, and Dover sole.

#### Coastal Pelagic Fishes

Coastal pelagic fishes found in the Central Coast region include northern anchovy, Pacific herring, Pacific bonito, Pacific barracuda, and jack mackerel.

#### Special Status Species

In the Central Coast region, the Central California coho salmon (*Oncorhynchus kisutch*) DPS is federally threatened. This DPS encompasses Gazos Creek, Waddell Creek, San Vicente Creek, San Lorenzo River, and Scott Creek. Three steelhead (*O. mykiss*) DPS occur in the Central Coast region: the Central California coast steelhead DPS from the Russian River to Santa Cruz is federally listed as threatened; the South-Central California coast DPS from Pajaro River Basin to the Santa Maria River is threatened; and the Southern California coast steelhead DPS ranges from Santa Maria into the Southern California region is endangered.

## Essential Fish Habitat

Composite EFH definitions applicable to the Central Coast region include rocky shelf, non-rocky shelf, canyon, continental slope/basin, neritic zone, and oceanic zone. The coastal pelagic EFH extends from the shoreline to the limit of the EEZ. Pacific salmon EFH for Chinook and coho salmon include estuaries, canopy kelp, and rocky reef areas, as well as all streams, lakes, ponds, wetlands, and other currently viable water bodies and most habitats historically accessible to salmon.

## South Coast Region

### Hard Bottom Fishes

Rocky intertidal shores contributed over 33.4 percent of the linear shoreline and subtidal hard bottom encompasses 10.5 percent of the seafloor in water depths less than 200 m in the Southern California area (URS 2010a,b). Fishes associated with rocky intertidal habitats in Southern California are typified by woolly sculpin (*Clinocottus analis*), rosy sculpin (*Oligocottus rubellio*), rockpool blenny (*Hypsoblennius gilberti*), and California clingfish (*Gobiesox rhessodon*). Other species such as bald sculpin and striped kelpfish occur along the entire coast in rocky intertidal habitats.

Fishes inhabiting rocky subtidal habitats include black rockfish, kelp greenling, black and yellow rockfish, cabezon, tidepool sculpin, and rosy lip sculpin. Cryptic reef species from Southern California were spotted kelpfish (*Gibbonsia elegans*), mussel blenny (*Hypsoblennius jenkinsi*), island kelpfish (*Alloclinus holderi*), snubnose pipefish (*Cosmocampus arctus*), bluebanded goby (*Lythrypnus dalli*), zebra goby (*Lythrypnus zebra*), slender clingfish (*Rimicola eigenmanni*), roughcheek sculpin (*Ruscarius creaseri*), and reef twin spot (URS 2010a,b). Other species such as kelp bass (*Paralabrax clathratus*), rubberlip seaperch (*Rhacochilus toxotes*), pile perch (*Rhacochilus vacca*), black perch (*Embiotoca jacksoni*), white seaperch, and barred sand bass (*Paralabrax nebulifer*) associate with the sand-rock ecotone.

In Southern California, kelp forest coverage averaged 0.6 percent of the area, and kelp-reef fish assemblages typically include blacksmith (*Chromis punctipinnis*), garibaldi (*Hypsypops rubicundus*), California sheephead, giant seabass (*Stereolepis gigas*), halfmoon (*Medialuna californiensis*), opaleye (*Girella nigricans*), and treefish. Also present are kelp perch, señorita, kelp rockfish, copper rockfish, and lavender sculpin.

### Soft Bottom Fishes

Soft bottom from the shoreline to 200-m water depths accounts for 78.3 percent of the shelf area in the Southern California area. As with the other regions, soft bottom fishes are distributed across the shelf in species-specific fashion forming recognizable assemblages in broad zones such as surf zone, inner shelf, middle shelf, and outer

shelf. The surf zone assemblage is numerically dominated by jacksmelt, topsmelt, queenfish (juveniles), and walleye surfperch. Other species include California grunion (*Leuresthes tenuis*), spotfin croaker (*Roncador stearnsii*), dwarf perch (*Micrometrus minimus*), yellowfin croaker (*Umbrina roncadore*), round stingray (*Urobatis halleri*), leopard shark (*Triakis semifasciata*), gray smoothhound (*Mustelus californicus*), and California corbina (*Menticirrhus undulatus*). Inner shelf fish assemblages in the South Coast region are composed of queenfish, white croaker, shiner perch, white seaperch, California lizard fish (*Synodus luciocephalus*), specklefin midshipman (*Porichthys myriaster*), basketweave cusk-eel (*Ophidion scrippsae*), California tonguefish (*Symphurus atricaudus*), diamond turbot (*Pleuronichthys guttulatus*), fantail sole (*Xystreureys liolepis*), and California halibut (*Paralichthys californicus*). In the middle shelf zone, common species are California lizardfish, shiner surfperch, Pacific argentine, pygmy poacher (*Odontopyxis trispinosa*), California tonguefish, yellowchin sculpin (*Icelinus quadriseriatus*), roughback sculpin (*Chitonotus pugetensis*), spotted scorpionfish, longfin sanddab (*Citharichthys xanthostigma*), hornyhead turbot (*Pleuronichthys verticalis*), and bigmouth sole (*Hippoglossina stomata*). The outer shelf off southern California is represented by white croaker, shortbelly rockfish, spotted ratfish, sablefish (*Anoplopoma fimbria*), blacktip poacher (*Xeneretmus latifrons*), hundred-fathom codling (*Physiculus rastrelliger*), smooth stargazer (*Kathetostoma avarruncus*), blackbelly eelpout, rex sole, slender sole, Dover sole, and bigmouth sole.

#### Coastal Pelagic Fishes

Coastal pelagic species found in the South Coast region are northern anchovy, Pacific pompano, Pacific mackerel, Pacific bonito, deepbody anchovy (*Anchoa compressa*), yellowtail (*Seriola lalandi*), Pacific barracuda (*Sphyræna argentea*), jack mackerel, walleye surf perch, white croaker, and queenfish.

#### Special Status Species

As described above, the white shark is listed as a candidate species under CESA and as a species whose listing may be warranted under FESA.

Southern steelhead ESU is listed federally as endangered and as a SSC by the State of California. Steelhead occur in pelagic waters of coastal California although some individuals never leave freshwater rivers or estuaries. The ESU for southern California includes San Mateo Creek, Malibu River, and Ventura Creek.

The giant sea bass associates with rocky subtidal reefs in water depths generally less than 30 m. This species has been protected in California waters since 1981. Current regulations (Cal. Code Regs., tit. 14, § 28.10, subd. (a)), prohibit take of giant sea bass in State waters.

## 1 Essential Fish Habitat

2 Composite EFH definitions applicable to the Southern California region include rocky  
3 shelf, non-rocky shelf, canyon, continental slope/basin, neritic zone, and oceanic zone.  
4 The coastal pelagic EFH extends from the shoreline to the limit of the EEZ. Pacific  
5 salmon EFH for Chinook and coho salmon include estuaries, canopy kelp, and rocky  
6 reef areas as well as all streams, lakes, ponds, wetlands, and other currently viable  
7 water bodies and most habitats historically accessible to salmon.

## 8 *Fish Harvested Commercially*

9 Details regarding commercially harvested species, including finfish and invertebrates,  
10 are provided in **Section 3.3.15, Commercial and Recreational Fisheries**. Major  
11 commercial fisheries targeting finfish include:

- 12 • Region I – coastal pelagic finfish and California halibut;
- 13 • Region II – king salmon, Pacific sardine, sablefish, albacore and other tuna,  
14 thornyheads, northern anchovy, Dover sole, California halibut, rockfishes (from  
15 nearshore, shelf, and slope depths), sanddabs and other flatfish, cabezon,  
16 grenadier, lingcod, sharks, white seabass, mackerel, butterfish, kelp greenling,  
17 jacksmelt, and surfperches;
- 18 • Region III – nearshore finfish, lingcod, tuna, slope rockfish/grenadier, shelf  
19 rockfish, California halibut, thornyheads (non-trawl), sablefish (non-trawl, line and  
20 trap), skates/rays/sharks and other flatfish; and
- 21 • Region IV – include salmon, smelt, deeper nearshore finfish, hagfish, shallow  
22 nearshore finfish, lingcod, herring, skates, rays, sharks, surfperch, and California  
23 halibut.

## 24 **Seabirds**

25 Seabirds found in California's coastal/nearshore and offshore waters include, but are  
26 not limited to, loons, grebes, albatrosses, shearwaters, petrels, storm-petrels, pelicans,  
27 cormorants, phalaropes, gulls, terns, auks, and puffins. Thirty-eight species of seabirds  
28 are regular breeders on the islands, islets, rocky shores, beaches, and old-growth  
29 forests of California. Nearly 150 species of breeding and migrating seabirds utilize the  
30 California Current System. Several of the key avifaunal species which frequent  
31 nearshore coastal waters of California, as identified by Audubon (2013) in their efforts to  
32 characterize and protect California's seabird species and identify important bird areas,  
33 include the following.

1    *Key Seabird Species*

2    Sooty Shearwater

3    Every spring and summer, millions of Sooty shearwaters (*Puffinus griseus*) visit the  
4    coast of California from breeding grounds in New Zealand and Chile. Recent satellite  
5    tracking studies of individual birds have recorded seasonal migrations of 39,000 miles.  
6    Satellite tracks show the birds can move in an extensive figure eight pattern across the  
7    Pacific Ocean basin. This species is the most abundant bird in California, and can be  
8    seen close to shore in certain places (e.g., Monterey Bay). Sooty shearwaters number  
9    about 20 million birds, with a population trend that is increasing. This species is not  
10   currently listed by the State of California. However, the species is now listed by  
11   the International Union for Conservation of Nature as “near threatened” because there  
12   are persistent signs of a decline due to some combination of fisheries by-catch, climate  
13   change, and direct harvesting.

14   Albatross

15   Most of the world’s albatross species are threatened with extinction due to fisheries  
16   interactions, invasive species on breeding islands, lead poisoning, and possibly plastic  
17   pollution. Three species of albatross occur regularly in the California Current: Laysan  
18   (*Phoebastria immutabilis*) and black-footed albatrosses (*Phoebastria nigripes*), which  
19   breed in Hawaii and Mexico, and short-tailed albatross (*Phoebastria albatrus*), which  
20   breeds in Japan. None of the albatross species present in California are listed by the  
21   State.

22   Ashy Storm-Petrel

23   The vast majority of ashy storm-petrels (*Oceanodroma homochroa*) breed in crevices  
24   on California’s Farallon and Channel Islands, feeding on small fish, krill, and squid at  
25   the ocean surface. There are less than 9,000 individuals in the world, with the  
26   population likely declining overall. This species is listed as a SSC by the State of  
27   California.

28   Common Murre

29   This circumpolar species has an estimated global population of 4.3 million individuals.  
30   Common murres (*Uria aalge*) dive up to 600 ft in pursuit of schools of small fish. Murres  
31   in the northeast Pacific have recovered from population declines associated with  
32   eggging, oil spills, and gillnet fishing. Murres can be viewed foraging in nearshore areas.  
33   This population is currently increasing. This species is not currently listed by the State of  
34   California.



1 California Brown Pelican

2 The California brown pelican (*Pelecanus occidentalis californicus*) nests on oceanic  
3 islands and roosts on islands and along the mainland, with a common presence over  
4 coastal waters. This species prefers nearshore areas where it plunge dives for fish. This  
5 subspecies suffered serious declines in the 20th century due to chemical contamination.  
6 In 1970, it was listed as federally endangered, when the global population was as low  
7 as 10,000 individuals. Following listing, conservation measures were implemented and  
8 the global population climbed to over 650,000 individuals, prompting the removal of this  
9 California subspecies from the endangered species list in 2009; however, they are still a  
10 fully protected species in California pursuant to Fish and Game Code section 3511. The  
11 California population is currently increasing.

12 Marbled Murrelet

13 The marbled murrelet (*Brachyramphus marmoratus*) is the only seabird known to nest in  
14 trees. Its population center lies in southeast Alaska, with about 700,000 individuals. A  
15 tiny, yet genetically distinct, population persists in Central California, centered in the  
16 Santa Cruz Mountains. While the Alaskan populations are stable, those found in  
17 Canada, Washington, Oregon, and California are declining. Marbled murrelets are listed  
18 as endangered under CESA and threatened under FESA.

19 Xantus's Murrelet

20 The Xantus's murrelet (*Synthliboramphus hypoleucus*) is a Federal candidate for listing  
21 and a State threatened species. Over 30 percent of the world population of this species  
22 occurs in the Channel Islands west of the Santa Barbara Channel, and the world's  
23 largest colony of the northern subspecies is on Santa Barbara Island (Karnovsky et al.  
24 2005; B. Keitt and D. Whitworth in litt. 2003). Nesting takes place from February to  
25 mid-June, during which murrelets forage around the islands (Jones et al. 2005). A small  
26 Channel Islands National Marine Sanctuary (CINMS)-established exclusion zone was  
27 created to protect Xantus's murrelets in 2003.

28 California Least Tern

29 The California least tern (*Sterna antillarum browni*) is a federally endangered  
30 subspecies of least tern that was rescued from near-extinction by regulators and  
31 volunteers working to restore its beach-nesting habitat centered in Southern California.  
32 Least terns feed on small fish and crustaceans in lagoons and estuaries and are highly  
33 vulnerable to predation by native and introduced predators, as well as human  
34 disturbance. There are about 7,500 California least terns, and the population is currently  
35 considered to be stable, but faces chronic threats associated with heavy human use of  
36 beaches where the species nests.

1 *California Important Bird Areas*

2 The American Bird Conservatory and the National Audubon Society joined in the  
3 development of an Important Bird Area (IBA) program in the U.S. From 1995 to 1998,  
4 the California IBA program designated 50 sites. Since 2000, Audubon California has  
5 administered the statewide IBA program through designation, mapping, and  
6 conservation. In 2004, Audubon California published Important Bird Areas of California  
7 (Cooper 2004), describing 148 IBAs located within State boundaries. California IBAs are  
8 defined as biogeographically distinct subregions that meet at least one of the following  
9 criteria:

- 10 • Support over one percent of the global population, or 10 percent of the California  
11 population, of one or more sensitive species (breeding or wintering);
- 12 • Support at least 10 sensitive species (federally or State-listed threatened or  
13 endangered species, as well as California SSC);
- 14 • Support 10,000 or more shorebirds that can be observed in one day; or
- 15 • Support 5,000 or more waterfowl that can be observed in one day.

16 Some IBAs, such as the Channel Islands or the Sierra Meadows, are a complex of  
17 separate sites. Sites were grouped if they shared a geographic area, similar  
18 management regime, or similar avifauna (Audubon California 2008). In May 2006, the  
19 mapping of IBA boundaries was identified as a critical step towards promoting  
20 conservation. An interactive mapping of California's IBAs, including those located along  
21 the coast, is available through the national Audubon website  
22 ([www.mapsportal.org/audubon\\_national\\_iba/](http://www.mapsportal.org/audubon_national_iba/)). Mapping results have also been  
23 published in several reports (e.g., Yun et al. 2008, Jones et al. 2008).

24 While the majority of the IBAs are located onshore and inland, there are several key  
25 IBAs located along the California coast. These coastal IBAs may be comprised  
26 predominantly of onshore or upland biomes but contain varying percentages of offshore  
27 (i.e., nearshore or coastal) waters. IBAs within California that contain a marine  
28 component include the following, by region:

- 29 • South Coast: Goleta Coast, Channel Islands–Northern, Point Mugu, Orange  
30 Coast Wetlands, North San Diego Lagoons, San Diego Bay–South, Tijuana River  
31 Reserve, San Clemente Island;
- 32 • Central Coast: Farallon Islands, Ano Nuevo Area, Elkhorn Slough, Salinas River–  
33 Lower, Big Sur Coast, Morro Bay, Santa Maria River Valley, Vandenberg Air  
34 Force Base and Santa Ynez Estuary;
- 35 • North Central Coast: Mendocino Coast, Bodega Harbor, Tomales Bay, Point  
36 Reyes–Outer, Bolinas Lagoon–Outer; and

- North Coast: Del Norte Coast, Humboldt Lagoons, Humboldt Bay.

More general seabird habitat and species occurrences for the four MPA regions are described below. Tabular summary data on seabird presence and population trends are provided, as available, based on recent syntheses.

### *South Coast Region*

Baird (1983) identified 195 marine and coastal birds species present in the SCB. Of the seabirds, the shearwaters, storm-petrels, phalaropes, gulls, terns, and auklets are the most abundant. A total of 43 seabird species utilize the SCB, with 20 species numerically dominant. A total of 17 species breed in the SCB, with 10 species overwintering in the region, and remaining species migrating through the SCB. In the spring, visitors are primarily austral breeders, while in the fall and winter they are subtropical breeders and Alaskan breeders, respectively.

Habitats of concern include all wetlands and adjacent lands and the Channel Islands, the latter of which are considered especially important due to the oceanic influence. Shallow waters of the insular shelf around the Channel Islands mimic the nearshore environment of the mainland, absent the influences of human development. Important roosting sites in Southern California include Anacapa Island, Sandpiper Pier, Santa Barbara Harbor, Ventura Harbor breakwater, Rincon island, Channel Islands Harbor, Mugu Lagoon, Marina del Rey, Kings Harbor, Long Beach breakwater, Dana Point jetty, Oceanside jetty, Agua Hedionda, and Zuniga Point (Robinette and Chivers 2008).

The Channel Islands are home to more than a dozen species of seabirds including a significant portion of the global population of ash storm-petrels and western gulls (*Larus occidentalis*), and 80 percent of the U.S. breeding population of Scripps's murrelets (*Synthliboramphus scripps*). The Channel Islands provide essential nesting and feeding grounds for 99 percent of seabirds in Southern California. In addition, the Islands are home to the only major breeding population of California brown pelicans in the western U.S. The Channel Islands also support the largest colonies in Southern California of Cassin's auklet (*Ptychoramphus aleuticus*), western gulls, Scripps's murrelets, rhinoceros auklets (*Cerorhinca monocerata*), tufted puffins (*Fratercula cirrhata*), ash storm-petrels, double-crested cormorants (*Phalacrocorax auritus*), pigeon guillemots (*Cepphus Columba*), and black storm-petrels (*Oceanodroma melania*).

### *North Central and Central Coast Regions*

In general, the marine birds off North/Central California are dominated in number and biomass by seasonally resident, non-breeding species, such as sooty shearwater, pink-footed shearwater (*Puffinus creatopus*), northern fulmar (*Fulmaris glacialis*), and black-legged kittiwake (*Rissa tridactyla*) (**Table 3-11**). The richness of the food web is the primary factor that attracts these species to the region.

1 **Table 3-11. Status, Abundance, and Temporal Occurrence Information for Select Seabird Species Present Within**  
2 **the North/Central California Coastal and Offshore Region (Adapted from: NCCOS 2007)**

Common Name	Scientific Name	Status and Abundance			Temporal Occurrence		
		Status	Estimated Abundance Trend	Estimated Relative Abundance at Sea	General Occurrence	Primary Months of Presence	Breeding Months
<b>Loons/Grebes</b>							
Pacific loon	<i>Gavia pacifica</i>	-	Unknown	Common	Seasonal	Mar-Apr, Aug-Sep	-
Common loon	<i>Gavia immer</i>	-	Unknown	Uncommon	Seasonal	Nov-Apr	-
Western & Clark's grebes	<i>Aechmophorus occidentalis</i> , <i>A. clarksii</i>	-	Unknown	Abundant	Year-round	Nov-Sept	-
<b>Sea Ducks (Scoters)</b>							
Surf scoter	<i>Melanitta perspicillata</i>	-	Stable	Abundant	Seasonal	Nov-Apr	-
<b>Albatrosses/Petrels</b>							
Black-footed albatross	<i>Phoebastria nigripes</i>	-	Stable	Common	Year-round	Mar-Aug	-
Laysan's albatross	<i>Phoebastria immutabilis</i>	-	Unknown	Rare	Seasonal	Nov-Mar	-
Northern fulmar	<i>Fulmarus glacialis</i>	-	Increasing	Common	Seasonal	Nov-Mar	-
Sooty shearwater	<i>Puffinus griseus</i>	-	Increasing	Very abundant	Seasonal	Apr-Nov	-
Pink-footed shearwater	<i>Puffinus creatopus</i>	-	Stable?	Common	Seasonal	Apr-Nov	-
Buller's shearwater	<i>Puffinus bulleri</i>	-	Unknown	Common	Seasonal	Aug-Nov	-
Black-vented shearwater	<i>Puffinus opisthomelas</i>	-	Stable?	Uncommon	Seasonal	Aug-Nov	-
Fork-tailed storm-petrel	<i>Oceanodroma furcata</i>	SSC	Decreasing?	Uncommon	Seasonal	Nov-Mar	-
Leach's storm-petrel	<i>Oceanodroma leucorhoa</i>		Decreasing	Common	Seasonal	Sept	Apr-Sept
Ashy storm-petrel	<i>Oceanodroma homochroa</i>	SSC	Decreasing	Uncommon	Year-round	All	Apr-Dec
Black storm-petrel	<i>Oceanodroma melania</i>	SSC	Unknown	Uncommon	Seasonal	Apr-Oct	-
<b>Pelican/Cormorants</b>							
California brown pelican	<i>Pelecanus occidentalis californicus</i>	FP	Increasing	Common	Year-round	Jun-Nov	-
Pelagic cormorant	<i>Phalacrocorax pelagicus</i>	-	Decreasing?	Uncommon	Year-round	All	Apr-Sept
Brandt's cormorant	<i>Phalacrocorax penicillatus</i>	-	Increasing	Abundant	Year-round	All	Apr-Aug
Double-crested cormorant	<i>Phalacrocorax auritus</i>	-	Increasing	Common	Year-round	Mar-Sept	Mar-Sep
<b>Phalaropes</b>							
Red phalarope	<i>Phalaropus fulicaria</i>	-	Stable?	Common	Seasonal	Apr-May, July-Aug	-
Red-necked phalarope	<i>Phalaropus lobatus</i>	-	Stable?	Common	Seasonal	Mar-Aug	-
<b>Gulls/Terns</b>							
Western gull	<i>Larus occidentalis</i>	-	Decreasing	Abundant	Year-round	All	Apr-Aug
California gull	<i>Larus californicus</i>	-	Increasing	Abundant	Year-round	Nov-Mar	Apr-Aug

Common Name	Scientific Name	Status and Abundance			Temporal Occurrence		
		Status	Estimated Abundance Trend	Estimated Relative Abundance at Sea	General Occurrence	Primary Months of Presence	Breeding Months
Glaucous-winged gull	<i>Larus glaucescens</i>	-	Stable	Uncommon	Seasonal	Nov-Mar	-
Heermann's gull	<i>Larus heermanni</i>	-	Stable?	Common	Year-round	Jul-Nov	-
Sabine's gull	<i>Xerna sabini</i>	-	Stable	Common	Seasonal	Mar-Sep	-
Black-legged kittiwake	<i>Rissa tridactyla</i>	-	Increasing?	Common	Seasonal	Nov-Mar	-
Caspian tern	<i>Sterna caspia</i>	-	Stable	Uncommon	Seasonal	Mar-Nov	Apr-Aug
Elegant tern	<i>Sterna elegans</i>	-	Stable	Uncommon	Seasonal	Jul-Nov	-
Arctic tern	<i>Sterna paradisaea</i>	-	Stable?	Common	Seasonal	Mar-Apr, Aug-Sept	-
<b>Alcids</b>							
Common murre	<i>Uria aalge</i>	-	Increasing	Very abundant	Year-round	All	Apr-Aug
Pigeon guillemot	<i>Cephus columba</i>	-	Stable	Uncommon	Seasonal	Mar-Aug	Mar-Aug
Cassin's auklet	<i>Ptychoramphus aleuticus</i>	SSC	Decreasing?	Abundant	Year-round	All	Mar-Jul
Rhinoceros auklet	<i>Cerorhinca monocerata</i>	-	Stable	Common	Year-round	Nov-Aug	Apr-Aug
Tufted puffin	<i>Fratercula cirrhata</i>	SSC	Decreasing	Uncommon	Seasonal	Mar-Sep	Apr-Aug
Marbled murrelet	<i>Brachyramphus marmoratus</i>	FT, SE	Decreasing?	Uncommon	Year-round	All	Apr-Aug
Xantus's murrelet	<i>Synthliboramphus hypoleucus</i>	FC, ST	Unknown	Rare	Seasonal	May-Oct	-
Craveri's murrelet	<i>Synthliboramphus craveri</i>	-	Unknown	Rare	Seasonal	Aug-Oct	-

Acronyms and Abbreviations: FE = federally endangered; FT = federally threatened; FC = Federal candidate; SE = State endangered; ST = State threatened; SSC = California Species of Special Concern; FP = State fully protected; ? = indicates that the abundance trend is estimated.

Notes: Information on California Species of Special Concern (SSC) derived from Shuford and Gardali (2006), updated via CDFG (2011) and CDFW (2013). Relative abundance estimates at sea were based on the number of individuals tallied in the CDAS at-sea survey data (1990-2001) and expert opinion. The categories from the CDAS data set are defined as follows: Rare – up to 100 birds; Uncommon – up to 1,000; Common – up to 10,000; Abundant – up to 100,000; and Very Abundant – up to 1,000,000. Entries with question marks are best estimates from David Ainley or Gerry McChesney (USFWS). Timing information is mostly from Cogswell (1977) and Ainley and Boekelheide (1990). Information on Caspian tern breeding time was from Joelle Buffa, USFWS (pers. comm.). Estimates on population status based on analysis of the CDAS shipboard data sets from 1985-2001, and for birds that breed in the study area, a review of available colony data. Months of presence and breeding in the study area are approximations, as timing is strongly influenced by the interannual variability of environmental conditions in the study area. Information on population status and temporal occurrence refers only to birds and their activities in the study area; other threatened or endangered marine-related birds that occur in the study area but are not included in this table include: short-tailed albatross (FE), western snowy plover (FT, SSC), and California least tern (FE, SE). Time period reflects when species breeds in or adjacent to study area (i.e., along the North/Central California coast).

1 Recent analyses (e.g., NCCOS 2007) have assessed avifaunal population changes  
2 offshore the Central California coast in response to changes in ocean temperatures  
3 which have occurred since 2000, accompanied by declines in zooplankton volumes and  
4 corresponding changes in fish fauna (e.g., increases in sardine abundance; decreases  
5 in anchovy, herring, and demersal fishes). Observations include major declines in key  
6 cool water species, including sooty shearwaters, common murre, and Cassin's auklets.  
7 In contrast, several warm water species have appeared in small numbers during recent  
8 years, some only for brief periods, and other species (e.g., Hawaiian Petrel (*Pterodroma*  
9 *sandwichensis*), Black Skimmer (*Rynchops niger*) have shown signs of staying (Ainley  
10 and Divoky 2001).

11 Physical and biological characteristics of the California coastal environment (e.g., water  
12 temperature, winds, upwelling, fronts, food availability) are highly variable and  
13 frequently operate at different spatial and temporal scales. Seasonal, interannual, and  
14 decadal variation of the regional biogeography of marine birds is influenced by changes  
15 in marine climate driven by the California Current System, local upwelling centers, and  
16 global climate. Biogeographic patterns of marine birds are not static and exhibit  
17 dramatic spatial and temporal variation, both in species composition and species  
18 abundance. Such variability makes it difficult to characterize the distribution and  
19 abundance of marine avian species in the region. While many of the species identified  
20 in **Table 3-11** prefer offshore waters (e.g., within the California Current), several species  
21 are more cosmopolitan in their distribution and may be found in nearshore, coastal  
22 waters. Proximity of the California Current to shore along portions of the Northern and  
23 Central California coastline also indicates that these species may occur in close  
24 proximity to State waters.

25 The Farallon Islands National Wildlife Refuge hosts 12 species including a significant  
26 portion of the global population of the rare ash storm-petrel. It is estimated that  
27 300,000 birds representing a dozen species nest on the islands, making this the largest  
28 seabird breeding colony in the continental U.S., and home to 30 percent of California's  
29 breeding seabirds.

30 A comprehensive characterization and assessment of biological resources was  
31 compiled for the Monterey Bay National Marine Sanctuary (MBNMS) (National Oceanic  
32 and Atmospheric Administration [NOAA], National Marine Sanctuaries Program 2008).  
33 The waters of the MBNMS are heavily used by seabirds and shorebirds. Ninety-four  
34 seabird species are known to occur regularly within and in the vicinity of the sanctuary;  
35 among these, about 30 are dominant. In addition, approximately 90 tidal and wetland  
36 species occur on the shores, marshes, and estuaries bordering on the sanctuary, about  
37 30 of which are dominant. Species composition overlaps little between the  
38 tidal/wetlands and ocean habitats, except for some species of grebes, loons, and ducks  
39 (MBNMS 2013).

Water depth and distance to the shelf-break front are the most critical factors determining habitat use by seabirds. Within Monterey Bay, very deep water lies within a few kilometers of shore (e.g., near Moss Landing and Davenport) as a result of the presence of the Monterey and Ascension submarine canyons. These deep waters are populated with pelagic species, including black-footed albatross, ashly storm-petrel, and Xantus's murrelet during summer and fall, and northern fulmars and black-legged kittiwakes during winter and spring. The coastal avifauna present over the continental shelf is composed largely of sooty shearwaters, western grebes, Pacific loons (*Gavia pacifica*), brown pelicans, cormorants, western gulls, and common murrelets. In close proximity to shore, along the surf break, seabird species include surf scoters (*Melanitta perspicillata*), white-winged scoters (*Melanitta deglandi*), and marbled murrelets (MBNMS 2013).

The vast majority of seabird species in the MBNMS are seasonal visitors. Most species are seasonally resident and come in large numbers from temperate areas of New Zealand and Chile, as well as Hawaii, Mexico, and Alaska to winter in MBNMS waters. The prevalence of marine birds using sanctuary waters changes from year to year, due to fluctuations in marine conditions, especially related to El Niño. The marine birds of the Gulf of the Farallones/Cordell Bank National Marine Sanctuaries and the birds of the MBNMS are associated with different habitat features. The Gulf of the Farallones has islands and a relatively broad shelf, while Monterey Bay has a relatively narrow, but sheltered shelf, cut by an immense, deep submarine canyon. The greater oceanic influence and lack of breeding islands in the MBNMS drive the marine bird species group present.

The shoreline and coastal wetlands that border the MBNMS are also important to birds. Elkhorn Slough attracts the third largest concentration of shorebirds in California, surpassed only by Humboldt and San Francisco Bays. Dominant shorebird species on the intertidal mudflats of Elkhorn Slough and the Salinas River mouth are sandpipers, dunlins (*Calidris alpina*), sanderlings (*Calidris alba*), dowitchers, black-bellied plovers, willets (*Tringa semipalmata*), American avocets (*Recurvirostra americana*), marbled godwits (*Limosa fedoa*), and long-billed curlews (*Numenius americanus*). Grebes, coots, diving ducks, and dabbling ducks dominate the coastal bird assemblage that uses the shallow, tidal waters of local sloughs and estuaries. On the outer coasts, the sandy beach avifauna is dominated by sanderlings, willets, and marbled godwits. The dominant species on the rocky shoreline are the resident black oystercatchers (*Haematopus bachmani*) and black turnstones (*Arenaria melanocephala*). These birds are most abundant during fall and winter, and during this period they are accompanied by small numbers of ruddy turnstones (*Arenaria interpres*), surfbirds (*Aphriza virgate*), and wandering tattlers (*Tringa incana*).

1 *North Coast*

2 Based on summary information prepared under the MLPA for the North Coast region  
3 (Horizon Water and Environment LLC 2012a,b), several special status bird species may  
4 be present in nearshore and coastal waters, including those described below.

5 Marbled murrelet is listed as endangered under CESA and threatened under FESA. This  
6 seabird species forages exclusively on small fish in nearshore waters and nests  
7 exclusively in old growth conifer trees within 45 mi of the coast. The vast majority of the  
8 State-listed population and a significant portion of the Federally-listed population is  
9 present, either nesting adjacent to or foraging within, waters of the North Coast region.  
10 Most of the marbled murrelet population is found in Redwood National and State Parks,  
11 with some murrelets nesting in other state parks or small old growth reserves of the North  
12 Coast region. Surveys of coastal waters of the North Coast region indicate that the vast  
13 majority of marbled murrelets are found from Cape Mendocino north, with the highest  
14 densities occurring north of Trinidad (i.e., directly off the coast of Redwood National and  
15 State Parks), and few murrelets foraging nearshore south of Cape Mendocino.

16 Brant (*Branta bernicla*) winter and stage along the entire California coast. This species is  
17 currently considered listed as a California SSC (wintering, staging). Brant are food  
18 specialists during nonbreeding season, eating eelgrass (*Zostera* spp.) almost exclusively.  
19 Winter and spring distributions of brant are closely tied with those of eelgrass. In the  
20 North Coast region, relatively high numbers of wintering and staging brant occur in  
21 Humboldt Bay. The health and distribution of the brant population are affected by  
22 destruction of eelgrass habitat. Brant also may be displaced from healthy eelgrass  
23 habitats by recreational activities (e.g., boating, hunting, recreational shellfish harvesting).

24 Western snowy plover (*Charadrius alexandrinus nivosus*) occurs throughout the North  
25 Coast region, with breeding occurring along most of the U.S. Pacific coast (i.e., Baja  
26 California to southern Washington). Western snowy plover are found on beaches,  
27 estuarine sand and mud flats, and salt ponds where they feeds on invertebrates and  
28 insects. Nesting occurs above the high-tide line on coastal beaches, sand spits, and  
29 dunes, and in lagoons and estuaries from March through September. Highly susceptible  
30 to disturbance and habitat alteration, western snowy plover are known to nest at the  
31 following locations in the North Coast region: Gold Bluffs Beach, Big Lagoon, Clam  
32 Beach, the south spit of Humboldt Bay, the Eel River Wildlife Area, Centerville Beach,  
33 and the Eel River gravel bars in Humboldt County; and Ten Mile River Beach,  
34 Manchester Dunes, and Virgin Creek in Mendocino County.

35 The tufted puffin breeds along northern Pacific Ocean coasts between Japan to central  
36 or southern California. The preferred nesting habitat for this species includes offshore  
37 rocks and mainland cliffs. Tufted puffins breed from April through September, foraging  
38 predominantly offshore over the shelf and continental slope during this time. Tufted



puffins occur throughout pelagic waters in their range during the nonbreeding season. The range of tufted puffins in California extends from the California-Oregon border to the Farallon Islands, with a single possible site in the Channel Islands. More than half of the 13 known puffin breeding colonies are located north of Cape Mendocino. Principal breeding sites include Prince Island and Castle Rock in Del Norte County, Green Rock in Humboldt County, and Goat Island and Fish Rock in Mendocino County.

Castle Rock National Wildlife Refuge is critical to the survival of several hundred thousand seabirds each year. It is also a key roosting site for up to 20,000 Aleutian cackling geese each winter and spring. The refuge provides nesting habitat for one of the largest breeding populations (100,000) of common murres on the Pacific coast. Ten other species of seabirds also nest in the refuge, including three species of cormorants, pigeon guillemots, Cassin's and rhinoceros auklets, Leach's and fork-tailed storm-petrels (*Oceanodroma furcata*), and tufted puffins. Western gulls also nest on the island.

#### *Listed or Bird Species of Special Concern*

Several bird species which use nearshore and coastal marine waters are listed under FESA and CESA, or are identified as species of special concern. The marbled murrelet is listed under FESA as threatened and under CESA as endangered. Xantus's murrelet is identified as a Federal candidate species and is listed under CESA as threatened. For California birds designated as SSC, the CDFW has developed species accounts for 63 ranked taxa to document general range and abundance, seasonal status, historical range and abundance, ecological requirements, and threats. While the majority of these SSC are inland or upland species (i.e., will not be encountered in coastal waters), several are found along the coast or offshore islands. Complete species accounts can be found at [www.dfg.ca.gov/wildlife/nongame/ssc/birds.html](http://www.dfg.ca.gov/wildlife/nongame/ssc/birds.html). Species of Special Concern that may use nearshore and coastal waters, as identified in the 2008 listing, are noted in **Table 3-12**.

#### **Marine Reptiles (Sea Turtles)**

Five species of sea turtles (superfamily Chelonioidea) variably occur in State waters: green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*), Pacific hawksbill (*Eretmochelys imbricata bissa*), and Pacific olive ridley (*Lepidochelys olivacea*) turtles. Only the Pacific leatherback and green sea turtle are common or frequent in State waters. Only the loggerhead has been documented in the North Coast region, while the remaining species may be found in waters of North Central, Central, and South Coast regions. Sea turtles spend most of their time at sea, coming ashore to nest on beaches. Sea turtles are not common within State waters of Southern California, although they are regularly sighted in the warm water effluent channels of power plants (San Diego Bay; San Gabriel River). Summary information for turtles in State waters is detailed in this section and in **Table 3-13**.

**Table 3-12. California's Bird Species of Special Concern That May Occur in Nearshore and Coastal Waters of the Study Area**

Taxa (Species, Subspecies, and Distinct Populations)	Season of Concern
<b>Taxa Assigned to the List Based Solely on the Bird Species of Special Concern Definition</b>	
<b>Taxa Listed as Federally, but Not State, Threatened or Endangered</b>	
Short-tailed albatross ( <i>Phoebastria albatrus</i> )	Year round
Snowy plover ( <i>Charadrius alexandrinus</i> ) (coastal population)	Year round
<b>Taxa Assigned to the List by Ranking Schemes</b>	
<b>First Priority</b>	
Tufted puffin ( <i>Fratercula cirrhata</i> )	Breeding
<b>Second Priority</b>	
Brant ( <i>Branta bernicla</i> )	Wintering, staging
Ashy storm-petrel ( <i>Oceanodroma homochroa</i> )	Breeding
<b>Third Priority</b>	
Fork-tailed storm-petrel ( <i>Oceanodroma furcata</i> )	Breeding
Black storm-petrel ( <i>Oceanodroma melania</i> )	Breeding
Gull-billed tern ( <i>Gelochelidon nilotica</i> )	Breeding
Cassin's auklet ( <i>Ptychoramphus aleuticus</i> )	Breeding

**Table 3-13. Sea Turtles of California, Including Summary Life History Information and Status**

Taxonomic Classification and Common Name	Scientific Name	Status	Presence, Habitat, and Diet
<b>Family: Cheloniidae</b>			
Loggerhead sea turtle	<i>Caretta caretta</i>	FE <sup>a</sup>	Rare in CA; occupies three different habitats – oceanic, neritic, and terrestrial (nesting only) depending upon life stage; omnivorous
Green sea turtle	<i>Chelonia mydas</i>	FE	Common In CA; resident populations in San Diego County; aquatic, but known to bask onshore; juvenile distribution unknown; omnivorous
Pacific hawksbill sea turtle	<i>Eretmochelys imbricata bisssa</i>	FE	Rare in CA; pelagic; feeding changes from pelagic surface feeding to benthic, reef-associated feeding mode; opportunistic diet
Olive ridley sea turtle	<i>Lepidochelys olivacea</i>	FT <sup>b</sup>	Rare in CA; primarily pelagic, but may inhabit coastal areas, including bays and estuaries; most breed annually, with annual migration (pelagic foraging, to coastal breeding/nesting grounds, back to pelagic foraging); omnivorous, benthic feeder
<b>Family: Dermochelyidae</b>			
Pacific leatherback sea turtle	<i>Dermochelys coriacea</i>	FE	Frequent in CA; pelagic, lives in the open ocean and occasionally enters shallower water (bays, estuaries); omnivorous (jellyfish, other invertebrates, vertebrates, kelp, algae)

<sup>a</sup> North Pacific Ocean Distinct Population Segment (DPS); <sup>b</sup> coastal Mexico population endangered; threatened elsewhere.

1    *Loggerhead Sea Turtle*

2    This species was first listed under the FESA as threatened throughout its range in 1978.  
3    In September 2011, NMFS and the U.S. Fish and Wildlife Service (USFWS) listed nine  
4    DPSs of loggerhead sea turtles under the FESA. This species is globally distributed, but  
5    is generally found in tropical and temperate waters.

6    Loggerheads are the most abundant species of sea turtle found in U.S. coastal waters.  
7    Major nesting beaches are located in the southeastern U.S., primarily along the Atlantic  
8    coast of Florida, North Carolina, South Carolina, and Georgia. In California, juveniles  
9    have been documented in coastal and open ocean waters. Loggerhead sea turtles  
10   occupy three different ecosystems during their lives, including beaches, open ocean  
11   (oceanic zone), and nearshore coastal areas (neritic zone). Pacific loggerheads migrate  
12   over 12,000 km between nesting beaches in Japan and feeding grounds off the coast of  
13   Mexico using the Kuroshio and North Pacific Currents. Loggerheads nest on ocean  
14   beaches, generally preferring high energy, relatively narrow, steeply sloped, coarse-  
15   grained beaches. Although feeding behavior may change with age, this species is  
16   carnivorous throughout its life. Hatchlings eat small animals living in seagrass mats that  
17   are often distributed along drift lines and eddies. Juveniles and adults show a wide  
18   variety of prey, mostly such as conchs, clams, crabs, horseshoe crabs, shrimps, sea  
19   urchins, sponges, fishes, squids, and octopuses. During migration through the open  
20   sea, loggerheads eat jellyfishes, pteropods, floating molluscs, floating egg clusters,  
21   squids, and flying fishes.

22   *Green Sea Turtle*

23   Listed as endangered for breeding populations in Florida and the Pacific coast of  
24   Mexico in 1978, this species is globally distributed and generally found in tropical waters  
25   between 30° N and 30° S. This species has been reported as far north as Redwood  
26   Creek (Humboldt County) and off the coasts of Washington, Oregon, and British  
27   Columbia; green sea turtles are sighted year-round in Southern California, with highest  
28   concentrations occurring from July through September. Recent minimum population  
29   estimates for green sea turtles are at least 3,319 individuals known to occur in the  
30   eastern Pacific. The current population status for this species is increasing. Green sea  
31   turtles spend most of their time foraging along the coast, including areas with open  
32   coastline and protected bays and lagoons. Marine algae and seagrass are important  
33   constituents of the green sea turtle diet, and some turtles may also forage heavily on  
34   invertebrates (e.g., sardines, anchovies, jellies, mollusks, worms, etc.). Red tide may  
35   lead to mortality of both juveniles and adults. Primary nesting for green sea turtles occur  
36   along the Pacific coasts of Mexico, Central America, South America, and the Galapagos  
37   Islands.

1 *Pacific Hawksbill Sea Turtle*

2 Pacific hawksbill sea turtle was listed as endangered under the FESA in 1970. The  
3 hawksbill sea turtle is found in warm tropical waters worldwide, usually occurring from  
4 30° N to 30° S latitude. In U.S. waters of the Pacific, hawksbill sea turtles are found  
5 along the coasts of Hawaii, American Samoa, Guam, and the Commonwealth of the  
6 Northern Mariana Islands (CNMI). In the eastern Pacific, hawksbill sea turtles nest  
7 sporadically in the southern part of the Baja peninsula, while sightings of juveniles and  
8 sub-adults foraging along the coast occur more regularly. Hawksbill sea turtles use  
9 different habitats at different stages of their life cycle, but are most commonly  
10 associated with healthy coral reefs. Post-hatchlings (oceanic stage juveniles) are  
11 believed to occupy the pelagic environment, although the pelagic habitat of hawksbill  
12 juveniles in the Pacific is unknown. After a few years in the pelagic zone, small juveniles  
13 recruit to coastal foraging grounds; this shift in habitat also involves a shift in feeding  
14 strategies, from feeding primarily at the surface to feeding below the surface on a varied  
15 diet, primarily on animals associated with coral reef environments.

16 *Pacific Olive Ridley Sea Turtle*

17 The Pacific olive ridley sea turtle was listed as endangered under the FESA in 1978. At  
18 present, the coastal Mexico population is listed as endangered; elsewhere, the olive  
19 ridley sea turtle is listed as threatened. Olive ridley turtles are considered the most  
20 abundant sea turtle in the world, with an estimated 800,000 nesting females annually.  
21 This species is distributed circumglobally. The normal range for olive ridley sea turtles in  
22 the eastern Pacific is from Southern California to Northern Chile. This species is rarely  
23 found in Southern California and no abundance estimates are available. The  
24 California/Oregon drift gillnet fishery has only documented the capture of one olive  
25 ridley sea turtle off Southern California, in 1999. While a total of 23 olive ridley sea  
26 turtles were stranded along the California coast between 1990 and 2002, fewer than two  
27 olive ridley sea turtles strand per year. Olive ridley sea turtles are omnivorous, feeding  
28 on fish, crabs, shellfish, jellyfish, seagrasses, and algae. This species may dive to 79 to  
29 300 m. Major nesting beaches for olive ridley sea turtles are located on the Pacific coast  
30 of Mexico and Costa Rica.

31 *Leatherback Sea Turtle*

32 The leatherback sea turtle was listed as endangered throughout its range in 1970;  
33 critical habitat for this species in the Pacific was revised in 2012 and now extends  
34 approximately 16,910 mi<sup>2</sup> (43,798 km<sup>2</sup>) from Point Arena to Point Arguello. Leatherback  
35 sea turtles are pelagic, migratory, and wide-ranging. Their distribution is circumglobal  
36 throughout the oceans of the world, occurring from 71° N to 47° S. Nesting is confined  
37 to tropical and subtropical latitudes. Leatherback sea turtles mate in the waters adjacent  
38 to nesting beaches and along migratory corridors.

After nesting, female leatherbacks migrate from tropical waters to more temperate latitudes that support high densities of jellyfish prey in the summer. Leatherbacks forage off Central California, generally at the end of the summer, when upwelling relaxes and sea surface temperatures increase. Leatherback sea turtles are the most common sea turtle off the western coast of the U.S., and are most abundant from July to September.

Stranding reports from 1990–2002 for California reveal that the leatherback is the second-most commonly stranded sea turtle, with an average of nearly five per year. Leatherback sea turtles target planktonic chordates (e.g., salps), dense aggregations of brown sea nettle (*Chrysaora fuscescens*), and scyphomedusae, particularly moon jellies. Recent population estimates for eastern Pacific leatherback sea turtles indicate that at least 178 individuals are known to occur off California. This population is believed to be decreasing worldwide; however, nesting trends on U.S. beaches have been increasing in recent years.

#### Marine Mammals

At least 46 marine mammal species may be present in California waters during some portion of the year, including at least 39 species of cetaceans (e.g., whales, dolphins, porpoises); six species of pinnipeds (e.g., seals, sea lions, and fur seals), and one species of mustelid (i.e., southern sea otter). Species are widely distributed based on habitat and movements between feeding and breeding grounds. Marine mammal species that may be present in State waters are listed in **Table 3-14**, with their legal status (e.g., listed under the Marine Mammal Protection Act [MMPA], FESA, or CESA), stock status, and estimated potential biological removal (PBR) determinations.

According to the MMPA, PBR is defined as, “...the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population.” PBR was initially intended to serve as an upper limit guideline for fishery-related mortality for each species, and is used here as a similar means of considering human-caused mortality. Taxonomic designations follow the conventions of the Committee on Taxonomy (2012).

The selection of waters overlying subtidal habitat less than 200 m deep resulted in the identification of a suite of marine mammal species that could occur in waters of the Project area, including 23 cetaceans (i.e., seven mysticete species, 15 odontocete species), four pinniped species, and the southern sea otter. Distribution of mysticete species along the California coast and particularly within State waters is driven largely by euphausiid (krill) presence as prey. Euphausiid distribution is controlled by upwelling and other environmental factors. Important feeding grounds for mysticete populations occur in California waters, but are likely to be seasonal with annual variability.

**Table 3-14. Marine Mammals That May Occur in State Waters and Current Status**  
**(Adapted from: Caretta et al. 2013; USFWS 2010)**

Species or Guild	Protected Status	Stock Status	Potential Biological Removal
<b>Mysticetes – Baleen Whales</b>			
Bryde's whale ( <i>Balaenoptera edeni</i> )	P	NS/ND	Not Determined
Sei whale ( <i>Balaenoptera borealis borealis</i> )	E	S, D	0.17
Minke whale ( <i>Balaenoptera acutorostrata scammoni</i> )	P	NS/ND	2.0
Fin whale ( <i>Balaenoptera physalus physalus</i> )	E	S, D	16
Blue whale ( <i>Balaenoptera musculus musculus</i> )	E	S, D	3.1
Humpback whale ( <i>Megaptera novaeangliae</i> )	E	S, D	11.3
North Pacific right whale ( <i>Eubalaena japonica</i> )	E	S, D	0.05
California gray whale ( <i>Eschrichtius robustus</i> )	P	NS/ND	2.8
<b>Odontocetes – Toothed Whales</b>			
Short-finned pilot whale ( <i>Globicephala macrorhynchus</i> )	P	NS/ND	4.6
Killer whale ( <i>Orcinus orca</i> )	P	NS/ND	1.6 (Offshore Stock); 0.14 (Southern Resident Stock)
Striped dolphin ( <i>Stenella coeruleoalba</i> )	P	NS/ND	82
Pygmy and dwarf sperm whales ( <i>Kogia</i> spp.) <sup>1</sup>	P	NS/ND	2.7 (Pygmy); No Calculation (Dwarf)
Small beaked whales (Ziphiidae) <sup>2</sup>	P	NS/ND	6.2 (Baird's); 5.8 ( <i>Mesoplodon</i> spp.); 13 (Cuvier's)
Sperm whale ( <i>Physeter macrocephalus</i> )	E	S, D	1.5
Bottlenose dolphin (Offshore) ( <i>Tursiops truncatus truncatus</i> )	P	NS/ND	5.5
Bottlenose dolphin (Coastal) ( <i>Tursiops truncatus truncatus</i> )	P	NS/ND	2.4
Long-beaked common dolphin ( <i>Delphinus capensis capensis</i> )	P	NS/ND	610
Short-beaked common dolphin ( <i>Delphinus delphis delphis</i> )	P	NS/ND	3,440
Northern right whale dolphin ( <i>Lissodelphis borealis</i> )	P	NS/ND	48
Dall's porpoise ( <i>Phocoenoides dalli dalli</i> )	P	NS/ND	257
Risso's dolphin ( <i>Grampus griseus</i> )	P	NS/ND	39
Pacific white-sided dolphin ( <i>Lagenorhynchus obliquidens</i> )	P	NS/ND	193
Common Dolphin – Long- & Short-Beaked ( <i>Delphinus</i> spp.) <sup>3</sup>	P	NS/ND	610 (Long-Beaked); 3,440 (Short-Beaked)
Harbor porpoise ( <i>Phocoena phocoena vomerina</i> )	P	NS/ND	19 (Morro Bay Stock); 10 (Monterey Bay Stock); 67 (SF-Russian R. Stock); 577 (N CA/S OR Stock)
<b>Pinnipeds – Seals and Sea Lions</b>			
Harbor seal ( <i>Phoca vitulina richardsi</i> )	P	NS/ND	1,600
Northern elephant seal ( <i>Mirounga angustirostris</i> )	P	NS/ND	4,382
Northern fur seal ( <i>Callorhinus ursinus</i> )	P	NS/ND	324
California sea lion ( <i>Zalophus californianus</i> )	P	NS/ND	9,200
Northern (Steller) sea lion ( <i>Eumetopias jubatus</i> )	P, T	S, D	2,378
Guadalupe fur seal ( <i>Arctocephalus townsendi</i> )	P, T, ST, FP	S, D	91
<b>Mustelid – Sea Otter</b>			
Southern sea otter ( <i>Enhydra lutris nereis</i> )	P, T, FP	S, D	8

Species or Guild	Protected Status	Stock Status	Potential Biological Removal
<sup>1</sup> Pygmy sperm whale ( <i>Kogia breviceps</i> ); dwarf sperm whale ( <i>Kogia sima</i> ); <sup>2</sup> Small beaked whales (Ziphiidae) include Baird's beaked whale ( <i>Berardius bairdii</i> ), mesoplodont beaked whales ( <i>Mesoplodon</i> spp.), and Cuvier's beaked whale ( <i>Ziphius cavirostris</i> ). <sup>3</sup> Stock assessment reports and cetacean surveys list <i>Delphinus</i> species rather than distinguish between long- and short-beaked common dolphins; consequently, this species group has been additionally considered as a whole throughout this document.  Acronyms and Abbreviations: P = protected (Marine Mammal Protection Act [MMPA]); FP = State fully protected; E = endangered (Federal Endangered Species Act [FESA]); T = threatened (FESA); ST = threatened (California Endangered Species Act [CESA]); NS/ND = not strategic stock/not depleted (MMPA); S = strategic stock (MMPA); D = depleted (MMPA); PBR = potential biological removal, per Caretta et al. (2013).			

1 Large-scale climatic events such as El Niño and La Niña can result in significant  
 2 changes in mysticete and offshore odontocete distribution and aggregations. Coastal  
 3 odontocetes are the least variable in distribution and density as their feeding relies more  
 4 directly on resident prey and defined seasonal movements; therefore, their predictability  
 5 of occurrence is higher than either the mysticetes or offshore/deep diving odontocetes  
 6 (e.g., sperm whales, beaked whales).

7 The most likely cetacean species to encounter in State waters are the common dolphin,  
 8 harbor porpoise, and coastal bottlenose dolphin. Pinnipeds are likely to be encountered  
 9 in any State waters along the California coast; however, unlike the coastal odontocetes,  
 10 distribution of some pinnipeds will be largely driven by breeding, and their likelihood of  
 11 encounter during a survey may be quite variable depending on the season and location  
 12 of the survey.

13 The three species that are most likely to occur in all the selected regions are the  
 14 California sea lion, harbor seal, and northern elephant seal. The area includes over  
 15 1,200 km of coast line; however, there is limited information available on the probability  
 16 of occurrence for many marine mammal species due to their varied temporal and spatial  
 17 distribution. As a result, this summary has focused on the probability of encountering  
 18 marine mammal species during an undefined OGPP survey anywhere in the Project  
 19 area within State waters.

20 This approach is most appropriate for wide-ranging species like mysticete whales, as  
 21 local density estimates are not easily predicted due to their mobility, reliance on prey  
 22 availability, and response to varying environmental conditions (Peterson et al. 2006).

23 Density estimates were calculated using the online Strategic Environmental Research  
 24 and Development Program (SERDP) spatial decision support system (SDSS) Marine  
 25 Animal Model Mapper on Duke University's Ocean Biogeographic Information System  
 26 Spatial Ecological Analysis of Megavertebate Populations (OBISSEAMAP) website  
 27 (<http://seamap.env.duke.edu/>). This online tool uses predictive habitat modeling based  
 28 on survey data to estimate densities in a given area of interest (e.g., Barlow et al. 2009).

1 Density estimates were not available for several species via SERDP/SDSS; alternative  
2 sources were used to complete the density matrix. For the California gray whale, a  
3 species that migrates along the California coast twice annually between wintering  
4 grounds off Baja California, Mexico and summer feeding grounds in the Bering,  
5 Beaufort, and Chukchi Seas, a seasonal (winter) density estimate was derived from the  
6 NOAA (2003) biogeographic assessment of Northern and Central California.

7 SERDP/SDSS models of cetacean densities are based on NOAA's Southwest Fisheries  
8 Science Center (SWFSC) ship line-transect data collected from 1986 to 2006. Model  
9 grid cell resolution is 25 by 25 km. The area of interest was defined by selecting the  
10 outermost 200 m isopleth boundary with deeper portions inside the 3-nm State limit  
11 connected by the northern and southern 200-m isopleths boundary that encompassed  
12 the 3-nm State waters boundary and included the Channel Islands.

13 Pinniped density estimates were obtained from a single source (Koski et al. 1998)  
14 derived from population take estimates in Central California. Variability in density  
15 estimates may be expected in other regions of California. To assess the likelihood of  
16 encountering pinniped species, densities from Koski et al. (1998) and the NMFS  
17 Southwest Region California pinniped map (2007) were jointly used.

18 Sea otter densities were not available on the SDSS model; therefore, densities for the  
19 southern sea otter were calculated from the U.S. Geological Survey (USGS) Western  
20 Ecological Research Center's Spring 2010 survey results (USGS 2013).

21 Comparisons were made for seven cetacean species that occur both in coastal  
22 California and the OCS region in the Gulf of Mexico. Habitats between the two ocean  
23 basins are very different and species stocks behave differently; however, the  
24 prevalence of seismic surveys in the Gulf of Mexico has resulted in extensive records  
25 detailing the frequency with which survey vessels encounter various species of marine  
26 mammal; these records offer the only comparative data available in estimated densities  
27 and recorded sighting frequency during seismic surveys.

28 For the Gulf of Mexico, the SDSS model area was selected for the northern Gulf of  
29 Mexico beyond 200 m as this is the water depth at which mitigation data are collected  
30 for seismic surveys in this OCS region (Barkaszi et al. 2012). SDSS density models  
31 were based on comparable NOAA surveys in the Gulf of Mexico region. Densities of  
32 species and their respective sighting frequencies are presented in **Table 3-15**.



**Table 3-15. California Marine Mammals – Species Accounts, Estimated Population Size, and Mean Estimate Determinations**

Species or Guild	Stock	Species Account for California Waters	Nest	Mean Density <sup>a</sup> (No./km <sup>2</sup> )	Probability of Encounter	GOM Mean Density <sup>a</sup>	GOM Sighting Frequency <sup>b</sup>
<b>Mysticetes – Baleen Whales</b>							
Bryde's whale ( <i>Balaenoptera edeni</i> )	Eastern Tropical Pacific	Bryde's whales along the California coast are likely part of a larger population inhabiting the eastern part of the tropical Pacific Ocean. As a result, a regular occurrence is likely to be very low.	No estimate	0.000006 (Summer)	Very low	0.000077	0.03
Sei whale ( <i>Balaenoptera borealis borealis</i> )	Eastern North Pacific	Sei whales are considered rare in California waters.	126	0.000086 (Summer)	Low		
Minke whale ( <i>Balaenoptera acutorostrata scammoni</i> )	California/Oregon/Washington	Minke whales occur year-round along shelf waters in California and in the Gulf of California, occurring south of California in the summer/fall.	478	0.000276 (Winter)	Low to Medium		
Fin whale ( <i>Balaenoptera physalus physalus</i> )	California/Oregon/Washington	Aggregations of fin whales occur year-round in Southern/Central California and the Gulf of California. Fin whale vocalizations are detected year-round off Northern California, with a peak in vocal activity between September and February. Although typically found over the slopes and continental shelves, fin whales have been regularly reported from shore during gray whale migration surveys.	3,044	0.00473 (Summer); 0.000185 (Winter)	Medium		
Blue whale ( <i>Balaenoptera musculus musculus</i> )	Eastern North Pacific	The U.S. west coast represents one of the most important feeding areas in summer and fall for blue whales. Most of this stock is believed to migrate south to Baja California, the Gulf of California, and the Costa Rica Dome during the winter and spring.	2,497	0.005492 (Summer); 0.000114 (Winter)	Medium		
Humpback whale ( <i>Megaptera novaeangliae</i> )	California/Oregon/Washington	Humpback whales in the North Pacific feed in coastal California waters and migrate south to winter. The California/Oregon/Washington stock includes humpback whales that feed along the U.S. west coast. Humpback whales are found throughout shelf waters, but have been reported with regularity inside the 100-m isobaths.	2,043	0.003724 (Summer); 0.001207 (Winter)	Medium		
North Pacific right whale ( <i>Eubalaena japonica</i> )	Eastern North Pacific	North Pacific right whales primarily occur in coastal or shelf waters in northern latitudes. During winter, right whales occur in lower latitudes and coastal waters where calving takes place. Sightings have been reported as far south as central Baja California in the eastern North Pacific.	31	0.000061 (Winter)	Low		

Species or Guild	Stock	Species Account for California Waters	N <sub>est</sub>	Mean Density <sup>a</sup> (No./km <sup>2</sup> )	Probability of Encounter	GOM Mean Density <sup>a</sup>	GOM Sighting Frequency <sup>b</sup>
California gray whale ( <i>Eschrichtius robustus</i> )	Eastern North Pacific	Most gray whales in the Eastern North Pacific stock spend the summer feeding in the northern and western Bering and Chukchi Seas before migrating south in the fall along the coast of North America from Alaska to Baja California. The stock winters along the coast of Baja California, using shallow lagoons and bays for calving. The northbound migration generally takes place between February and May with cows and newborn calves migrating northward, primarily between March and June, well within 5 mi of the shoreline.	19,126	0.05 (Winter)	Seasonal: High to Low		
<b>Odontocetes – Toothed Whales</b>							
Short-finned pilot whale ( <i>Globicephala macrorhynchus</i> )	California/ Oregon/ Washington	Short-finned pilot whales were likely residents off Southern California; however, after a strong El Niño event in 1982-83, short-finned pilot whales virtually disappeared from this region. Since then, there have been infrequent sightings of pilot whales off the California coast.	760	0.000307 (Summer)	Low to Medium	0.00459	0.89
Killer whale ( <i>Orcinus orca</i> )	Eastern North Pacific Offshore <sup>2</sup>	Killer whales are wide-ranging species, with this stock ranging from the outer coasts of Washington, Oregon and California.	240	0.000709 (Summer); 0.000246 (Winter)	Low to Medium	0.000256	0.02
Striped dolphin ( <i>Stenella coeruleoalba</i> )	California/ Oregon/ Washington	Striped dolphins are typically sighted 100 to 300 nm from the California coast.	10,908	0.001722 (Summer)	Medium		
Pygmy and dwarf sperm whales ( <i>Kogia</i> spp.)	California/ Oregon/ Washington	Pygmy and dwarf sperm whales are distributed throughout deep waters and along the continental slopes of the North Pacific; however, little population data are available for these species. <i>Kogia</i> sightings may underestimate their presence due to their inconspicuous behavior. Due to their deep diving habits, they may be more susceptible to sound impacts than other species.	579 (pygmy) Unknown (dwarf)	0.001083 (Summer)	Low to Medium	0.00113	0.10
Small beaked whales <sup>1</sup> (Ziphiidae)	California/ Oregon/ Washington	At least five species of Mesoplodont whales have been recorded off the U.S. west coast. They are grouped here due to the infrequent records and difficulty of positive identification. Ziphiid beaked whales are distributed widely throughout deep waters of all oceans, but have been seen primarily along the continental slope in western U.S. waters from late spring to early fall. They have been seen less frequently and are presumed to be farther offshore during the colder water months of November through April. Due to their deep diving habits, they may be more susceptible to sound impacts than other species.	907- 2,143 (species dependent)	0.002907 (Summer); 0.001483 (Winter)	Low to Medium	0.00065	0.05

Species or Guild	Stock	Species Account for California Waters	N <sub>est</sub>	Mean Density <sup>a</sup> (No./km <sup>2</sup> )	Probability of Encounter	GOM Mean Density <sup>a</sup>	GOM Sighting Frequency <sup>b</sup>
Sperm whale ( <i>Physeter macrocephalus</i> )	California/ Oregon/ Washington	Sperm whales are widely distributed across the entire North Pacific during the summer, while in winter, the majority are thought to be south of 40° N (roughly Eureka, CA). Sperm whales are found year-round in California waters with peak abundances from April to June, and again from September to November. They are typically found on slopes in waters deeper than 200 m.	971	0.000317 (Summer)	Medium	0.00176	5.84
Bottlenose dolphin (offshore) ( <i>Tursiops truncatus truncatus</i> )	California/ Oregon/ Washington	Offshore bottlenose dolphins are evenly distributed at distances greater than a few kilometers from the mainland and throughout the SCB.	1,006	0.004365 (Summer); 0.04651 (Winter)	Medium	0.020 <sup>c</sup>	8.40
Bottlenose dolphin (coastal) ( <i>Tursiops truncatus truncatus</i> )	California Coastal	California coastal bottlenose dolphins are typically found within 1 km from shore from Point Conception south into Mexican waters.	450	0.361173 (Year Round)	High (South Coast region)		
Long-beaked common dolphin ( <i>Delphinus capensis capensis</i> )	California	Long-beaked common dolphins are commonly found within 50 nm of the coast from Southern to Central California.	27,046	0.0432 (Summer)	Medium		
Short-beaked common dolphin ( <i>Delphinus delphis</i> )	California/ Oregon/ Washington	Short-beaked common dolphins are the most abundant cetacean off California and can be seen in coastal and shelf waters up to 300 nm from shore.	411,211	0.9219 (Summer)	High		
Northern right whale dolphin ( <i>Lissodelphis borealis</i> )	California/ Oregon/ Washington	Northern right whale dolphins are primarily seen in shelf and slope waters with seasonal movements into California waters during the colder water months.	8,334	0.03111 (Summer); 0.112739 (Winter)	Medium		
Dall's porpoise ( <i>Phocoenoides dalli dalli</i> )	California/ Oregon/ Washington	Dall's porpoises are commonly seen in shelf, slope, and offshore waters with occurrences common off Southern California in winter.	42,000	0.03779 (Summer); 0.035151 (Winter)	Medium (location, season)		
Risso's dolphin ( <i>Grampus griseus</i> )	California/ Oregon/ Washington	Risso's dolphins are commonly seen in shelf waters within the SCB and in slope and offshore waters of California.	6,272	0.03303 (Summer); 0.174569 (Winter)	Medium		
Pacific white-sided dolphin ( <i>Lagenorhynchus obliquidens</i> )	California/ Oregon/ Washington	Pacific white-sided dolphins are common along continental margins and offshore, with peak occurrences off California during the colder winter months.	26,930	0.08361 (Summer); 0.22565 (Winter)	Medium to High		

Species or Guild	Stock	Species Account for California Waters	N <sub>est</sub>	Mean Density <sup>a</sup> (No./km <sup>2</sup> )	Probability of Encounter	GOM Mean Density <sup>a</sup>	GOM Sighting Frequency <sup>b</sup>
Common dolphin (long- and short-beaked) ( <i>Delphinus</i> spp.)	California/ Oregon/ Washington (short- beaked); California (long- beaked)	Many stock assessment and cetacean surveys list <i>Delphinus</i> species rather than distinguish between short- and long-beaked common dolphins; consequently, this species group has been considered as a whole in the density model.	27,046 (long- beaked); 411,211 (short- beaked)	0.05503 (Long- Beaked; Summer); 2.823 (Short- Beaked; Summer)	High		
Harbor porpoise ( <i>Phocoena phocoena</i> <i>vomerina</i> )	Central California (incl. bay Stocks & N. California/ S. Oregon Stock)	Four geographic stocks in California waters are identified as separate stocks mainly due to varying fisheries pressures. The combined range extends from Southern Oregon/Northern California to Point Conception. Harbor porpoise are found almost exclusively in coastal and inland waters.	40,000+	1.5575 (Year Round)	High		
<b>Pinnipeds – Seals and Sea Lions</b>							
Harbor seal ( <i>Phoca vitulina</i> <i>richardsi</i> )	California	Harbor seals inhabit nearshore coastal and estuarine areas from Baja California to the Pribilof Islands in Alaska. In California, approximately 400 to 600 harbor seal haul-out sites are widely distributed on the mainland and on offshore islands, intertidal sandbars, rocky shores, and beaches. Rookeries are located from Santa Rosa to Mexico.	30,196	0.023 <sup>d</sup>	High		
Northern elephant seal ( <i>Mirounga</i> <i>angustirostris</i> )	California (breeding)	Northern elephant seals breed and give birth in California primarily on offshore islands from December to March from about San Francisco southward. Adults return to land between March and August to molt. Adults return to their feeding areas again between their spring/summer molting and their winter breeding seasons.	124,000	0.154 <sup>d</sup>	High (seasonal)		
Northern fur seal ( <i>Callorhinus ursinus</i> )	San Miguel Island	All northern fur seals in California waters are found along San Miguel Island off Southern California.	9,968	0.030 <sup>d</sup>	High (Channel Islands region)		
California sea lion ( <i>Zalophus californianus</i> )	California	California sea lions are distributed along the entire coastline year round, and breed on islands in Southern California.	153,337	NA	High		
Northern (Steller) sea lion ( <i>Eumetopias jubatus</i> )	Eastern US	Rookeries for Steller sea lions (eastern DPS) are located between Cape Fairweather, Alaska and Ano Nuevo Island, California. Breeding takes place from May to July, outside of which they are widely dispersed.	52,847	NA	High (seasonal)		

Species or Guild	Stock	Species Account for California Waters	N <sub>est</sub>	Mean Density <sup>a</sup> (No./km <sup>2</sup> )	Probability of Encounter	GOM Mean Density <sup>a</sup>	GOM Sighting Frequency <sup>b</sup>
Guadalupe fur seal ( <i>Arctocephalus townsendi</i> )		Guadalupe fur seals pup and breed mainly at Isla Guadalupe, Mexico, with a second rookery at Isla Benito del Este, Baja California. In 1997, a pup was born at San Miguel Island, California. Individuals have stranded or have been sighted as far north as Blind Beach, California, inside the Gulf of California, and as far south as Zihuatanejo, Mexico.	7,408	NA	Extremely low		
<b>Mustelid – Sea Otter</b>							
Southern sea otter ( <i>Enhydra lutris nereis</i> )	California	Southern sea otters occupy nearshore waters along the California coastline from San Mateo County to Santa Barbara County. A translocated colony has been established at San Nicolas Island, Ventura County.	2,792	1.593 <sup>e</sup>	High (location)		

<sup>1</sup> Includes *Mesoplodon* species and *Ziphiidae* species.

<sup>2</sup> Stocks overlap in some California waters; however, this stock encompasses the waters along the entire California coast.

<sup>a</sup> Density estimates of marine mammal species and species groups calculated using the SERDP-SDSS Density Model for the California Coast to the 200 m isopleth.

<sup>b</sup> Source: Barkaszi et al. 2012; per 1000 hours of seismic survey.

<sup>c</sup> Bottlenose dolphin in the Gulf of Mexico mitigation reports were not separated between offshore and coastal varieties; however, in areas >200 m depth there is a greater likelihood of the offshore variety.

<sup>d</sup> Pinniped densities based on take assessments for Pt. Mugu exercises in Southern California (Koski et al. 1998) and may not represent densities equally across the California coast.

<sup>e</sup> Otter densities based on USGS/USFWS Western Ecological Research Center's Spring 2010 survey; (USGS WERC 2010); N<sub>est</sub> based on 2012 survey results, using the three-year average (USGS WERC 2012; Otter Project 2012). Additional information from Tinker et al. (2006, 2007).

Notes: **BOLD** entries indicate species whose range varies regionally along the California coast; therefore, densities will vary on a survey-specific basis.

Probability of encounter during low energy geophysical surveys is based on population estimates and distribution facts in the NOAA Stock Assessment Reports, and the density calculations are from the SERDP-SDSS density models and are not referenced from the NOAA Stock Assessment Reports. The probability of occurrence for marine mammal species in the Project area was determined based on the overall population density of the species, spatial and seasonal distribution patterns (particularly those associated with water depth), and species behavioral characteristics. These descriptors are partially subjective in that they assume an overall equal possibility of an OGPP operation occurring anywhere in State waters at any given time. Species with very low and low probability of occurrence (N= 3) during operations were those that have a low overall population density off the California coast combined with either a narrow seasonal occurrence, or are typically found well outside State waters (e.g., outside the 200 m isopleth). Species with a low to medium probability of occurrence are those that have (or have had) a documented population (seasonal or year round) in waters off the coast of California, but tend to occur at depths beyond those delineated as State waters. Species with documented sightings within State waters and those that use of shelf and slope waters or have a widely distributed resident population fell to the medium rather than low end of the occurrence scale. Species meeting both the low and medium criteria with behaviors that make them less conspicuous (e.g., deep diving, less gregarious), or lacking population data were given a higher occurrence rating as a precautionary approach. Species that have documented populations in State waters were given a high probability of occurrence even if found in a localized geographic region or only during specific seasons.

1 Similarities in densities between the seven species vary, and sighting frequency in State  
2 waters may or may not be similar. It is likely that environmental parameters and habitat  
3 use has more influence in the likelihood of occurrence rather than densities; however,  
4 some corresponding elements like sightability, surface time, and potential behavior  
5 changes due to low energy geophysical operations may be considered in evaluating the  
6 comparisons.

## 7 **Summary of Special Status Species**

8 **Table 3-16** lists special status species that may occur in the Project area, including  
9 invertebrates, birds, fish, sea turtles, and marine mammals.

## 10 **Invasive Species**

11 All major ports and harbors in California have been affected to varying degrees by  
12 invasive species, or aquatic invasive species (AIS), and include both flora and fauna.  
13 According to the CDFW (California Department of Fish and Game [CDFG] 2008a), each  
14 major commercial port in the State has between 40 and 190 introduced species, with an  
15 additional 15 to 138 species of unknown origin (i.e., cryptogenic) that are possibly  
16 introduced (CDFG 2008a; CSLC 2012a). Several of the most readily identifiable and  
17 problematic AIS include the European green crab (*Carcinus maenas*), the Chinese  
18 mitten crab (*Eriocheir sinensis*), the Asian overbite clam (*Corbula amurensis*), and a  
19 variety of aquatic plants.

20 Vectors for AIS include ballast water and biofouling present on vessel hulls. Invasive  
21 species can also cling to recreational gear, fishing equipment, drilling platforms, floating  
22 debris and docks. In addition, they may escape or be released into State waters from  
23 aquaculture packing materials, ornamental ponds, and aquariums. Shoreline restoration  
24 and construction projects, as well as water-based scientific research, also transport  
25 species (CDFG 2008a). Introduced species have the potential to affect indigenous  
26 populations through a variety of mechanisms. AIS may reduce diversity and abundance  
27 of native plants and animals due to competition, predation, parasitism, genetic dilution,  
28 introduction of pathogens, and smothering and loss of habitat. AIS may also degrade  
29 existing wildlife habitat and place stress on rare, threatened, and endangered species.  
30 Introduced species may alter native food webs and produce declines in productivity, as  
31 well as alter native biogeochemical cycles (including nutrient cycling and energy flow),  
32 affecting fisheries production and degrading water quality. AIS may also affect  
33 socioeconomic resources by impairing recreational uses (e.g., swimming, boating,  
34 diving and fishing), and affect coastal infrastructure due to the presence and activity of  
35 fouling and boring organisms.

1 **Table 3-16. Special Status Species that may Occur in the Project Area (From: CDFG 2011; CDFW 2013)**

Common Name	Scientific Name	Status
<b>Invertebrates</b>		
Black abalone	<i>Haliotis cracherodii</i>	FE
White abalone	<i>Haliotis sorenseni</i>	FE
Green abalone	<i>Haliotis fulgens</i>	SC
Pink abalone	<i>Haliotis corrugata</i>	SC
Pinto abalone	<i>Haliotis kamtschatkana kamtschatkana</i>	SC
Flat abalone	<i>Haliotis walallensis</i>	SC
<b>Birds</b>		
Ashy storm-petrel	<i>Oceanodroma homochroa</i>	SSC
Black storm-petrel	<i>Oceanodroma melania</i>	SSC
California black rail	<i>Laterallus jamaicensis coturniculus</i>	ST
California clapper rail	<i>Rallus longirostris obsoletus</i>	SE, FE
California condor	<i>Gymnogyps californianus</i>	SE, FE
California least tern	<i>Sterna antillarum browni</i>	SE, FE
Cassin's auklet	<i>Ptychoramphus aleuticus</i>	SSC
Fork-tailed storm-petrel	<i>Oceanodroma furcata</i>	SSC
Light-footed clapper rail	<i>Rallus longirostris levipes</i>	SE, FE
Marbled murrelet	<i>Brachyramphus marmoratus</i>	SE, FT
Short-tailed albatross	<i>Phoebastria albatrus</i>	FE; SSC
Tufted puffin	<i>Fratercula cirrhata</i>	SSC
Western snowy plover	<i>Charadrius alexandrinus nivosus</i>	FT; SSC
Xantus's murrelet	<i>Synthliboramphus hypoleucus</i>	ST
<b>Fish</b>		
Chinook salmon	<i>Oncorhynchus tshawytscha</i>	Winter run: SE, FE; CA Coastal ESU: FT; Spring run: ST, FT
Coho salmon	<i>Oncorhynchus kisutch</i>	S. OR/N. CA ESU: ST, FT; Central CA Coast ESU: SE, FE
Pacific eulachon	<i>Thaleichthys pacificus</i>	Southern DPS: SSC; FT
Green sturgeon	<i>Acipenser medirostris</i>	Southern DPS: FT
Steelhead	<i>Oncorhynchus mykiss irideus</i>	Southern CA DPS: FE; South/Central CA Coast and Northern CA DPS: SSC, FT; Central CA Coast DPS: FT
Tidewater goby	<i>Eucyclogobius newberryi</i>	FE; SSC
White shark	<i>Carcharodon carcharias</i>	SSC
<b>Sea Turtles</b>		
Green sea turtle	<i>Chelonia mydas</i>	FT
Leatherback sea turtle	<i>Dermochelys coriacea</i>	FE
Loggerhead sea turtle	<i>Caretta caretta</i>	North Pacific DPS: FE
Olive ridley sea turtle	<i>Lepidochelys olivacea</i>	FT

Common Name	Scientific Name	Status
<b>Marine Mammals</b>		
Blue whale	<i>Balaenoptera musculus musculus</i>	FE
Fin whale	<i>Balaenoptera physalus physalus</i>	FE
Humpback whale	<i>Megaptera novaeangliae</i>	FE
North Pacific right whale	<i>Eubalaena japonica</i>	FE
Sei whale	<i>Balaenoptera borealis borealis</i>	FE
Sperm whale	<i>Physeter macrocephalus</i>	FE
Guadalupe fur seal	<i>Arctocephalus townsendi</i>	ST, FT
Killer whale	<i>Orcinus orca</i>	Southern resident DPS: FE; proposed for delisting Nov 2012
Southern sea otter	<i>Enhydra lutris nereis</i>	FT
Northern (Steller) sea lion	<i>Eumetopias jubatus</i>	Eastern DPS: FPD (FT)
Acronyms and Abbreviations: SSC = California Species of Special Concern; DPS = distinct population segment; ESU = evolutionary significant unit(s); FDP = federally proposed for delisting; FE = federally endangered; FT = federally threatened; SC = Federal Species of Concern; SE = State endangered; ST = State threatened.		



## **Marine Protected Areas**

The CFGC and CDFW have jurisdiction over a number of MPAs located within State waters across all four permit regions. MPAs were created in response to MLPA requirements and are intended primarily to protect or conserve marine life and habitat. The CDFW website ([www.dfg.ca.gov/marine/mpa/index.asp](http://www.dfg.ca.gov/marine/mpa/index.asp)) lists individual MPA guides. A summary of each MPA region is included below.

The South Coast region encompasses approximately 2,351 mi<sup>2</sup> of State waters from Point Conception (Santa Barbara County) south to the California/Mexico border, including State waters around the Channel Islands. A network of 50 MPAs (i.e., 19 State Marine Reserves [SMRs], 31 State Marine Conservation Areas [SMCAs]) and two special closures (including 13 MPAs previously established at the northern Channel Islands) covers approximately 355 mi<sup>2</sup>, or about 15 percent, of State waters in Southern California. There are no State Marine Parks (SMPs) or State Marine Recreational Management Areas (SMRMAs) in the South Coast region.

The Central Coast region encompasses approximately 1,144 mi<sup>2</sup> of State waters from Pigeon Point (San Mateo County) south to Point Conception (Santa Barbara County). A network of 28 MPAs (i.e., 13 SMRs, 14 SMCAs, and one SMCA/SMP), and one SMRMA covers approximately 207 mi<sup>2</sup>, or about 18 percent, of State waters off Central California.

The North Central Coast region includes 21 MPAs (i.e., 11 SMRs, 10 SMCAs), three SMRMAs, and six special closures with varying degrees of protection. These areas cover approximately 153 mi<sup>2</sup>, or about 20 percent, of State waters within the region (Alder Creek to Pigeon Point). Of the 21 MPAs, 10 are no-take state marine reserves which represent about 84 of the 153 mi<sup>2</sup>, or about 11 percent of the State waters in the North Central Coast region.

The North Coast region encompasses approximately 1,027 mi<sup>2</sup> of State waters from the California-Oregon border south to Alder Creek, near Point Arena (Mendocino County). A network of 19 MPAs (i.e., 13 SMCAs, six SMRs), one SMRMA, and seven special closures covers approximately 137 mi<sup>2</sup>, or about 13 percent, of State waters in Northern California.

## **Ambient Underwater Noise**

This section describes the general existing underwater noise-related conditions in the Project area. As background for that discussion and for the technical discussions later in this section, an explanation of key technical terms and concepts associated with the characterization of sound is provided below.

1 *Sound Characteristics*

2 Sound is generated when an object vibrates and causes minute periodic fluctuations in  
3 atmospheric pressure, i.e., sonic waves. Perception of sound is dependent on various  
4 factors, including the following:

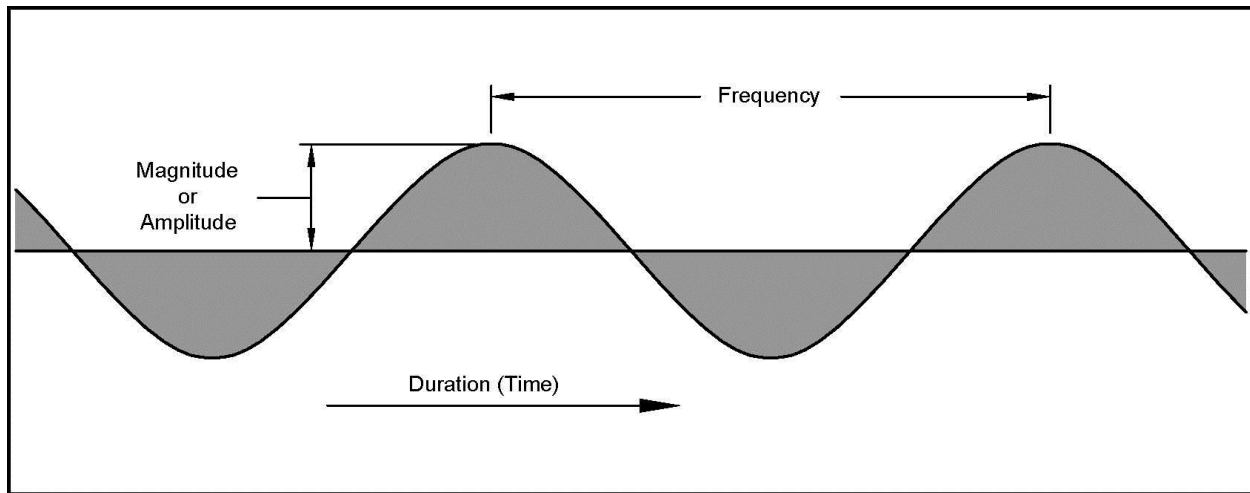
- 5 • *Frequency.* Frequency is the number of pressure variations (vibrations) per  
6 second (Hertz [Hz]). Humans can typically hear sound waves with frequencies  
7 between 20 Hz and 20 kHz; the human ear does not perceive sound at the low-  
8 and high-frequencies as well as it does at the middle frequencies.
- 9 • *Tone vs. Pulse.* A tone is a sound of a constant frequency that continues for a  
10 substantial time, whereas a pulse is a sound of short duration, and it may include  
11 a broad range of frequencies.
- 12 • *Frequency Range.* Because the range of frequencies of a sound source may  
13 vary, the sound's frequency bandwidth should be specified and included in the  
14 reference units. The units for a power spectrum are decibels (dB) referenced to  
15 (re) 1 square microPascal ( $\mu\text{Pa}^2$ )/Hz.
- 16 • *Magnitude.* Sound magnitude, or degree of loudness, is measured on the decibel  
17 (dB) scale, which is a logarithmic scale of sound wave amplitude (i.e., the  
18 "height" of a sound wave; see **Figure 3-1** below). A logarithmic scale is used  
19 because equal increments of dB values do not have an equal increase in effect.  
20 Any quantity expressed in this scale is termed a 'level'. These quantities are  
21 absolute values, however, and not tied to how sound energy interacts with  
22 hearing organisms; therefore, sound is more commonly expressed as a sound  
23 pressure level (SPL),<sup>10</sup> which is a ratio of the dB level to a standard reference  
24 sound level related to sound levels at which humans can perceive noise. By  
25 convention, the reference quantity is smaller than the smallest value to be  
26 expressed on the scale, so that any level quoted is a positive value. For example:
  - 27 ○ A reference sound pressure of 20 microPascal ( $\mu\text{Pa}$ ) (expressed as "dB re  
28 20  $\mu\text{Pa}$ ") is used for sound in air, because this is the threshold of human  
29 hearing in air; and
  - 30 ○ For underwater sound, 1  $\mu\text{Pa}$  is used as the reference sound pressure  
31 (expressed as "dB re 1  $\mu\text{Pa}$ ").<sup>11</sup>

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<sup>10</sup> Recalling that sound moves as a wave, the higher the amplitude of the wave, the more pressure it exerts on the atmosphere or on a surface, such as an ear drum.

<sup>11</sup> A Pascal (Pa) is equal to the pressure exerted by one Newton over one square meter; 1  $\mu\text{Pa}$  equals one millionth of a Pascal.

Figure 3-1. Diagram of Sound Wave Characteristics



Because sound energy is not constant, but occurs in waves, with positive peaks and negative dips, acousticians calculate the effective, average sound level by squaring the amplitudes of the wave to make all values positive, averaging those values over a period of time, and then taking the square root of that average. Sound pressures averaged in this way are measured in units of root mean square (rms) SPL. Sound pressure may also be expressed as peak-to-peak or zero-to-peak (see **Glossary**). Peak-to-peak (p-p) is the pressure difference between the maximum positive pressure and the maximum negative pressure in a sound wave. Zero-to-peak (0-p) is the pressure difference between zero and the maximum positive (or maximum negative) pressure in a sound wave.

To account for the fact that the human ear does not perceive sound equally well at all frequencies, a weighting scale called A-weighting decibel scale (dBA) is typically used to better characterize the noise level perceived by the human ear. On this scale, the low and high frequencies are given less weight than the middle frequencies.

- *Duration* – The length of time to which a receptor is exposed to a sound also affects the organism's perception of that sound. The same acoustic energy can be obtained from a pulse of high sound pressure level lasting a short time or a tone of lower sound pressure level lasting a correspondingly longer time.
- *Inter-pulse Interval* – The inter-pulse interval (IPI) is the lag time between consecutive pulses, or sounds.
- *Rise Time* – The rise time for a signal, or sound, is the interval of time required for it to go from zero, or its lowest value, to its maximum value.

1 Sound travels much faster in water (approximately 1,500 meters per second [m/s]) than  
2 in air (340 m/s). Because water is a relatively incompressible dense medium, the  
3 pressures associated with underwater sound tend to be much higher than in air. As an  
4 example, background levels of ocean noise of approximately 130 dB re 1  $\mu$ Pa for  
5 coastal waters are not uncommon (Nedwell et al. 2003; Nedwell et al. 2007). This level  
6 equates to about 100 dB re 20  $\mu$ Pa in air. Such levels in air would be considered  
7 hazardous; however, marine mammals and fish have evolved to live in this environment  
8 and are thus adapted to these sound pressures compared to terrestrial mammals.

#### 9 *Sources of Ocean Noise*

10 Ambient underwater noise levels in the ocean can be complex, and vary spatially  
11 (i.e., from location to location; deep- versus shallow-water) and temporally (e.g., day to  
12 day, within a day, and/or from season to season). Both natural and anthropogenic  
13 (human-made) sources provide significant contributions to ambient noise levels in the  
14 ocean.

15 Natural noise sources include wind, waves, rain, and biologics (e.g., whales, dolphins,  
16 fish). Naturally occurring noise levels in the ocean from wind and wave activity may  
17 range from 90 dB re 1  $\mu$ Pa under very calm, low wind conditions to 110 dB re 1  $\mu$ Pa  
18 under windy conditions. Wind is the major contributor to noise between 100 Hz and  
19 30 kHz, while wave generated noise is a significant contribution in the infrasonic range  
20 (1 to 20 Hz). Surf noise, however, is specific to coastal locations (Simmonds et al.  
21 2003).

22 Anthropogenic noise sources include shipping, industry (e.g., oil and gas drilling), and  
23 equipment (**Table 3-17**). Increases in ambient underwater noise levels are a result of  
24 increased maritime activities including commercial shipping, seismic surveys associated  
25 with oil and gas exploration and academic research, military and commercial sonar use,  
26 maritime recreation, fishing activities, and coastal development. In many ocean areas,  
27 the dominant source of anthropogenic, low frequency noise (i.e., 20-200 Hz) is from the  
28 propellers and engines of commercial shipping vessels (Rolland et al. 2012; McKenna  
29 et al. 2012), which can contribute to ambient underwater noise levels across large  
30 spatial scales (Curtis et al. 1999; Andrew et al. 2002; McDonald et al. 2006, 2008;  
31 Chapman and Price 2011).

**Table 3-17. Sound Characteristics of Major Ocean Sound Producers**  
**(From: MMC 2007; Hildebrand 2005)**

Sound Source	Primary Frequency Range	Sound Pressure Levels	Distribution	Total Energy
Commercial Shipping	5–100 Hz	150–195 dB re 1 $\mu\text{Pa}^2/\text{Hz}$ at 1 m	Great circle routes, coastal and port areas	$3.7 \times 10^{12}$
Seismic Airgun Arrays	5–300 Hz	up to 259 dB dB re 1 $\mu\text{Pa}$	Variable, with emphasis on continental shelf and deep-water areas potentially containing oil and/or gas	$3.9 \times 10^{13}$
Naval Sonars	100–500 Hz (SURTASS LFA)	235 dB re 1 $\mu\text{Pa}$	Variable below 70° latitude	$2.6 \times 10^{13}$
	2–10 kHz (Mid-frequency sonar)	235 dB re 1 $\mu\text{Pa}$	Variable, with emphasis in coastal areas	
Fisheries Sonars	10–200 kHz	150–210 dB re 1 $\mu\text{Pa}$	Variable, primarily coastal and over the continental shelf	Unknown
Research Sonars	3–100 kHz	up to 235 dB dB re 1 $\mu\text{Pa}$	Variable	Unknown
Acoustic Deterrents, Harassment Devices	5–16 kHz	130–195 dB re 1 $\mu\text{Pa}$	Coastal	Unknown

Acronyms: SURTASS = Surveillance Towed Array Sensor System; LFA = Low-Frequency Active.

Different noise sources are dominant in each of three frequency bands:

- Low: 10 to 500 Hz;
- Mid: 500 Hz to 25 kHz; and
- High: > 25 kHz.

The low-frequency band is dominated by anthropogenic sources: primarily, commercial shipping and, secondarily, seismic exploration. Shipping and seismic sources contribute to ambient noise across ocean basins, since low-frequency sound experiences little attenuation (loss in sound energy level that occurs as sound travels away from its source), allowing for long range propagation. Over the past few decades, the contribution of shipping noise to ambient noise levels has increased, coincident with a significant increase in the number and size of vessels comprising the world's commercial shipping fleet (Hildebrand 2009).

The mid-frequency band is comprised of natural (e.g., sea surface agitation) and anthropogenic (e.g., military and mapping sonars, small vessels) noise sources that cannot propagate over long ranges, owing to greater attenuation, with only local or regional sources contributing to the ambient noise field (Hildebrand 2009).

The high-frequency band is dominated by thermal noise, with anthropogenic noise sources such as sonars (for shallow-water echosounding and locating small objects, such as fish), contributing to the ambient noise field. At high-frequencies, acoustic attenuation becomes extreme so that all noise sources are confined to an area within a few kilometers of the source (Hildebrand 2009).

### Marine Vessel Traffic

Vessel traffic noise dominates marine waters, originating from propellers (i.e., propeller cavitation), machinery, hull movement through water, and various equipment types (e.g., sonar, depth sounders). Shipping is a major contributor to increased levels of low-frequency anthropogenic noise (less than 1 kHz) in the marine environment (National Research Council [NRC] 1994, 2003a), and has raised ambient noise levels at frequencies below 100 Hz by an estimated 15 dB in the deep ocean since 1950 due to motorized shipping (Ross 1987, 1993; Mazzuca 2001; Andrew et al. 2002). In comparison to shipping, small leisure craft typically generate sound from 1 to 50 kHz. Representative sound source levels from various vessels are provided in **Table 3-18**. In addition to vessel noise, the high volume of commercial vessel traffic into California's major ports is a concern, particularly as it relates to ship strike potential and marine mammals (e.g., Redfern et al. 2013).

**Table 3-18. Summary of Sound Frequencies Produced by Shipping Traffic and Their Source Levels (Adapted from: Simmonds et al. 2003)**

Type of Vessel	Frequency (kHz)	Source Level (dB re 1 $\mu$ Pa at 1 m)	Reference
Rigid inflatable (rescue craft)	6.3	152	Malme et al. 1989
Motor boat (7 m outboard)	0.63	156	Malme et al. 1989
Fishing boat	0.25–1.0	151	Greene 1985
Fishing trawler	0.1	158	Malme et al. 1989
Tug pulling empty barge	0.037	166	Buck and Chalfant 1972; Miles et al. 1989
	1.0	164	
	5.0	145	
Tug pulling loaded barge	1.0	170	Miles et al. 1989
	5.0	161	
Workboat (34 m; twin diesel engine)	0.63	159	Malme et al. 1989
Tanker (135 m)	0.43	169	Buck and Chalfant 1972
Tanker (179 m)	0.06	180	Ross 1976
Supertanker (266 m)	0.008	187	Thiele and Ødengaard 1983
Containership (219 m)	0.033	181	Buck and Chalfant 1972
Containership (274 m)	0.008	181	Ross 1976
Freighter (135 m)	0.041	172	Thiele and Ødengaard 1983

Generally, the ambient noise spectral level (i.e., the sound pressure density spectrum) in the ocean is about 140 dB re 1  $\mu$ Pa<sup>2</sup>/Hz at 1 Hz and decreases at the rate of 5 to 10 dB per octave to a level of about 20 dB re 1  $\mu$ Pa<sup>2</sup> per Hz at 100 kHz. An octave is defined as those frequencies contained between a given frequency and a frequency

that is twice as high. Ambient noise level due to ship traffic may be nominally 75 dB re 1  $\mu\text{Pa}^2/\text{Hz}$  at 100 Hz. Large commercial vessels produce relatively loud and predominately low-frequency sounds; source levels are generally in the 180 to 195 dB re 1  $\mu\text{Pa}$  at 1m with peak levels in the 10 to 50 Hz frequency band (Heitmeyer et al. 2004). Other sources cite shipping traffic at frequencies from 20 to 300 Hz, with fishing vessels producing the higher-frequency sound peaking at 300 Hz, and larger cargo vessels at the lower frequency sounds (MMS 2001).

Richardson et al. (1995) summarized anthropogenic noise from various vessels and aircraft, reporting broadband source levels up to 186 dB re 1  $\mu\text{Pa}$  from tankers with most energy below 430 Hz. Arveson and Vendittis (2000) report wideband source levels of a merchant cargo ship up 178 to 193 dB re 1  $\mu\text{Pa}$  rms at speeds from 8 to 16 knots, respectively. Thiele and Ødegaard (1983) measured third-octave band source levels up to 198 dB re 1  $\mu\text{Pa}$  from the container ship *M/S Jutlandia*. Estimated source levels of 156 dB re 1  $\mu\text{Pa}$  at 1 m have been noted for a 16-m crew boat (with a 90-Hz dominant tone) and 159 dB re 1  $\mu\text{Pa}$  at 1 m for a 34-m twin diesel (630 Hz, 1/3 octave). Broadband source levels for small, supply boat-sized ships (55 to 85 m) are about 170 to 180 dB re 1  $\mu\text{Pa}$  at 1 m. Support vessels associated with offshore oil and gas operations emit average noise levels of approximately 182 dB re 1  $\mu\text{Pa}$ , noise produced mainly by the bow thrusters (Pidcock et al. 2003). Noise from a support vessel holding its position using bow thrusters may be detectable above background noise during calm weather for 20 km or more from the vessel. Most of the sound energy produced by these vessels is at frequencies below 500 Hz, including many of the commercial fishing vessels operating off California.

Individual vessels produce unique acoustic signatures, and these signatures may change with ship speed, vessel load, operational mode, and any implemented noise-reduction measures (Hildebrand 2009). Large vessels tend to be noisier than small ones, as are vessels with a full load (towing or pushing a load) than unladen vessels (Simmonds et al. 2003). In addition, noise levels typically increase with vessel speed. Propellers produce most of the broadband noise, with propulsion and auxiliary machinery also contributing to overall noise signatures (Pidcock et al. 2003; Sakhalin 2004). For example, underwater noise from a 20-m fishing vessel traveling at 11 to 12 knots was recorded at 166 dB re 1  $\mu\text{Pa}$ , and a 64-m oil rig tender at 177 dB re 1  $\mu\text{Pa}$ , indicating that the larger the boat the more noise it produces (Pidcock et al. 2003).

The relative contribution of vessel noise to ambient ocean noise varies with the distribution of vessel traffic, such as areas with shipping lanes (Andrew et al. 2002; McDonald et al. 2006). Distant shipping noise causes elevated ocean noise levels across a defined frequency band (5 to 100 Hz), where the integrated effects of numerous distant vessels create a slowly varying background noise level that is omnipresent (Hatch and Fristrup 2009). Transiting vessels introduce a variety of

1 exposure patterns to marine fauna, and dispersed vessel traffic will produce transient  
2 noise peaks for those animals close to each ship's path. Shipping lanes generate similar  
3 transient peaks, but at much higher repetition rates. Currently, commercial vessels are  
4 exempt from noise exposure assessment and regulation; however, U.S. regulators are  
5 examining noise-quieting technologies.

#### 6 Oil and Gas Platforms

7 Several oil and gas production platforms are located offshore Ventura, Santa Barbara,  
8 and San Luis Obispo Counties, mostly in Federal waters, and all of which are currently  
9 in production, except for Platform Grace, which is no longer producing, but moves  
10 product from Platform Gail to the Carpinteria Gas Plant in Santa Barbara County.

11 Noise characterizations from drilling platforms are limited. Richardson et al. (1995)  
12 notes that the noise produced by platforms are comparable to those produced by  
13 semi-submersible drill rigs, the latter of which are broadband sources in the range of  
14 146 to 154 dB re 1  $\mu$ Pa when not actively drilling, and 169 dB re 1  $\mu$ Pa during drilling  
15 operations.

#### 16 Commercial and Recreational Fishing

17 Commercial fishing occurs in marine waters of all four coastal regions in the study area.  
18 Since 1980, there has been a trend of a decreasing number of commercial fishermen  
19 and commercial fishing vessels participating in California's commercial fisheries.  
20 Between 1980 and 2004, the number of commercial fishing vessels registered statewide  
21 has declined by 64 percent, from approximately 9,200 in 1980 to 3,300 in 2004.  
22 Although a decline in registered vessels has not occurred every year since 1988, the  
23 overall decline has averaged 3.2 percent per year since then (CDFG 2005).

24 Recreational fishing is an important activity along the entire California coast,  
25 contributing to many local and regional economies. Second only to Florida, California  
26 has more than 2.7 million sportfishing participants (Pendleton and Rooke 2006).

27 Commercial fishing vessels represent a potentially significant noise source on a  
28 localized basis, attributed to vessel engines and the use of fish-finding sonar and depth  
29 finders. The use of such equipment also extends to recreational fishing vessels, the  
30 latter of which may represent 500,000 to 600,000 vessels.

31 For a detailed description of commercial and recreational fishing and potential Project  
32 effects, please see **Section 3.3.15, Commercial and Recreational Fisheries**.

#### 33 Sonar

34 At mid- and high-frequencies, naval, commercial, fishery, and recreational sonars are  
35 dominant. Civilian and commercial sonars operating at high frequencies are used for



detection, localization, and classification of various underwater targets (e.g., seabed, plankton, fish). Such sonars generally produce sound at lower source levels with narrower beam patterns and shorter pulse lengths than military sonars; however, these sonars are more widespread due to their presence on a large number of commercial and recreational vessels (NRC 2003a; Hildebrand 2009). Vessels equipped with civilian or commercial sonars operate primarily in shallow waters (e.g., coastal, continental shelf areas), and operational usage has been characterized as nearly continuous, with activities occurring both day and night and throughout the year (Convention on Biological Diversity 2012).

Most civilian and commercial sonar systems focus sound downwards, though some horizontal fish finders are available. Fish-finding sonars operate at frequencies typically between 24 and 200 kHz, which is within the hearing frequencies of some marine mammals (e.g., phocids), but above that of most fish (OSPAR Commission 2009). Bathymetric mapping sonars use frequencies ranging from 12 kHz for deep-water systems to between 70 and 100 kHz for shallow water mapping systems. Multibeam sonars operate at high source levels (e.g., 245 dB re 1  $\mu$ Pa rms at 1 m), but have highly directional beams (Hildebrand 2009).

#### *Existing Ocean Noise Levels*

Ambient noise levels off the coast of California have increased many-fold over the past several decades, primarily attributed to increased commercial shipping transits. In the Santa Barbara Channel region, average baseline noise levels have been estimated at 50 to 55 dB re 1  $\mu$ Pa. This area encompasses an area that is bordered by Anacapa Island, the south side of Santa Cruz Island to San Nicolas Island, and Santa Barbara Island (U.S. Department of the Navy 2002).

Measurements off the Central California coast have shown marked increases in noise levels over the past several decades. Cocker (2008) evaluated ocean acoustic recordings from January to June 2007 from a former listening station west of Point Sur; Margolina et al. (2011) evaluated sound data from the same location during the 2008-2009 period. Data were analyzed to determine the characteristics of the ambient acoustic noise. Direct comparisons to previous studies conducted at the same location by Cocker (2008) revealed a near identical match of the pressure spectrum level in the 50- to 120-Hz frequency band to a 1994–2001 study. Comparison to a 1963–1965 study revealed a 3 to 5 dB increase in ambient noise over the 60- to 300-Hz frequency band. As expected, relating ambient noise to wind speed revealed a significant correlation between 400 Hz and 10 kHz, with a maximum correlation near 2 kHz. Comparing shipping data from San Francisco and Los Angeles-Long Beach ports to ambient noise in the 10-Hz to 1-kHz frequency band revealed obvious patterns in the relationship of the number of ships arriving or departing each day and noise level. Due to its proximity, San Francisco shipping data had a greater effect on ambient noise levels at Point Sur.

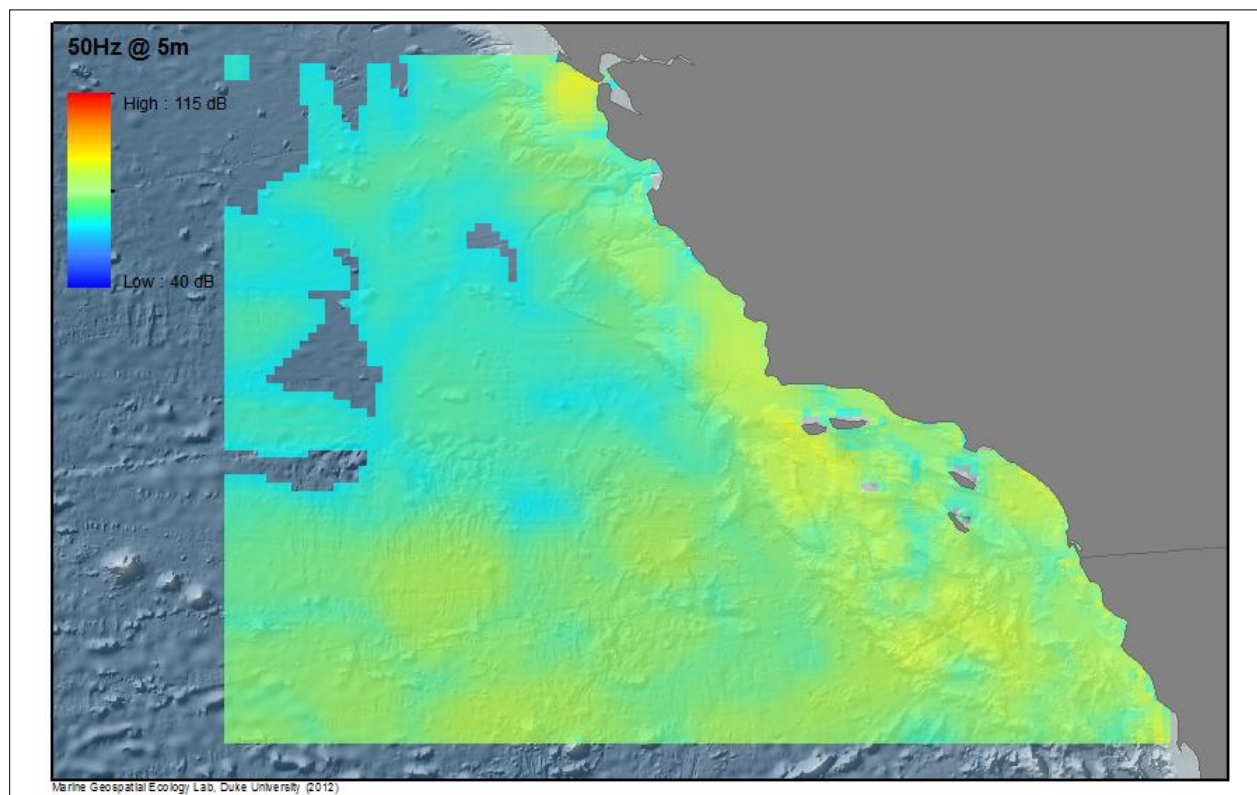
Dazey et al. (2012), measuring ambient noise levels in the ocean off Santa Rosa Island, noted rms SPLs ranging from 70.6 to 110.9 dB, with an average peak frequency of 174.1 Hz (Table 3-19).

**Table 3-19. Descriptive Statistics for Peak Frequency and Sound Pressure Levels Measured from Recordings During Baseline Monitoring in Bechers Bay, April and May 2009 (N = 143)**

Statistic	Peak Frequency (Hz)	SPL (dB re 1 $\mu$ Pa rms)
Min	86.1	70.6
Max	1320.7	110.9
Mean (x)	174.1	92.1
SD	166.4	10.8

NOAA's Underwater Sound-field Mapping Working Group (SoundMap) is developing tools to map the contribution of human sound sources to underwater ocean noise in U.S. waters. An example is provided in Figure 3-2.

**Figure 3-2. Noise Levels off the Southwest U.S. Coast from Passenger Vessels (From: NOAA 2012)**



These tools use environmental descriptors and the distribution, density, and acoustic characteristics of human activities within U.S. waters to develop first-order estimates of

1 their contribution to ambient noise levels at multiple frequencies, depths, and  
 2 spatial/temporal scales. SoundMap is providing preliminary mapping products as  
 3 images with the goal of making the underlying data available in subsequent releases.

#### 4 3.3.4.2 Regulatory Setting

5 Federal and State laws and regulations pertaining to this issue and relevant to the  
 6 Project are identified in **Table 3-20**.

7 **Table 3-20. Major U.S. and/or State Laws, Regulations, and Policies**  
 8 **Potentially Applicable to the Project (Biological Resources)**

U.S.	Endangered Species Act (FESA) (7 U.S.C. § 136, 16 U.S.C. § 1531 et seq.)	<p>The FESA, which is administered in California by USFWS and NMFS, provides protection to species listed as threatened or endangered, or proposed for listing as threatened or endangered. Generally, USFWS manages land and freshwater species, while NMFS manages marine and anadromous species, with minor exception; for example, USFWS has responsibility for the southern sea otter and polar bear (other exceptions are noted below). NMFS currently has jurisdiction over 94 listed species, including marine mammals (exclusions noted), sea turtles, marine and anadromous fish, marine invertebrates, and marine plants.</p> <p>In addition to the listed species, the Federal government also maintains lists of species that are neither formally listed nor proposed, but could potentially be listed in the future. Federal candidate species list includes taxa for which substantial information on biological vulnerability and potential threats exists, and is maintained in order to support the appropriateness of proposing to list the taxa as an endangered or threatened species. Federal Species of Concern comprise those species that should be given consideration during environmental review.</p> <p>Section 9 prohibits the “take” of any member of a listed species.</p> <ul style="list-style-type: none"> <li>• Take is defined as “...to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.”</li> <li>• Harass is “an intentional or negligent act or omission that creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding, or sheltering.”</li> <li>• Harm is defined as “...significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering.”</li> </ul> <p>When applicants are proposing projects with a Federal nexus that “may affect” a federally listed or proposed species, the Federal agency is required to consult with the USFWS or NMFS, as appropriate, under Section 7, which provides that each Federal agency must ensure that any actions authorized, funded, or carried out by the agency are not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of areas determined to be critical habitat.</p>
U.S.	Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. § 1801	<p>The MSA is the primary law governing marine fisheries management in U.S. Federal waters. The MSA was first enacted in 1976 and amended in 1996. Amendments to the 1996 MSA require the identification of Essential Fish Habitat (EFH) for federally managed species and the implementation of measures to conserve and enhance this habitat. Any project requiring Federal authorization, such as an ACOE permit, is required to complete and submit an EFH Assessment with the application and either show that no significant impacts to the essential habitat of managed species are expected or identify mitigations to reduce those</p>

	et seq.)	impacts. Under the MSA, Congress defined EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity” (16 U.S.C. § 1802(10)). The EFH provisions of the MSA offer resource managers a means to heighten consideration of fish habitat in resource management. Pursuant to section 305(b)(2), Federal agencies shall consult with the NMFS regarding any action they authorize, fund, or undertake that might adversely affect EFH.
U.S.	Marine Mammal Protection Act (MMPA) (16 U.S.C. § 1361 et seq.)	<p>The MMPA is designed to protect and conserve marine mammals and their habitats. It prohibits takes of all marine mammals in the U.S. (including territorial seas) with few exceptions. The NMFS may issue a take permit under section 104 if the activities are consistent with the purposes of the MMPA and applicable regulations at 50 C.F.R. Part 216. The NMFS must also find that the manner of taking is “humane” as defined in the MMPA. If lethal taking of a marine mammal is requested, the applicant must demonstrate that using a non-lethal method is not feasible.</p> <p>Under the MMPA, the Secretary of Commerce is responsible for the conservation and management of pinnipeds (other than walruses) and cetaceans. This act also specifies and defines actions that are considered harassment and provides for agency-mandated compliance with mitigations to reduce impacts to the protected species. The Secretary of the Interior is responsible for walruses, sea and river otters, polar bears, manatees and dugongs. The Secretary of Commerce delegated MMPA authority to NMFS. Part of the responsibility that NMFS has under the MMPA involves monitoring marine mammal populations, including recovery, to ensure that populations at risk remain at optimum levels. If a population falls below its optimum level, it is designated as depleted, its stock status is determined to be strategic, and a conservation plan is developed to guide research and management actions to restore the population to healthy and sustainable levels.</p>
U.S.	Migratory Bird Treaty Act (MBTA) (16 U.S.C. § 703-712)	The MBTA was enacted to ensure the protection of shared migratory bird resources. The MBTA prohibits the take, possession, import, export, transport, selling, purchase, barter, or offering for sale, purchase, or barter, of any migratory bird, their eggs, parts, and nests, except as authorized under a valid permit. The responsibilities of Federal agencies to protect migratory birds are set forth in EO 13186. The USFWS is the lead agency for migratory birds. The USFWS issues permits for takes of migratory birds for activities such as scientific research, education, and depredation control, but does not issue permits for incidental take of migratory birds.
U.S.	Other	<ul style="list-style-type: none"> <li>• The <b>Bald and Golden Eagle Protection Act</b> makes it illegal to import, export, take (including molest or disturb), sell, purchase or barter any bald eagle or golden eagle or parts thereof.</li> <li>• <b>Clean Water Act</b> (33 U.S.C. § 1251 et seq.) (See 3.3.8, Hydrology and Water Quality)</li> <li>• <b>Executive Order 13112</b> requires Federal agencies to use authorities to prevent introduction of invasive species, respond to and control invasions in a cost-effective and environmentally sound manner, and to provide for restoration of native species and habitat conditions in ecosystems that have been invaded.</li> <li>• <b>Executive Order 13158</b> requires Federal agencies to (1) identify actions that affect natural or cultural resources that are within a Marine Protected Area (MPA); and (2) in taking such actions, to avoid harm to the natural and cultural resources that are protected by a MPA.</li> <li>• <b>The Marine Plastic Pollution Research and Control Act of 1987</b> (33 U.S.C. § 1901 et seq.) prohibits the disposal of plastics and non-biodegradable material into the marine waters.</li> <li>• <b>The National Aquatic Invasive Species Act</b> was originally passed in 1990 in response to the invasion of the zebra mussel and other species that damaged the Great Lakes. That law brought much-needed attention to the global movement of aquatic species. It also established the Federal interagency</li> </ul>

		<p>Aquatic Nuisance Species Task Force, which became a key resource for regional and state efforts. The 2005 reauthorization specifies the requirements related to the exchange/discharge of ballast water from ocean-going vessels that enter Federal waters or U.S. lakes.</p> <ul style="list-style-type: none"> <li>• <b>The Oil Pollution Act of 1990 (OPA 90)</b> (33 U.S.C. § 2712) requires owners and operators of facilities that could cause substantial harm to the environment to prepare and submit plans for responding to worst-case discharges of oil and hazardous substances. The passage of OPA 90 directed the State of California to pass a more stringent spill response and recovery regulation and to create the State Office of Spill Prevention and Response (OSPR) to review and regulate oil spill plans and contracts.</li> <li>• <b>Rivers and Harbors Act</b> (33 U.S.C. § 401) (See 3.3.8, Hydrology and Water Quality)</li> </ul>
CA	California Endangered Species Act (CESA) (Fish & G. Code § 2050 et seq.)	<p>The CESA provides for the protection of rare, threatened, and endangered plants and animals, as recognized by the California Department of Fish and Wildlife (CDFW), and prohibits the taking of such species without its authorization. Furthermore, the CESA provides protection for those species that are designated as candidates for threatened or endangered listings. Under the CESA, the CDFW has the responsibility for maintaining a list of threatened species and endangered species (Fish &amp; G. Code § 2070). The CDFW also maintains a list of candidate species, which are species that the CDFW has formally noticed as under review for addition to the threatened or endangered species lists. The CDFW also maintains lists of Species of Special Concern that serve as watch lists. Pursuant to the requirements of the CESA, an agency reviewing a proposed project within its jurisdiction must determine whether any State-listed endangered or threatened species may be present in the project site and determine whether the proposed project will have a potentially significant impact on such species. In addition, the CDFW encourages informal consultation on any proposed project that may affect a candidate species. The CESA also requires a permit to take a State-listed species through incidental or otherwise lawful activities (§ 2081, subd. (b)).</p>
CA	California Lake and Streambed Alteration Program (Fish & G. Code §§ 1600-1616)	<p>The CDFW regulates activities that would interfere with the natural flow of, or substantially alter, the channel, bed, or bank of a lake, river, or stream. These regulations require notification of the CDFW for lake or stream alteration activities. If, after notification is complete, the CDFW determines that the activity may substantially adversely affect an existing fish and wildlife resource, the CDFW has authority to issue a Streambed Alteration Agreement.</p>
CA	California Marine Life Protection Act (MLPA) (Fish & G. Code §§ 2850–2863)	<p>Passed by the State Legislature in 1999, the MLPA required the CDFW to redesign its system of MPAs to increase its coherence and effectiveness at protecting the State's marine life, habitats, and ecosystems. For the purposes of MPA planning, a public-private partnership commonly referred to as the MLPA Initiative was established, and the State was split into five distinct regions (four coastal and the San Francisco Bay) each of which had its own MPA planning process. All four coastal regions have completed these individual planning processes. As a result the coastal portion of California's MPA network is now in effect statewide. Options for a planning process in the San Francisco Bay have been developed for consideration at a future date.</p>
CA	California Native Plant Protection Act (Fish & G. Code § 1900 et seq.)	<p>This Act is intended to preserve, protect, and enhance endangered or rare native plants in California. This Act includes provisions that prohibit the taking of listed rare or endangered plants from the wild and a salvage requirement for landowners. The Act directs the CDFW to establish criteria for determining what native plants are rare or endangered. Under section 1901, a species is endangered when its prospects for survival and reproduction are in immediate jeopardy from one or more causes. A species is rare when, although not threatened with immediate extinction, it is in such small numbers throughout its range that it may become endangered.</p>



CA	California Coastal Act Chapter 3 policies	<p>Coastal Act policies applicable to this issue area are:</p> <ul style="list-style-type: none"> <li>• <b>Section 30230</b> states: Marine resources shall be maintained, enhanced, and where feasible, restored. Special protection shall be given to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes.</li> <li>• <b>Section 30231</b> addresses biological productivity and water quality (See 3.3.8, Hydrology and Water Quality).</li> <li>• <b>Section 30233</b>, which applies in part to development activities within or affecting wetlands and other sensitive areas among other requirements, identifies eight allowable uses, requires that the proposed project be the least environmentally damaging feasible alternative, and where applicable, requires feasible and appropriate mitigation.</li> <li>• <b>Section 30240</b> states: (a) Environmentally sensitive habitat areas shall be protected against any significant disruption of habitat values, and only uses dependent on those resources shall be allowed within those areas. (b) Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas.</li> </ul>
CA	Other	<ul style="list-style-type: none"> <li>• The <b>California Aquatic Invasive Species Management Plan</b> controls the introduction and spread of non-native species within the aquatic and marine waters of the State. The management plan focuses on the non-native algae, crabs, clams, fish, plants and other species that have invaded California's creeks, wetlands, rivers, bays, and coastal waters.</li> <li>• The <b>California Harbors and Navigation Code</b> (Sections 1-7340) describes and defines provisions and legislative policy for California harbors, navigable waters, traffic, cargo, wrecks and salvage, marinas, construction/improvements, and harbor and port mitigation.</li> <li>• The <b>California Species Preservation Act</b> (Fish &amp; G. Code §§ 900-903) provides for the protection and enhancement of the amphibians, birds, fish, mammals, and reptiles of California.</li> <li>• <b>Fish and Game Code sections 3503 &amp; 3503.5</b> prohibit the taking and possession of native birds' nests and eggs from all forms of needless take. These regulations also provide that it is unlawful to take, possess, or destroy any birds in the orders Falconiformes or Strigiformes (birds-of-prey) or to take, possess, or destroy the nests or eggs of any such bird except as otherwise provided by this Code or any regulation adopted pursuant thereto.</li> <li>• <b>Fish and Game Code sections 3511</b> (birds), <b>4700</b> (mammals), <b>5050</b> (reptiles and amphibians), &amp; <b>5515</b> (fish) designate certain species as "fully protected." Fully protected species, or parts thereof, may not be taken or possessed at any time without permission by the CDFW.</li> <li>• <b>Fish and Game Code section 3513</b> does not include statutory or regulatory mechanism for obtaining an incidental take permit for the loss of non-game, migratory birds.</li> <li>• The <b>Lempert-Keene-Seastrand Oil Spill Prevention and Response Act (OSPRA)</b> established the Office of Spill Prevention and Response (OSPR) within the CDFW to provide protection of California's natural resources from the potential effects of an oil spill within ocean waters of the State. OSPRA covers all aspects of marine oil spill prevention and response in California. OSPRA requires that the CDFW and OSPR Administrator establish rescue and rehabilitation stations for seabirds, sea otters, and other marine mammals.</li> </ul>

		<ul style="list-style-type: none"> <li>• The <b>Porter-Cologne Water Quality Control Act of 1969</b> (California Water Code § 13000 et seq.) mandates that waters of the State shall be protected, such that activities which may affect waters of the State shall be regulated to attain the highest quality. This Act establishes the State Water Resources Control Board (SWRCB) as the principal State agency for the coordinated control of water quality in California. The SWRCB provides regulations that mandate a “non-degradation policy” for State waters, especially those of high quality. The SWRCB is divided into local regional boards that have been delegated authority to issue permits or waive water quality conditions under Section 401 of the CWA for the ACOE permitting process.</li> </ul>
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#### 3.3.4.3 Impact Analysis

#### **Methodology for Noise Impact Analysis for Invertebrates and Fish**

Potential effects on fish and invertebrates from OGPP surveys were evaluated based on information available in the literature, habitats and species of high ecological or commercial value in California, and expected noise levels as estimated by noise modeling, which are presented in Appendix G. A summary of findings from the literature is incorporated into the impact discussions.

#### **Methodology for Noise Impact Analysis for Marine Mammals and Sea Turtles**

The evaluation of potential noise impacts on marine mammals presented herein is based on detailed analyses performed for this MND using species-specific criteria and noise modeling results. The methodology consisted of the following critical steps:

- Identifying species of concern, and determining which species would require a full “take” analysis based on vulnerability and expected presence during the survey. Sixteen species were selected for full take analysis;
- Estimating animal densities of the selected species;
- Establishing criteria for injury and disturbance effects;
- Establishing criteria for assessing the severity of the impact;
- Applying noise modeling results to determine potential impacts and severity of the noise generated by the Project;
- Applying Mitigation Measures (MMs) to reduce or avoid significant effects; and
- Determining level of significance using CEQA criteria, after application of MMs.

Each of these steps is described in more detail below. The underwater noise modeling approach and results are documented in **Appendix G**.

**a) Would the Project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?**

## **Significance Criteria**

In light of the project-specific context of the OGPP, the CSLC has expanded on the general guidance identified in **(a)** above, which is derived from Appendix G of the State CEQA Guidelines. For the OGPP, impacts to marine biological resources would be considered significant if one of the following results is realized:

- A substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by Federal (e.g., NMFS, USFWS) or State agencies (e.g., CDFW); this criterion would include the incidental take of special status marine mammal species, according to current NMFS policies or guidelines. In this context, “take” would include the first of two harassment levels – Level A take, constituting injury or mortality. The second take level – Level B take – constitutes behavioral modification and does not ordinarily represent a significant impact; however, additional discussion follows, as species- and context-specific factors could elevate this “harassment” to a potentially significant level. Current NMFS guidelines for Level A harassment of marine mammals include exposure to pinnipeds in water and cetaceans to 190 and 180 dB re 1  $\mu$ Pa rms, respectively; 180 dB re 1  $\mu$ Pa rms is also used as the injury threshold level for sea turtles;
- The “take” (as defined in Fish & G. Code § 86) of species listed under the CESA or designated as “fully protected” pursuant to the Fish and Game Code; section 2080 prohibits “take” of any species that the CFGC determines to be an endangered species or a threatened species. Take is defined in Fish and Game Code section 86 as “hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill;”
- A substantial reduction in the habitat of a fish or wildlife species;
- Impact to a fish or wildlife population which produces a reduction below self-sustaining levels; or
- Introduction of non-native, invasive species.

The first significance criterion noted above requires further clarification. The use of the Level A harassment criterion is well documented in regards to the potential for significant impact. Removal of an individual from a population via mortality has definitive ramifications regarding the loss of reproductive potential and its potential effects on the survivability of a population, as does major injury. Level B harassment, in contrast,



represents a behavioral modification with extremely limited potential for effects at the population level. If a marine mammal does react briefly to an underwater sound by changing its behavior or moving a small distance, the impacts of the change are unlikely to be significant to the individual, let alone the stock or population. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on individuals and populations could be significant (e.g., Lusseau and Bejder 2007; Weilgart 2007). When NMFS considers applications for incidental harassment, it will only consider granting such permission if the incidental take will have a negligible impact on the species or stock(s), or will not have an unmitigable adverse impact on the availability of the species or stock(s) for certain subsistence uses.

NMFS also requires that the permissible methods of taking and requirements pertaining to the mitigation, monitoring, and reporting of such taking are set forth. NMFS has defined “negligible impact” (50 C.F.R. § 216.103) as *“an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.”* As a consequence, except as provided in the significance threshold above regarding the possibility of context-specific factors, the Level B harassment criterion should be viewed as a less than significant impact. The NMFS threshold for Level B harassment of marine mammals from impulsive sound is 160 dB re 1 µPa rms; 160 dB re 1 µPa rms is also used by NMFS as a *de facto* threshold for harassment of sea turtles.

#### “Take” and “Harassment” Under the MMPA

##### Take

As defined under the MMPA, to “harass, hunt, capture, kill or collect, or attempt to harass, hunt, capture, kill or collect.”

##### Harassment

Harassment is defined under the MMPA as any act of pursuit, torment, or annoyance that:

- **(Level A Harassment)** has the potential to injure a marine mammal or marine mammal stock in the wild; or,
- **(Level B Harassment)** has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, but which does not have the potential to injure a marine mammal or marine mammal stock in the wild.

For purposes of this analysis, all marine mammals are considered “special status” because they are protected under the MMPA; some may also be listed under FESA and/or CESA. Species designated as Species of Special Concern or Fully Protected by CDFW are also considered special status. Noise may also adversely affect sea turtles, invertebrates, and fish. Results of a literature review and synopsis regarding noise and its effects on marine mammals, sea turtles, invertebrates, and fish has been completed and is included in **Appendix H**. The discussion below summarizes the results of the scientific review; following that, project-specific significance criteria are identified that further characterize the guidance identified in **(a)** above and expected impacts are

analyzed in comparison to the criteria. Where expected impacts would exceed the criteria, project changes and/or mitigation measures are incorporated to ensure that, as implemented, the OGPP would not result in significant effects to biological resources.

#### **Acoustic Modeling – Description and Parameters**

In order to calculate the sound fields produced by each equipment type, representative equipment was identified for acoustic modeling. Acoustic modeling was completed based on representative equipment employed in low energy geophysical surveys offshore California, including a single beam and multibeam echosounder, subbottom profiler, side-scan sonar, and boomer (a specialized type of subbottom profiler). The characteristics of equipment used for representative noise modeling are provided in **Table 3-21**.

Selection of the equipment modeled not only included those equipment types most frequently used, but also identified those sources with the highest sound source levels. Acoustic modeling of the following low energy geophysical equipment was conducted:

- Teledyne Odom CV-100 single beam echosounder
- R2Sonic multibeam echosounder
- Klein 3000 Digital side-scan sonar
- Edgetech X-Star subbottom profiler (SB-216/SB-424)
- AP3000 triple plate boomer system

Sound source levels employed in the modeling analysis were based on one of two sources, either manufacturer's specifications or, where available, field measurements. Use of manufacturer's equipment specifications represents a conservative metric (i.e., maximum source levels), as equipment sound output is typically adjusted/tuned to accommodate site-specific conditions. Use of actual field measurements provides a more representative modeling situation when physical conditions are similar (e.g., water depth, water column characteristics, substrate types). Among the equipment types, the acoustic modeling of the single beam and multibeam echosounder, subbottom profiler, and side-scan sonar used manufacturer's specifications, while the boomer was modeled based on field measurements.

The scope of the modeling analysis was similar to recent acoustic modeling exercises. An approach similar to that employed during the Central Coastal California Seismic Imaging Project (CSLC 2012a) was followed, where single pulse and cumulative exposure were considered. Maximum horizontal distances to thresholds of interest were calculated, providing a conservative measure for determining areas to be ensonified and potentially monitored or mitigated. The calculation of maximum horizontal distance is equipment-specific, as detailed in **Appendix G**.

1

**Table 3-21. Characteristics of Equipment Used for Representative Noise Modeling**

Equipment type, model and manufacturer	Dominant Frequency or Frequencies	Deployment Depth	Tow Speed	Maximum Output (dB re 1 µPa @ 1 m)	Beam Width	Signal Duration
<b>SUBBOTTOM PROFILERS</b>						
<b>Boomers</b>						
AP3000 triple plate boomer system	100-800 Hz	Surface towed	Variable	219 (peak) @ 1.5 kJ	H: 8°–105° @ >1 kHz	60 msec
<b>Subbottom Profilers (general)</b>						
Edgetech X-Star full spectrum digital subbottom profiler	400 Hz–24 kHz	300–6,000 m maximum	3-4 kn, optional at 6 kn	212 (peak)	10°-30°	20–40 msec
<b>SIDE-SCAN SONARS</b>						
Klein System 3000 side-scan sonar	100 kHz (125 ±1%); 500 kHz (445 ±1%)	1.5, 3, 6 km (max); Maximum <sup>1</sup> : 600 m (105 kHz); 150 m (500 kHz);	Variable	220 (estimated; p-p)	H: 1° (100 kHz); H: 0.2° (500 kHz); V: 40°	25–400 µsec
<b>ECHOSOUNDERS</b>						
<b>Single Beam Echosounders</b>						
Teledyne Odom CV-100 digital single beam echosounder	Low: 10–50 kHz; High: 100–750 kHz; 1 kHz adjustable steps	Hull mounted or over the side; 0-15 m	Variable	230 (rms)	5°	0.1 ms
<b>Multibeam Echosounders</b>						
R2Sonic 2024 multibeam echosounder	200–400 kHz, or 700 kHz	Hull mounted	Variable	221 (p-p) 193 (rms)	0.3° x 0.6° (700 kHz); 0.5° x 1° (400 kHz); 1° x 2° (200 kHz)	15–500 µsec

<sup>1</sup> Maximum = maximum water depth below transducers.

Abbreviations: dB = decibel(s); H = horizontal; Hz = Hertz (cycles per second); kHz = kilohertz; kn = knots; m = meter(s); msec = millisecond(s); p-p = peak-to-peak; rms = root mean square; V = vertical; µPa = microPascal(s); µsec = microsecond(s).

Oceanographic conditions, including bathymetry and geoacoustic and water sound speed profiles, were representative of a Central and Southern California location, consistent with regions (i.e., OGPP Regions I and II) where the vast majority of recent low energy geophysical surveys have taken place, and where near-term future surveys are expected.

The location for the single pulse modeling calculations was located 3 km offshore over sandy sediments in a water depth of 64 m. A similar location was modeled for the cumulative exposure scenario, however, the survey tracklines extended from the outer edge of the surf zone to the 3 nm line, using a three trackline grid with 75 m between each line. The cumulative scenario considered maximum daylight operations (i.e., 14 hr), with 10 hr of equipment operation at a vessel speed of 4 knots, considered a worst case scenario for routine, daytime low energy geophysical survey operations. Additional modeling parameters are described in **Appendix G**.

Several physical factors may influence modeling results, including bathymetry, the sound speed profile, and the geoacoustic properties of the sediment. Within the study area, bathymetry is expected to be more or less similar along the California coast (i.e., <200 m), with the exception of a limited number of deep-water areas (e.g., where canyons approach close to shore; Monterey Bay). In contrast to the relatively static nature of bathymetry, sound speed profiles and bottom type can change significantly. Bottom types can be quite variable, with soft sediments including sands, silts, and clays. Exposed rocky outcroppings and seasonally emergent hard bottom may also occur along the California coast.

The modeling parameters selected in this analysis were considered representative of previous surveys and most likely to represent future near-term survey locations. Technical discussion regarding how variation in each physical factor may affect modeling results is discussed within **Appendix G**.

Site-specific acoustic fields resulting from representative low energy sound sources were modeled with JASCO's Marine Operations Noise Model (MONM). For each source, the sound fields for each operation were developed as tables of distances to the following sound level thresholds:

- Unweighted<sup>12</sup> rms SPLs of 208 dB re 1  $\mu$ Pa – to account for possible impacts to fish and invertebrates;
- Unweighted and M-weighted rms SPLs of 190, 180, 160, 140, and 120 dB re 1  $\mu$ Pa – to account for accepted SPL exposure thresholds for injury (190 dB for pinnipeds in water; 180 dB for cetaceans and sea turtles), behavioral

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<sup>12</sup> M-weighted sound levels are adjusted to account for the frequency of the sound and the receptor's sensitivity to that frequency; unweighted sound levels do not reflect frequency. The marine mammal impact analysis below provides further details on the two approaches.

modification (160 dB), and more conservative estimators of behavioral change (120 and 140 dB);

- Unweighted and M-weighted sound exposure levels (SEL) of 198, 192, 186, and 179 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  – to account for current SEL thresholds for injury, per Southall et al. (2007), as modified by Wood et al. (2012); and
- Unweighted and M-weighted SELs of 183 and 171 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  – to account for current SEL thresholds for behavioral modification, per Southall et al. (2007).

Current NMFS acoustic thresholds are based exclusively on the rms SPL metric, which is the square root of the average of the square pressure of the sound signal over a given duration; however, the duration over which the rms SPL is calculated can vary significantly for impulsive sounds (i.e., airguns). Pulse duration and other pulse characteristics (e.g., rise time) can have significant influence on the potential for injury (e.g. permanent and temporary threshold shifts [PTS, TTS]) (Madsen et al. 2006). Wood et al. (2012) notes that thresholds based on rms SPL values alone are not good predictive indicators of the likelihood of injury, and suggests using the SEL threshold, which measures the energy of sound, and depends on both amplitude, or loudness, and duration of exposure. The SEL is the time-integral of the instantaneous squared sound pressure normalized to a squared reference pressure over a 1-second period, using a unit of 1  $\mu\text{Pa}^2\cdot\text{s}$ . The SEL metric is considered to be more biologically realistic in the sense that it incorporates the duration of the noise into the noise metric as well as the received level, unlike the rms SPL metric that only incorporates the received level. Consequently, the following analysis considers both SPL and SEL metrics. The impact discussions below include further explanation for the particular sound level thresholds selected for different species groups, as well as modeling results relevant to each group.

As summarized by NMFS (2010), a peer-review panel of scientists was convened in 2010 to review incidental harassment authorizations and NMFS criteria used to assess impacts to marine mammals. Several findings and recommendations resulted from their review. The panel recognized that NMFS needs to begin a transition away from using a single metric of acoustic exposure (i.e., SPL) to estimate the potential effects of anthropogenic sound on marine living marine resources. They noted:

*“Although sound pressure level (SPL) has been used historically and is relatively simple to apply, the available science increasingly indicates that no single factor is likely to encompass all of the relevant aspects of sound exposure needed to assess, monitor, or mitigate effects. Rather, the effects of anthropogenic sound on marine mammals are determined by the influence of a suite of potentially co-varying physical and biological factors. Important characteristics of sound may include the natural ambient level, the relative difference from ambient noise as a new noise is introduced (the signal-to-noise ratio), the ‘sensation’ level of sound which takes into*

1        *account both the signal-to-noise ratio and characteristics of receiver hearing*  
2        *capabilities, sound 'rise' time (the time required for the sound to reach its peak level)*  
3        *and the relative impulsiveness of the signals, total sound energy received, sound*  
4        *frequency, sound constancy or pattern, and sound duration."*

5        Other important physical factors that influence the sound field include bathymetry,  
6        proximity to shore, and ocean bottom substrate, among others. Important biological  
7        influences may include activity of the animals involved (e.g., feeding, migration,  
8        reproduction), their social structure (e.g., aggregations of individuals or presence of  
9        mother-calf pairs), their previous individual experience with the sound (i.e., sound  
10       novelty, association with predator or prey sounds), and the various other biological  
11       stressors affecting them.

12       NMFS (2010) has determined that marine mammals are best understood as living within  
13       dynamic acoustic environments that, among other things, vary over time, space,  
14       frequency, level, and directionality. The panel concluded by stating:

15       *"The term "spatial-temporal-spectral" variation has been used to indicate the*  
16       *complex and dynamic nature of marine acoustic environments. The term also serves*  
17       *as a reminder that a single sound pressure level or other single descriptive*  
18       *parameter is likely a poor predictor of the effects of introduced anthropogenic sound*  
19       *on marine life. Indeed, science has consistently shown that the single-parameter*  
20       *approach to predicting specific effects of sound exposure is largely untenable and*  
21       *more biologically-realistic ways of estimating impact are needed (e.g., Southall et al.*  
22       *2007, Clark et al. 2009). That is, further progress in understanding the effects of*  
23       *sound on marine ecosystems will require a more comprehensive approach that*  
24       *recognizes and characterizes the 'acoustic scene' or 'soundscape' in much the same*  
25       *manner that a full understanding of a terrestrial species requires the study of*  
26       *landscape ecology and the co-varying abiotic and biotic features of its surroundings."*

## 27       **Benthic Marine Habitat-Associated Fauna**

28       **Less than Significant.** Impacts to benthic marine habitats and associated fauna from  
29       low energy geophysical surveys will be limited to those portions of the seafloor where  
30       acoustic energy is focused. Narrow beam width characteristics of most equipment  
31       suggest that impacts will be restricted to areas beneath the survey vessel and/or  
32       equipment. Major faunal components of the benthos – invertebrates and fishes – would  
33       be expected to show startle responses during OGPP surveys. Motile fish and  
34       invertebrates may be expected to exhibit avoidance behavior. Due to the relatively short  
35       duration and localized nature of OGPP surveys, impacts to benthic habitats and  
36       associated fauna are expected to be less than significant.

## 1 Plankton and Ichthyoplankton

2 **Less than Significant.** Noise impact studies on plankton and ichthyoplankton are  
 3 limited, with several studies assessing the effects of high energy seismic sources  
 4 (e.g., airguns). These findings suggest that injury and mortality are highest at close  
 5 range and decrease rapidly with distance from the source (e.g., Dalen and Knutsen  
 6 1987; Kostyuchenkov 1973; Kosheleva 1992).

7 Gausland (1993) estimated the effect of airguns on plankton along a 100,000 line km  
 8 seismic survey in Norwegian waters as equivalent to the feeding of 30 whales. An  
 9 argument similar to that of Gausland (1993) concerning the effects of acoustic surveys  
 10 on Antarctic krill can be made that the effect of geophysical surveys on krill in the  
 11 Project area are expected to be smaller compared to predation and fishing. For  
 12 example, Stocks et al. (2012) examined the responses of larvae of temperate  
 13 invertebrates to three sound treatments: natural ambient sound (shallow rocky reef),  
 14 anthropogenic sound (vessel engine), and no sound (control). Species analyzed  
 15 included larvae of two mollusks (gastropod *Bembicium nanum*; oyster *Crassostrea*  
 16 *gigas*), an echinoderm (echinoid *Heliocidaris erythrogramma*), and a bryozoan (*Bugula*  
 17 *neritina*). Larvae of the gastropod increased their swimming activity in response to both  
 18 natural and anthropogenic sound, while larvae of the bryozoan decreased swimming  
 19 activity when exposed to engine noise, but not recordings from the natural reef.  
 20 Considerable variation was observed in the swimming behavior of larvae of the  
 21 echinoid, with no evidence of differences in response among the treatments. The  
 22 behavior of oyster larvae was dependent on its nutritional status, with unfed larvae not  
 23 responding to sound, whereas fed larvae increased swimming activity, but only in  
 24 response to natural sound.

25 Banner and Hyatt (1973) studied two estuarine fish species raised in tanks, determining  
 26 the viability of eggs and the resulting larvae, as well as growth rate; they determined  
 27 that both viability and growth rate were significantly reduced in noisy tanks when  
 28 compared to controls (i.e., quiet tanks).

29 Several studies have assessed mortality in eggs, larvae, and fry exposed to airgun  
 30 noise. Booman et al. (1996) studied the eggs, yolk sac larvae, post-yolk sac larvae,  
 31 post-larvae, and fry of various commercially important fish species (i.e., cod, saithe,  
 32 herring, turbot, and plaice). Exposures were received SPLs ranging from 220 to 242 dB  
 33 re 1  $\mu$ Pa (unspecified measure type). Received levels corresponded to exposure  
 34 distances ranging from 0.75 to 6 m. Authors reported several cases of injury and  
 35 mortality, with the majority occurring as a result of exposures at very close range  
 36 (i.e., less than 15 m). Recent reviews have indicated that the rigors of the anatomical  
 37 and pathological assessments in this study are questionable.

1 Dalen and Knutsen (1987), Kostyuchenkov (1973), and Kosheleva (1992) conducted  
2 studies on the effects of airgun shots on fish eggs and juveniles. Among the three  
3 studies, the lowest SPL exposure level for which lethal effects were demonstrated was  
4 220 dB re 1  $\mu$ Pa, and no lethal effects were observed at 214 dB re 1  $\mu$ Pa (unspecified  
5 measure type).

6 Impacts to plankton and ichthyoplankton from low energy geophysical surveys will be  
7 limited to the area immediately around the equipment (i.e., below the equipment for  
8 narrow beam sources), and will be restricted to those devices creating an acoustic pulse  
9 above 220 dB re 1  $\mu$ Pa; this would include the single beam echosounder, multibeam  
10 echosounder, and side-scan sonar; other sources are less than 220 dB re 1  $\mu$ Pa. The  
11 zone within which sound levels would be of that magnitude would be limited to the  
12 immediate area of the survey equipment, and the extent of impact to plankton and  
13 ichthyoplankton will be proportional to the number of tracklines surveyed. Due to the  
14 relatively short duration and localized operations of OGPP surveys, impacts to plankton  
15 and ichthyoplankton are expected to be less than significant.

## 16 Invertebrates

17 **Less than Significant.** Based on a recent review by Popper (2012), there are very  
18 limited data addressing hearing by aquatic invertebrates. Available data suggest that  
19 hearing among invertebrates is in the low-frequency bands, and possibly restricted to  
20 only the particle motion component of the sound field (e.g., Mooney et al. 2010, 2012).

21 Moriyasu et al. (2004) conducted a critical review of 20 studies completed through 2003  
22 which addressed seismic and marine noise effects on invertebrates. They determined  
23 that among the nine studies that were quantitative, the effects on marine invertebrate  
24 species were mixed. More recently, NSF and USGS (2011) summarized the effects of  
25 seismic survey noise, providing summary information regarding pathological,  
26 physiological, and behavioral responses of marine invertebrates exposed to seismic  
27 sources (**Table 3-22**).



1 Table 3-22. Summary of Seismic Noise Exposure Studies on Invertebrates (Adapted From: NSF and USGS 2011)

Species	Test Subject(s)	Exposure	Determinations	Reference(s)
<b>Pathological Effects</b>				
Snow crab ( <i>Chionoecetes opilio</i> )	Captive adult males, egg-carrying females, and fertilized eggs	Variable sound pressure levels (SPL) (191–221 dB re 1 $\mu\text{Pa}_{0-p}$ ) and sound exposure levels (SELs) (<130–187 dB re 1 $\mu\text{Pa}^2\cdot\text{s}$ )	Neither acute nor chronic (12 weeks post-exposure) mortality was observed for the adult crabs. A significant difference in development rate was noted between the exposed and unexposed fertilized eggs/embryos. The egg mass exposed to seismic energy had a higher proportion of less developed eggs than did the unexposed mass. Both egg masses came from a single female and any measure of natural variability was unattainable.	Christian et al. 2003, 2004
Snow crab ( <i>Chionoecetes opilio</i> )	Caged egg-bearing females	Maximum received SPL was ~195 dB re 1 $\mu\text{Pa}_{0-p}$ . Crabs were exposed for 132 survey hr	Neither acute nor chronic lethal or sub-lethal injury to female crabs or crab embryos was indicated. Some exposed individuals had short-term soiling of gills, antennules and statocysts, bruising of the hepatopancreas and ovary, and detached outer membranes of oocytes; these differences could not be linked conclusively to exposure to seismic survey sound. Study design problems impacted interpretation of some of the results (Chadwick 2004).	DFOC 2004
American lobster ( <i>Homarus americanus</i> )	Adult	Exposed either 20 to 200 times to 202 dB re 1 $\mu\text{Pa}_{p-p}$ or 50 times to 227 dB re 1 $\mu\text{Pa}_{p-p}$	Monitored for changes in survival, food consumption, turnover rate, serum protein level, serum enzyme levels, and serum calcium level. Results showed no delayed mortality or damage to the mechanosensory systems associated with animal equilibrium and posture.	Payne et al. 2007
Dungeness crab ( <i>Cancer magister</i> )	Stage II larvae	Single discharges from a seven-airgun array	No statistically significant differences were found in immediate survival, long term survival, or time to molt between the exposed and unexposed larvae, even those exposed within 1 m of the seismic source.	Pearson et al. 1994
Squid ( <i>Sepioteuthis australis</i> )	Adult	Exposed to noise from a single 20-in <sup>3</sup> airgun with maximum SPLs of >200 re 1 $\mu\text{Pa}_{0-p}$ .	No squid or cuttlefish mortalities were reported as a result of these exposures.	McCauley et al. 2000a,b
<b>Physiological Effects</b>				
Snow crab ( <i>Chionoecetes opilio</i> )	Captive adult males	Variable SPLs (191–221 dB re 1 $\mu\text{Pa}_{0-p}$ ) and SELs (<130–187 dB re 1 $\mu\text{Pa}^2\cdot\text{s}$ )	No significant acute or chronic differences were found between exposed and unexposed animals in which various stress indicators (e.g., proteins, enzymes, cell type count) were measured.	Christian et al. 2003, 2004

Species	Test Subject(s)	Exposure	Determinations	Reference(s)
American lobster ( <i>Homarus americanus</i> )	Adult	Exposed either 20 to 200 times to 202 dB re 1 $\mu\text{Pa}_{\text{p-p}}$ or 50 times to 227 dB re 1 $\mu\text{Pa}_{\text{p-p}}$	Noted decreases in the levels of serum protein, particular serum enzymes and serum calcium, in the haemolymph of animals exposed to the sound pulses. Statistically significant differences ( $P=0.05$ ) were noted in serum protein at 12 days post-exposure, serum enzymes at 5 days post-exposure, and serum calcium at 12 days post-exposure. During the histological analysis conducted 4 months post-exposure, noted more deposits of periodic-acid Schiff (PAS)-stained material, likely glycogen, in the hepatopancreas of some of the exposed lobsters. Accumulation of glycogen could be due to stress or disturbance of cellular processes.	Payne et al. 2007
Blue mussels ( <i>Mytilus edulis</i> )	Small and large mussels	10 kHz pure tone continuous signal	Decreasing respiration. Smaller mussels did not appear to react until exposed for 30 min whereas larger mussels responded after 10 min of exposure. The oxygen uptake rate tended to be reduced to a greater degree in the larger mussels than in the smaller animals.	Price 2007
<b>Behavioral Effects</b>				
Snow crab ( <i>Chionoecetes opilio</i> )	Eight adults	Received SPL and SEL were $\sim 191$ dB re 1 $\mu\text{Pa}_{\text{o-p}}$ and $<130$ dB re 1 $\mu\text{Pa}^2\cdot\text{s}$ , respectively. The crabs were exposed to 200 discharges over a 33-min period	Equipped with ultrasonic tags, released, and monitored for multiple days prior to exposure and after exposure. None of the tagged animals left the immediate area after exposure to the seismic survey sound. Five animals were captured in the snow crab commercial fishery the following year, one at the release location, one 35 km from the release location, and three at intermediate distances from the release location.	Christian et al. 2003
Snow crab ( <i>Chionoecetes opilio</i> )	Seven pre-exposure and six post-exposure trap sets	SPLs and SELs were not measured directly; expected to be similar to levels noted above	Investigated the pre- and post-exposure catchability of snow crabs during a commercial fishery using remote video camera. Results indicated that the catch-per-unit effort did not decrease after the crabs were exposed to seismic survey sound.	Christian et al. 2003
Rock lobster ( <i>Jasus edwardsii</i> )	Variable	Commercial catches and seismic surveying in Australian waters from 1978-2004.	No evidence that lobster catch rates were affected by seismic surveys.	Parry and Gason 2006
Snow crab ( <i>Chionoecetes opilio</i> )	Caged females	Airgun sound associated with a recent commercial seismic survey	Exhibited a higher rate of “righting” than those crabs not exposed to seismic survey sound. “Righting” refers to a crab’s ability to return itself to an upright position after being placed on its back. Christian et al. (2003) made the same observation in their study.	J. Payne unpublished; reported in NSF and USGS 2011

Species	Test Subject(s)	Exposure	Determinations	Reference(s)
American lobster ( <i>Homarus americanus</i> )	Adult	Exposed either 20 to 200 times to 202 dB re 1 $\mu\text{Pa}_{\text{p-p}}$ or 50 times to 227 dB re 1 $\mu\text{Pa}_{\text{p-p}}$	Noted a trend for increased food consumption by the animals exposed to seismic sound.	Payne et al. 2007
Shrimp	Variable	Seismic survey sound	Bottom trawl yields of Brazil artisanal shrimp were measured before and after multiple-day shooting of an airgun array. Water depth in the experimental area ranged between 2 and 15 m. Results of the study did not indicate any significant deleterious impact on shrimp catches.	Andriguetto-Filho et al. 2005
Brown shrimp ( <i>Crangon crangon</i> )	Variable	Not specified	Shrimp reared under different acoustical conditions exhibited differences in aggressive behavior and feeding rate	Lagardère 1982
Squid ( <i>Sepioteuthis australis</i> ) and cuttlefish ( <i>Sepia officinalis</i> )	Adults – 50 squid and 2 cuttlefish	Exposed to noise from a single 20-in <sup>3</sup> airgun with maximum SPLs of >200 dB re 1 $\mu\text{Pa}_{\text{0-p}}$	The two-run total exposure times during the three trials ranged from 69 to 119 min. at a firing rate of once every 10–15 s. Some of the squid fired their ink sacs apparently in response to the first shot of one of the trials and then moved quickly away from the airgun. In addition to the above-described startle responses, some squid also moved towards the water surface as the airgun approached. Researchers reported that the startle and avoidance responses occurred at a received SPL of 174 dB re 1 $\mu\text{Pa}$ rms. They also exposed squid to a ramped approach-depart airgun signal whereby the received SPL was gradually increased over time. No strong startle response (i.e., ink discharge) was observed, but alarm responses, including increased swimming speed and movement to the surface, were observed once the received SPL reached a level in the 156–161 dB re 1 $\mu\text{Pa}$ rms range.	McCauley et al. 2000a,b
Cuttlefish ( <i>Sepia officinalis</i> )	Juveniles	Exposed to local sinusoidal water movements of different frequencies between 0.01 and 1000 Hz	Responses included body pattern changing, movement, burrowing, reorientation, and swimming.	Komak et al. 2005
Octopus ( <i>Octopus ocellatus</i> )	Adults	Non-impulse sound, level of 120 dB re 1 $\mu\text{Pa}$ rms, at 50, 100, 150, 200 and 1000 Hz.	The respiratory activity of the octopus changed when exposed to sound in the 50–150 Hz range but not for sound at 200–1,000 Hz. Respiratory suppression by the octopus might have represented a means of escaping detection by a predator.	Kaifu et al. 2007

1 Among the studies completed on the effects of sound on invertebrates, the vast majority  
2 have focused on the impact of seismic surveys (i.e., airgun arrays), primarily using  
3 crustaceans and cephalopods. Crustaceans appear to be most sensitive to sounds less  
4 than 1 kHz, although some species are able to detect sounds up to 3 kHz (Lovell et al.  
5 2005). Cephalopods appear to be sensitive to the low frequency particle motion  
6 component of the sound field and not pressure (Mooney et al. 2012), and are sensitive  
7 to water movement stimuli in a range between less than 20 and 1500 Hz (Packard et al.  
8 1990; Hu et al. 2009).

9 There are only limited data on high anthropogenic sound levels and corresponding  
10 physiological effects on invertebrates. Potentially relevant data are limited to results  
11 from a study on the effects of seismic exploration on snow crabs on the east coast of  
12 Canada (Boudreau et al. 2009) and controlled exposure of cephalopods to low  
13 frequency sound. Results from Boudreau et al. (2009) showed no short-term or  
14 long-term effects of seismic exposure in adult or juvenile crabs or crab eggs.

15 Andre et al. (2011) conducted controlled exposure experiments on four cephalopod  
16 species (*Loligo vulgaris*, *Sepia officinalis*, *Octopus vulgaris*, and *Illex coindetii*),  
17 subjecting them to low-frequency sound. Exposure to low-frequency sounds resulted in  
18 permanent and substantial alterations of the sensory hair cells of the statocysts, the  
19 structures responsible for the animals' sense of balance and position. The exposure  
20 level (received SPL) was  $157 \pm 5$  dB re 1  $\mu$ Pa, with peak levels at 175 dB re 1  $\mu$ Pa.

21 Study results presented by Andre et al. (2011) have been critically reviewed (Popper  
22 2012), with concerns raised over lack of scientific control (i.e., control specimens being  
23 handled and treated to identical conditions, absent sound exposure) and the absence of  
24 an assessment of particle motion (i.e., invertebrates are detectors of particle motion,  
25 with no specializations coupling an air-filled structure to the ear). While there is  
26 uncertainty regarding the biological importance of particle motion sensitivity versus  
27 acoustic pressure, recent electrophysiological studies confirmed cephalopod  
28 sensitivities to frequencies under 400 Hz (*Octopus vulgaris*, Kaifu et al. 2008;  
29 *Sepioteuthis lessoniana*, *Octopus vulgaris*, Hu et al. 2009; *Loligo pealei*, Mooney et al.  
30 2010).

31 There are few data indicating if and how invertebrates may use sound in behavior,  
32 although a number of species make sounds and so, presumably, use such sounds for  
33 communication (e.g., Budelmann 1992; Popper et al. 2001). Invertebrate species  
34 capable of producing sounds include barnacles, amphipods, shrimp, crabs, lobsters,  
35 mantis shrimps, sea urchins, and squid (Au and Banks 1998; Iversen et al. 1963;  
36 Radford et al. 2008; Staaterman et al. 2011, 2012). However, there are no data that  
37 indicate whether masking occurs in invertebrates or suggest whether anthropogenic  
38 sound would have any impact on invertebrate behavior. A study assessing the effects of

seismic exploration on shrimp suggests no behavioral effects at sound levels with a source level of about 196 dB re 1  $\mu$ Pa rms at 1 m (Andriguetto-Filho et al. 2005).

Direct observation of squid exposed to airgun sound showed both a strong startle response involving ink ejection and rapid swimming at 174 dB re 1  $\mu$ Pa rms and avoidance behavior (McCauley et al. 2000a,b). Sensitivity to low frequencies indicates that marine invertebrates, like squid (Packard et al. 1990; Urick 1983), are likely to be susceptible to anthropogenic sources of underwater sound such as shipping, offshore industrial activities (e.g., wind or tidal turbines), and seismic surveys. As a result, invertebrates sensitive to low frequencies may be susceptible to masking or other physiological or behavioral impacts of anthropogenic noise (McCauley et al. 2000). In addition, statocyst or lateral line hair cells may be affected by sound energy (either long duration or brief, high-intensity noise). Such hair cell damage and related temporary hearing loss has been demonstrated in fishes (McCauley et al. 2003), and this has been suggested for squid which possess a lateral line analogue (Budelmann 1994).

#### *Invertebrate Noise Exposure Criteria*

Interim criteria for the onset of injury in fish (i.e., physiological effects) have been established at a peak SPL level of 208 dB re 1  $\mu$ Pa, based on the work of Popper et al. (2006). This threshold, as applied in the current analysis, was also applied to recent analyses (e.g., Central California Coast Seismic Imaging Project, CSLC 2012a) to both fish and invertebrates. This threshold was originally derived from studies of fish and invertebrates exposed to pile driving noise (Popper et al. 2006) and included an SEL threshold of 187 dB re 1  $\mu$ Pa<sup>2</sup>·s. In 2009, the interim criteria were revised to account for the onset of physical injury (i.e., TTS) when either the peak SPL exceeds 206 dB re 1  $\mu$ Pa (peak) or the SEL, accumulated over all pile strikes generally occurring within a single day, exceeds 183 or 187 dB re 1  $\mu$ Pa<sup>2</sup>·s, depending upon fish weight (Stadler and Woodbury 2009). Popper (2012) notes that the interim criteria have been closely scrutinized, and that recent pile driving effects studies (Halvorsen et al. 2011, 2012a,b; Casper et al. 2011, 2012a,b) have introduced further concerns regarding acceptable exposure levels. Given these concerns and the absence of revised criteria, the current analysis has used the approach outlined in CSLC (2012a), adopting the SPL threshold of 208 dB re 1  $\mu$ Pa and the lower current SEL threshold of 183 dB re 1  $\mu$ Pa.

Modeling results for single pulse exposure for the 208 dB re 1  $\mu$ Pa SPL and 183 dB re 1  $\mu$ Pa SEL thresholds are provided in **Table 3-23**.

Given the SPL source levels and SELs for each equipment type, unweighted distances to the threshold of concern for invertebrates would be less than 20 m. In some cases (i.e., single beam echosounder, subbottom profiler, boomer), equipment source levels were below the SPL threshold for invertebrates.

**Table 3-23. Single-Pulse Maximum ( $R_{\max}$ , m) and 95% ( $R_{95\%}$ , m) Horizontal Distances from the Source to Modeled Maximum-Over-Depth SPL and SEL Thresholds for Invertebrates**

Equipment Type	208 dB re 1 $\mu$ Pa SPL		183 dB re 1 $\mu$ Pa SEL	
	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$
Single Beam Echosounder	-	-	<20	<20
Multibeam Echosounder	<20	<20	<20	<20
Side-Scan Sonar	<20	<20	<20	<20
Subbottom Profiler	-	-	<20	<20
Boomer	-	-	<20	<20

“-” – indicates that the equipment source level was below the threshold.

Impacts to invertebrates from low energy geophysical surveys are expected to be limited to those portions of the seafloor and water column where acoustic energy is focused, and limited to a maximum distance of less than 20 m from the source. Narrow beam width characteristics of most equipment suggest that impacts will be restricted to areas beneath the survey vessel and/or equipment. Invertebrates would be expected to show a startle response. Highly motile invertebrates may be expected to exhibit avoidance behavior. Due to the relatively short duration and localized operations of OGPP surveys, impacts to invertebrates are expected to be less than significant.

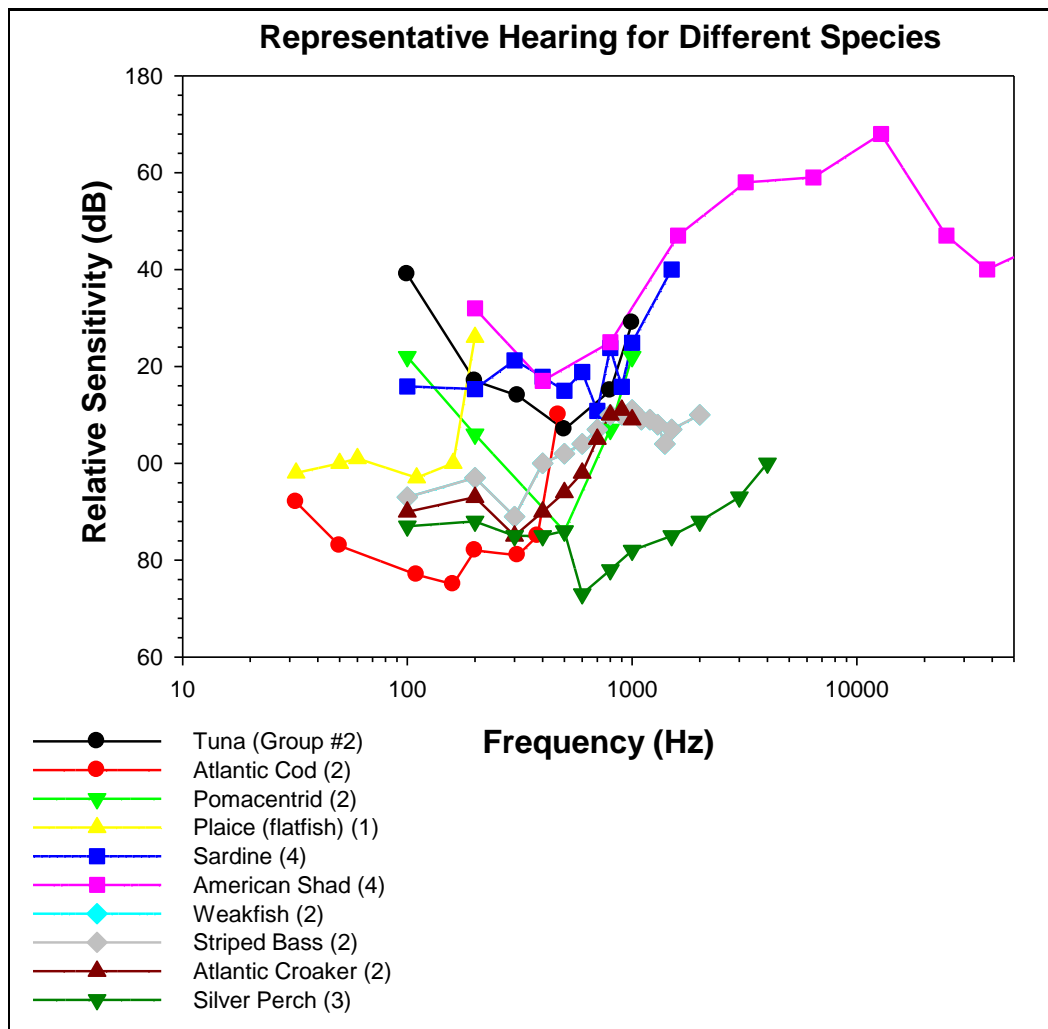
### **Fish, Fisheries, and Essential Fish Habitat**

**Less than Significant.** The effects of anthropogenic sound on fishes have been summarized by several authors, including Popper (2003), Hastings (2008), Popper and Hastings (2009a,b), Slabbekoorn et al. (2010, 2012), and Popper and Hawkins (2011). Popper (2012) has also recently prepared a summary of fish hearing and sound-related impacts.

Sound plays a major role in the lives of all fishes (e.g., Zelick et al. 1999; Fay and Popper 2000). Fishes acquire information about biotic (living) and abiotic (environmental) sources via sound and sound interpretation (Fay and Popper 2000; Popper et al. 2003; Fay 2005; Slabbekoorn et al. 2010). In addition to listening to their environment, many bony fishes species use sound to communicate. Anthropogenic sound may interfere with the normal behavior of fishes, and has the potential to adversely affect the survival of individuals and/or populations. Detailed discussions of fish bioacoustics can be found in Webb et al. (2008), Fay and Megela-Simmons (1999), Zelick et al. (1999), and Popper et al. (2003). A broad discussion of the interactions of anthropogenic sounds and fishes can be found in Popper and Hastings (2009a,b) and Popper and Hawkins (2011). Per Popper (2012), hearing thresholds have been determined for approximately 100 fish species. Data on hearing thresholds for fishes can be found in Fay (1988), Popper et al. (2003), Ladich and Popper (2004), Nedwell et al. (2004), Ramcharitar et al. (2006), and Popper and Schilt (2008).

Available data indicate that most fishes cannot hear sounds above approximately 3 to 4 kHz, with the majority of species only able to detect sounds to 1 kHz or below. Recent studies have demonstrated that some species can detect sounds below 50 Hz (i.e., infrasound), but it remains unclear as to whether these sounds are sensed by the ear or via the lateral line (Karlsen 1992; Knudsen et al. 1994; Popper 2012). There have also been a limited number of studies on cartilaginous fishes, with results suggesting that they detect sounds to no more than 600 or 800 Hz (e.g., Myrberg et al. 1976; Myrberg 2001; Casper et al. 2003; Casper and Mann 2006). Available data suggest that the majority of fish species do not have specializations to enhance hearing, probably relying on both particle motion and sound pressure for hearing. Hearing capabilities vary considerably between different bony fish species and within fish groups (**Figure 3-3; Table 3-24**), and there is no clear correlation between hearing capability and environment.

**Figure 3-3. Hearing Curves (Audiograms) for Select Bony Fishes. Each Data Point Reflects the Lowest Sound Level Detectable for Each Species, at a Particular Frequency. Fish Hearing Group Numbers Provided (From: Popper 2012)**



1 **Table 3-24. Hearing Sensitivity, by Family, of Representative California Marine Fishes (From: Popper 2012)**

Family	Common Name of Taxa	Highest Frequency Detected (Hz)	Hearing Category /Group	Representative California Marine Species	Notes	Reference
Asceripensidae	Sturgeon	800	2	Green sturgeon	Several different species tested. Relatively poor sensitivity	Lovell, et al. 2005; Meyer et al. 2010
Anguillidae	Eels	300	2	N/A	Poor sensitivity	Jerkø et al. 1989
Batrachoididae	Toadfishes	400	2	Plainfin midshipman	None	Fish and Offutt 1972; Vasconcelos and Ladich 2008
Clupeidae	Shad, menhaden	>120,000	4	Pacific herring, Pacific sardine	Ultrasound detecting, but sensitivity relatively poor	Mann et al. 1997, 2001
	Anchovy, sardines, herrings	4,000	4	Northern anchovy	Not detect ultrasound, and relatively poor sensitivity	Mann et al. 2001
Chondrichthyes [Class]	Rays, sharks, skates	1,000	1	California skate, longnose skate, spiny dogfish	Low frequency hearing, not very sensitive to sound	Casper et al. 2003
Gadidae	Atlantic cod, haddock, pollack, hake	500	2	Hundred-fathom codling	Probably detect infrasound (below 40 Hz). Best hearing 100 to 300 Hz	Chapman and Hawkins 1973; Sand and Karlsen 1986
	Grenadiers		3?	Giant grenadier, California rattail	Deep sea, highly specialized ear structures suggests good hearing, but no measures of hearing	Deng et al. 2011
Gobiidae	Gobies	400	1 or 2	Bluebanded goby, blackeye goby	None	Lu and Xu 2009
Labridae	Wrasses	1,300	2	Senorita, California sheepshead	None	Tavolga and Wodinsky 1963
Lutjanidae	Snappers	1,000	2	N/A	None	Tavolga and Wodinsky 1963
Malacanthidae	Tilefish		2	Ocean whitefish	No data	None available
Moronidae	Striped bass	1,000	2	N/A	None	Ramcharitar unpublished
Pomacentridae	Damselfish	1,500 to 2,000	2	Blacksmith	None	Myrberg and Spires 1980
Pomadasyidae	Grunts	1,000	2	Salema, sargo	None	Tavolga and Wodinsky 1963
Polyprionidae	Wreckfish		2	Giant sea bass	No data	None available
Sciaenidae	Drums, weakfish, croakers	1,000	2	White seabass, queenfish	Hear poorly	Ramcharitar et al. 2006
	Silver perch	3,000	3	N/A	None	Ramcharitar et al. 2004, 2006
Serranidae	Groupers	--	2	Kelp bass, barred sand bass	No data	None available
Scombridae	Yellowfin tuna	1,100	2	Yellowfin tuna	With swim bladder	Iversen 1967
	Tuna	1,000	1	Pacific bonito	Without swim bladder	Iversen 1969
	Bluefin tuna	1,000	2	Bluefin tuna	Based only on ear anatomy	Song et al. 2006

Source: Popper (2012), as compiled from Fay (1988) and Nedwell et al. (2004). N/A = not applicable



Species within a group may differ substantially in terms of their hearing structures. For example, tuna species may or may not have a swim bladder, the latter of which is involved in pressure detection. While the hearing range of species with and without swim bladders is quite similar, it is likely that the sensitivity is poorer in the species without this structure (Popper 2012).

Fish groups have been categorized based on hearing capability by Popper (2012), as follows:

- Group 1: Fishes that do not have a swim bladder; these fishes are likely to use only particle motion for sound detection. The highest frequency of hearing is likely to be no greater than 400 Hz, with poor sensitivity compared to fishes with a swim bladder. Fishes within this group include flatfish, some gobies, some tunas, and all sharks and rays and their relatives.
- Group 2: Fishes that detect sounds from below 50 Hz to perhaps 800 to 1,000 Hz, although several are predicted to only detect sounds to 600 to 800 Hz. These fishes have a swim bladder but no known structures in the auditory system that would enhance hearing; hearing sensitivity is limited. These species detect both particle motion and pressure, and the differences between species are related to how well the species can use the pressure signal. A wide range of species fall into this category, including tuna with swim bladders, sturgeons, and salmonids, among others.
- Group 3: Fishes that have some kind of structure that mechanically couples the inner ear to the swim bladder (or other gas bubble), thereby resulting in detection of a wider bandwidth of sounds and lower intensities than fishes in other groups. These fishes detect sounds to 3,000 Hz or more, and their hearing sensitivity, which is pressure driven, is better than in fishes of Groups 1 and 2. There are not many marine species known to fit within Group 3, but this group may include some species of sciaenids (Ramcharitar et al. 2006). It is also possible that a number of deep sea species fall within this category, based on morphology of the auditory system (e.g., Popper 1980; Deng et al. 2011). Other members of this group would include all of the Otophysan fishes, though few of these species other than catfishes are found in marine waters.
- Group 4: All of these fishes are members of the herring family and relatives (Clupeiformes). Their hearing below 1,000 Hz is generally similar to fishes in Group 1, but their hearing range extends to at least 4,000 Hz (e.g., sardine), and some species (e.g., American shad) are able to detect sounds to over 180 kHz (Mann et al. 2001).

1 Pearson et al. (1992) investigated the effects of seismic airgun sound on the behavior of  
2 captive rockfishes (Sebastes species – including blue, olive, vermillion, and black  
3 rockfish) in Estero Bay, on California's Central coast. Rockfish were exposed to the  
4 sound of a single stationary airgun at a variety of distances. The airgun used in the  
5 study had a source level of 223 dB re 1  $\mu\text{Pa}_{0-p}$  at 1 m, and measured received levels  
6 that ranged from 137 to 206 dB re 1  $\mu\text{Pa}_{0-p}$ .

7 Rockfishes reacted to the airgun sounds by exhibiting varying degrees of startle and  
8 alarm responses, depending on the species of rockfish and the received SPL. Startle  
9 responses were observed at a minimum received level of 200 dB re 1  $\mu\text{Pa}_{0-p}$ , and alarm  
10 responses occurred at a minimum received level of 177 dB re 1  $\mu\text{Pa}_{0-p}$ . Startle  
11 responses are flexions of the body followed by rapid swimming, shudders, or tremors.  
12 Alarm responses are changes in schooling behavior that presumably would lead to  
13 avoidance behavior.

14 Other observed behavioral changes included the tightening of schools, downward  
15 distributional shift, and random movement and orientation. Some fishes ascended in the  
16 water column and commenced to mill (i.e., "eddy") at increased speed, while others  
17 descended to the bottom of the enclosure and remained motionless. Pre-exposure  
18 behavior was reestablished from 20 to 60 min after cessation of seismic airgun  
19 discharge. Pearson et al. (1992) concluded that received SPL thresholds for overt and  
20 more subtle rockfish behavioral response are 180 dB re 1  $\mu\text{Pa}_{0-p}$  and 161 dB re  
21 1  $\mu\text{Pa}_{0-p}$ , respectively. Fish returning to pre-exposure behavior within 20 to 60 min  
22 suggests that any effects on fishing would be transitory.

23 Slotte et al. (2004) assessed the impacts of airgun use on several pelagic fish species,  
24 including blue whiting (*Micromesistius poutassou*) and Norwegian spring-spawning  
25 herring (*Clupea harengus*). Twelve days of seismic survey operations spread over a  
26 period of 1 month used a seismic airgun array with a source level of 222.6 dB re  
27 1  $\mu\text{Pa}_{p-p}$  at 1 m. The SPLs received by the fish were not measured. There was no  
28 strong evidence of short-term horizontal distributional effects. Researchers reported that  
29 fish schools were observed at greater depths following airgun exposure. Concentrations  
30 of fish at distance (i.e., 30 to 50 km from the airgun source) also suggest that migrating  
31 fish avoided the area of seismic survey activity.

32 Wardle et al. (2001) used underwater video and an acoustic tracking system to examine  
33 the behavior of several fish species (i.e., juvenile saithe, adult pollock, juvenile cod, and  
34 adult mackerel) in response to emissions from a single seismic airgun. The received  
35 SPLs ranged from approximately 195 to 218 dB re 1  $\mu\text{Pa}_{0-p}$ . Pollock did not move away  
36 from the reef in response to the seismic airgun sound, and their diurnal rhythm did not  
37 appear to be affected. However, there was an indication of a slight effect on the  
38 long-term day-to-night movements of the pollock. Video observations indicated that fish  
39 exhibited startle responses ("C-starts") to all received levels. There were also

indications of behavioral responses to visual stimuli. If the seismic source was visible to the fish, they fled from it. However, if the source was not visible to the fish, they often continued to move toward it. Startle responses to seismic sound have been observed in several other fish species (Hassel et al. 2004 – lesser sandeel, *Ammodytes marinus*; Skalski et al. - rockfishes, *Sebastes*, various species; Santulli et al. 1999 – European sea bass, *Dicentrarchus labrax*).

In an evaluation of the behavior of free-swimming fishes to noise from seismic air guns, fish movement (e.g., swimming direction or speed) was observed in the Mackenzie River (Northwest Territories, Canada) using sonar. Fishes did not exhibit a noticeable response even when sound exposure levels (single discharge) were on the order of 175 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  and peak levels of over 200 dB re 1  $\mu\text{Pa}$  (Jorgenson and Gyselman 2009; Cott et al. 2012).

While several studies have focused on the effects of low-frequency, high energy airgun surveys, fewer have assessed the effects of mid- and high-frequency equipment on fishes. Doksaeter et al. (2009) showed no responses from free-swimming herring (*Clupea*) when exposed to naval sonars. Similarly, sounds at the same received level that had been produced by major predators of the herring (killer whales) elicited strong flight responses. Sonar sound levels received by the fishes ranged from 197 to 209 dB re 1  $\mu\text{Pa}$  rms at 1 to 2 kHz. The hearing threshold for herring is approximately 125 to 135 dB re 1  $\mu\text{Pa}$  (Mann et al., 2005); fishes exposed to sonar showed no reactions to a sound that is biologically irrelevant at a level that was 84 dB above the herring hearing threshold. Other key references regarding impacts of sonars on fishes include Kvadsheim and Sevaldsen (2005), Halvorsen et al. (2006, 2012), and Kane et al. (2010).

Several issues are associated with many of these study results, including difficulties associated with determining sound source levels, and the applicability of airgun study results to low energy geophysical equipment due to some extent on frequency and sound propagation distance differences. Nonetheless, one common finding from these airgun studies that is applicable to this analysis, is the fact that injury or mortality to several fish species and life stages (i.e., adults, juveniles, larvae) may occur with exposure to SPLs between 220 dB and 240 dB re 1  $\mu\text{Pa}$  (unspecified measure type) (e.g., see Larson 1985; Dalen and Knutsen 1987; Holliday et al. 1987; Greenlaw et al. 1988; Turnpenny and Nedwell 1994; Turnpenny et al. 1994; Davis et al. 1998; Wardle et al. 2001; McCauley et al. 2003). Notably, however, results of sound modeling for low energy geophysical equipment indicate that while such levels may occur with use of several equipment types studied for this MND, such levels would occur only within several meters of the sound source, and with many equipment types, only in a single direction. As a result, only fish present within this small zone would be subjected to sound levels which are potentially injurious or lethal, but otherwise, no injurious or lethal effects are expected from exposure to low energy geophysical surveys. The number of

1 fish that would be present in this already limited zone is expected to be further reduced  
2 by the fishes' startle response and ability to swim away from the sound source. Minor  
3 behavioral modification may be associated with select equipment, particularly those  
4 sources with the potential to affect large areas, including boomers.

5 Behaviors are expected to include startle reactions and possible short-term  
6 displacement from habitat. Behavioral modification may affect fish catchability on a  
7 localized and short-term basis; however, no long-term, permanent abandonment of fish  
8 habitat is expected. EFH impacts will be less than significant, based on the relatively  
9 small area affected by each survey, the localized and short-term nature of the survey  
10 activity, and the absence of any impact to water quality or habitat suitability. Impacts to  
11 fish are expected to be less than significant.

#### 12 *Fish Noise Exposure Criteria*

13 As noted previously in the discussion of noise impacts to invertebrates, interim criteria  
14 for the onset of injury in fish (i.e., physiological effects) were initially established at a  
15 peak SPL level of 208 dB re 1  $\mu$ Pa, based on the work of Popper et al. (2006). This  
16 threshold was also applied to recent analyses (e.g., Central California Coast Seismic  
17 Imaging Project, CSLC 2012a).

18 Interim criteria also included an SEL threshold of 187 dB re 1  $\mu$ Pa<sup>2</sup>·s. In 2009, the  
19 interim criteria were revised to account for the onset of physical injury (i.e., TTS) when  
20 either the peak SPL exceeds 206 dB re 1  $\mu$ Pa (peak) or the SEL, accumulated over all  
21 pile strikes generally occurring within a single day, exceeds 183 or 187 dB re 1  $\mu$ Pa<sup>2</sup>·s,  
22 depending upon fish weight (Stadler and Woodbury 2009). Popper (2012) notes that the  
23 interim criteria have been closely scrutinized, and that recent pile driving effects studies  
24 (Halvorsen et al. 2011, 2012a,b; Casper et al. 2011, 2012a,b) have introduced further  
25 concerns regarding acceptable exposure levels.

26 Given these concerns and the absence of revised criteria, the current analysis has used  
27 the approach outlined in CSLC (2012a), adopting the SPL threshold of 208 dB re 1  $\mu$ Pa  
28 and the lower current SEL threshold of 183 dB re 1  $\mu$ Pa.

29 Modeling results for single pulse exposure for the 208 dB re 1  $\mu$ Pa SPL and 183 dB re  
30 1  $\mu$ Pa SEL thresholds are provided in **Table 3-25**.

**Table 3-25. Single-Pulse Maximum ( $R_{\max}$ , m) and 95% ( $R_{95\%}$ , m) Horizontal Distances from the Source to Modeled Maximum-Over-Depth SPL and SEL Thresholds for Fish**

Equipment Type	208 dB re 1 $\mu$ Pa SPL		183 dB re 1 $\mu$ Pa SEL	
	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$
Single Beam Echosounder	-	-	<20	<20
Multibeam Echosounder	<20	<20	<20	<20
Side-Scan Sonar	<20	<20	<20	<20
Subbottom Profiler	-	-	<20	<20
Boomer	-	-	<20	<20

“-“ – indicates that the equipment source level was below the threshold.

Given the SPL source levels and SELs for each equipment type, unweighted distances to the threshold of concern for fish would be less than 20 m. In some cases (e.g., single beam echosounder, subbottom profiler), equipment source levels were below the SPL threshold for fish. As a result, impacts to fish from low energy geophysical surveys are expected to be limited to those portions of the seafloor and water column where acoustic energy is focused, and limited to a maximum distance of less than 20 m from the source. Narrow beam width characteristics of most equipment suggest that impacts will be restricted to areas beneath the survey vessel and/or equipment. Fish exposed to OGPP equipment noise would be expected to show a startle response, including avoidance behavior and movement out of the immediate area of the survey. Due to the relatively short duration and localized operations of OGPP surveys, impacts to fish are expected to be less than significant.

## **Birds**

**Less than Significant.** Popper et al. (2012) note that for birds in air, continuous noise exposure levels above 110 dBA SPL (A-weighting, in air) can result in physical damage to the auditory system (e.g., PTS). Continuous noise exposure at levels of 90 to 95 dBA SPL and above can result in temporary elevation of hearing thresholds, mask important communication signals, and may produce other effects. Popper et al. (2012) also suggest that, in the absence of direct measurements of hearing capabilities or behavioral reactions to sound exposure, diving birds do not hear well underwater. While the middle ear cavity of diving birds may function like a swim bladder in fish, there remain unanswered questions as to the role of sound and communication among diving bird species (e.g., role of sound in foraging, predator avoidance, other behaviors),

Low energy geophysical surveys will introduce sound into the marine environment. Sounds produced underwater which are repetitive but very brief, have a narrow beam width, and are directed at the seafloor, such as those produced during OGPP surveys, may traverse the water-air interface but only at significantly reduced intensity levels. According to Hildebrand (2004), when sound propagates from water into air, there is a

30 dB (i.e., 1000-fold) decrease in acoustic intensity because the characteristic impedance of water is much greater than that of air. Directional sound from OGPP equipment will reach the ocean surface after it reflects off the seafloor; sound attenuation after passing through the water column twice, coupled with sound loss due to varying levels of absorption from the seafloor, will be significant. In addition, surface refraction of an underwater sound wave increases as the surface rugosity increases; waves and swell will diminish the potential for underwater sound to traverse the water-air interface. The sea surface acts like a mirror for sound waves (i.e., Lloyd mirror effect). Directional sound sources such as OGPP equipment have less potential to produce noise-related impacts above the ocean surface than omnidirectional sources. These factors suggest that sounds produced by an underwater source during OGPP surveys will be reduced significantly as they pass through the water-air interface.

At and above the ocean surface, OGPP equipment sounds may not be audible due to ambient noise levels (e.g., wind, waves) and/or other anthropogenic noise sources (e.g., survey vessel engines; vessel traffic). Marine and coastal birds either flying or resting on the ocean surface in the vicinity of OGPP survey operations are unlikely to be affected by underwater equipment and associated noise (i.e., levels of 90 to 95 dBA or above are not expected).

Diving birds (e.g., plunge divers such as boobies, tropicbirds, some terns, and Brown Pelicans) may be at risk of increased sound exposure during feeding when in close proximity to OGPP survey equipment. Sound exposure risk will be greatest under those conditions where a diving bird is below the equipment. Birds diving lateral to active OGPP equipment will be exposed to equipment-specific reductions in sound levels (i.e., narrow beam width sources will produce less ensonification in surrounding waters).

Impacts to marine and coastal birds from low energy geophysical surveys are expected to be limited. Those species that forage on the ocean surface are unlikely to be affected by OGPP survey equipment and associated noise. Diving birds are more likely to be exposed to noise from OGPP survey equipment; however, impacts to diving birds will be limited to those individuals foraging beneath OGPP survey equipment where acoustic energy is focused, and will be limited to a maximum distance of less than 20 m from the source. Due to the relatively short duration and localized operations of OGPP surveys, as well as limitations of impacts to diving birds and their position in the water column, impacts to birds are expected to be less than significant.

#### **Marine Reptiles (Sea Turtles)**

**Less than Significant.** Few studies have examined the role acoustic cues play in the ecology of sea turtles (Mrosovsky 1972; Samuel et al. 2005; Nunny et al. 2008). It has been suggested that sea turtles use sound to navigate, locate prey, avoid predators, and sense their environment (Piniak et al. 2011). There is evidence that sea turtles may

use sound to communicate; the few vocalizations described for sea turtles are restricted to the “grunts” of nesting females. These sounds are low-frequency and relatively loud, thus leading to speculation that nesting females use sounds to communicate with conspecifics (Mrosovsky 1972).

While little is known regarding the extent to which sea turtles use acoustic cues to sense and monitor their environment, it is recognized that a turtle’s ambient and passive acoustic environment changes with each ontogenetic habitat shift. In the inshore environment where juvenile and adult sea turtles generally reside, the ambient environment is noisier than the open ocean environment of the hatchlings; this inshore environment is dominated by low-frequency sound (Hawkins and Myrberg 1983). In areas with high levels of vessel traffic, low-frequency noise from shipping, recreational boating, and seismic surveys compound the potential for acoustic impact (Hildebrand 2005).

#### *Sea Turtle Hearing*

The characterization of sea turtle hearing can be broadly organized into two study types: measurements of electrophysiological responses to sound exposure and observations of behavioral responses to sound exposure. The following summary has been derived from a recent synthesis effort completed by Bartol (2012). Detailed discussions of sea turtle hearing and applicable study results are provided in **Appendix H**.

Sea turtles are low-frequency hearing specialists, typically hearing frequencies from 30 to 2,000 Hz, with a range of maximum sensitivity between 100 and 800 Hz (Bartol and Ketten 2006; Bartol et al. 1999; Lenhardt 1994; Ridgway et al. 1969). Hearing below 80 Hz is less sensitive but may be important biologically (Lenhardt 1994). By species, hearing characteristics of sea turtles that may be present in California waters include:

- Loggerhead sea turtle: greatest sensitivities around 250 Hz or below for juveniles, with the range of effective hearing from at least 250 to 750 Hz (Bartol et al. 1999);
- Green sea turtle: greatest sensitivities are 300 to 400 Hz (Ridgway et al. 1969); juveniles and sub-adults detect sounds from 100 to 500 Hz underwater, with maximum sensitivity at 200 and 400 Hz (Bartol and Ketten 2006) or between 50 and 400 Hz (Dow et al. 2008); peak response at 300 Hz (Yudhana et al. 2010b); Pacific hawksbill sea turtle: greatest sensitivities at 50 to 500 Hz (Yudhana et al. 2010a);
- Olive ridley sea turtle: juveniles of a congener (Kemp’s ridley) found to detect underwater sounds from 100 to 500 Hz, with a maximum sensitivity between

100 and 200 Hz (Bartol and Ketten 2006); similar functional hearing capabilities are assumed; Pacific leatherback sea turtle: a lack of audiometric information noted; anatomy suggests hearing capabilities similar to other sea turtles, with functional hearing assumed to be 10 Hz to 2 kHz.

Green and leatherback sea turtles are the most likely species to be present offshore California, with loggerheads, hawksbill, and olive ridley sea turtle presence considered to be rare. **Table 3-26** summarizes hearing sensitivities and presence, habitat, and diet of sea turtles of California.

**Table 3-26. Hearing Sensitivities and Presence, Habitat, and Diet of Sea Turtles of California**

Taxonomic Classification and Common Name	Scientific Name	Presence, Habitat, and Diet	Hearing
Loggerhead sea turtle	<i>Caretta caretta</i>	Rare in CA; occupies three different habitats – oceanic, neritic, and terrestrial (nesting only), depending upon life stage; omnivorous	Low-frequencies (optimal: 250 to 750 Hz)
Green sea turtle	<i>Chelonia mydas</i>	Common In CA; resident populations in San Diego County; aquatic, but known to bask onshore; juvenile distribution unknown; omnivorous	Low-frequencies (optimal: 200 to 400 Hz)
Pacific hawksbill sea turtle	<i>Eretmochelys imbricata bisssa</i>	Rare in CA; pelagic; feeding changes from pelagic surface feeding to benthic, reef-associated feeding mode; opportunistic diet	Low-frequencies (optimal: 50 to 500 Hz)
Olive ridley sea turtle	<i>Lepidochelys olivacea</i>	Rare in CA; primarily pelagic, but may inhabit coastal areas, including bays and estuaries; most breed annually, with annual migration (pelagic foraging, to coastal breeding/nesting grounds, back to pelagic foraging); omnivorous, benthic feeder	Low-frequencies (optimal: 100 to 200 Hz; congener)
Pacific leatherback sea turtle	<i>Dermochelys coriacea</i>	Frequent in CA; pelagic, living in the open ocean and occasionally entering shallower water (bays, estuaries); omnivorous (jellyfish; other invertebrates, vertebrates, kelp, algae)	Low-frequencies (estimated: 10 Hz to 2 kHz)

Sounds have the potential to impact a sea turtle in several ways: masking of biologically significant sounds, alteration of behavior, trauma to hearing (temporary or permanent), and trauma to non-hearing tissue (barotraumas) (McCarthy 2004). Anthropogenic noise, even below levels that may cause injury, has the potential to mask relevant sounds in the environment. Masking sounds can interfere with the acquisition of prey, affect the ability to locate a mate, diminish the ability to avoid predators, and, particularly in the case of sea turtles, adversely affect the ability to properly identify an appropriate nesting site (Nunny et al. 2008); however, there are no quantitative data demonstrating masking effects for sea turtles.



Clear avoidance reactions to seismic signals at levels between 166 and 179 dB re 1  $\mu$ Pa (unspecified measure type) have been observed (Moein et al. 1995; McCauley et al. 2000); however, both of these studies were done in a caged environment, so the extent of avoidance could not be monitored. Moein et al. (1995) did observe a habituation effect to the airguns when the animals stopped responding to the signal after three presentations. This lack of behavioral response could be a result of trauma to hearing.

Hearing damage is usually categorized as either a temporary or permanent injury. Threshold shifts are noise-induced increases in hearing thresholds within a specific frequency range; threshold shifts can be temporary (temporary threshold shift [TTS]) or permanent (permanent threshold shift [PTS]). TTSs are recoverable injuries to the hearing structure and can vary in intensity and duration. Normal hearing abilities return over time; however, animals often lack the ability to detect prey and predators and assess their environment during the recovery period. In contrast, PTSs constitute a permanent loss of hearing through loss of sensory hair cells (Clark 1991). Key references pertinent to threshold shifts in general include Kryter (1994), Ward (1997), Kastak et al. (1999) and Yost (2000). Few studies have looked at hair cell damage in reptiles, and it is still unknown if sea turtles are able to regenerate hair cells (Warchol 2011). There are almost no data on the effects of intense sounds on marine turtles and, thus, it is difficult to predict the level of damage to hearing structures. No studies have been identified that address the effects of low energy geophysical equipment noise on sea turtles. NSF (2011), in its analysis of research-based oceanographic survey equipment (i.e., subbottom profiler, multibeam echosounder, pingers, and Acoustic Doppler Current Profiler [ADCP]), determined that significant impacts to sea turtles through masking, disturbance, or hearing impairment would not be expected. Mitigating factors supporting this determination include equipment frequencies well above the optimal hearing range of sea turtles, low source levels, the directional and narrow-beam characteristics of the acoustic signals, and/or brief signal duration and exposure periods.

### *Sea Turtle Noise Exposure Criteria*

There currently are no noise exposure criteria for sea turtles. NMFS has, however, implemented *de facto* use of the marine mammal exposure protocols when addressing impacts and implementing mitigation for sea turtles. NMFS has established the following SPL criteria:

- Injury: 180 dB re 1  $\mu$ Pa rms for impulsive sound;
- Behavioral response: 160 dB re 1  $\mu$ Pa rms for impulsive sound; and
- Behavioral response: 120 dB re 1  $\mu$ Pa rms for continuous (non-impulsive) sound.

1 In the absence of sea turtle-specific criteria, the 180 and 160 dB thresholds are applied.  
2 Currently, no SEL thresholds have been recommended for sea turtles.

3 Impacts to sea turtles from OGPP surveys will be limited due to several factors,  
4 including the narrow beam width characteristics of most equipment, areas of highest  
5 potential exposure located directly below the equipment, and the species-specific  
6 variability of sea turtle presence in California waters. If sea turtles are present, they  
7 would be expected to show startle responses during OGPP surveys when in close  
8 proximity to survey equipment. No sea turtle injury or mortality is expected from acoustic  
9 sources when complying with OGPP permit requirements for mitigation. Due to the  
10 relatively short duration and localized nature of OGPP surveys, impacts to sea turtles  
11 are expected to be less than significant.

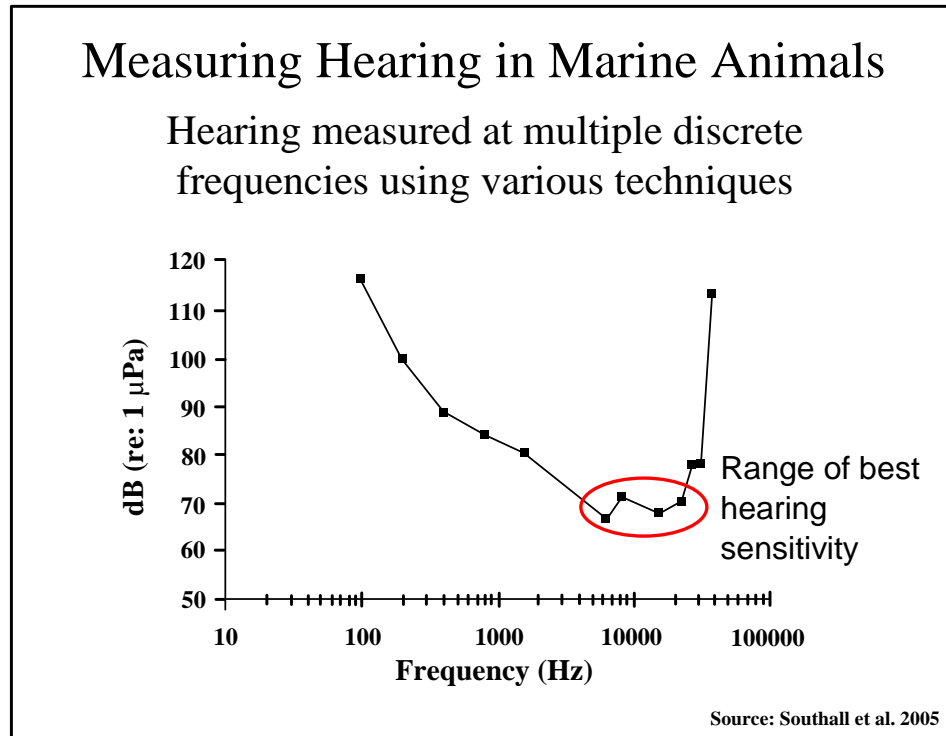
## 12 **Marine Mammals**

13 **Less than Significant; Less than Significant with Mitigation.** Significance  
14 conclusions presented in this section depend on the equipment type, duration of  
15 exposure (i.e., single pulse or cumulative), species or species group (and related  
16 hearing frequency), and other factors. The discussions below evaluate the potential  
17 impacts as they relate to all these factors, and individual significance conclusions are  
18 identified for each of the different equipment types and species groups.

19 Hearing has been measured using behavioral and/or electrophysiological methods in  
20 about a quarter of the known marine mammal species, although with a disproportional  
21 representation of species commonly found in captivity, and some entire groups  
22 (e.g., mysticetes) remain untested (Southall 2012). Hearing sensitivity is generally  
23 quantified by determining the quietest possible sound that is detectable by an animal  
24 either via a behavioral response or by quantifying an electrical response, based on  
25 exposure to an acoustic signal. By exposing an animal to a broad range of test  
26 frequencies, the overall hearing capability can be determined. The graphic depiction of  
27 the overall hearing capability of a test subject is known as an audiogram (**Figure 3-4**).

28 Hearing sensitivity is greatest in those frequency ranges where sound detection levels  
29 are lowest. Audiograms follow a U-shaped curve, with the lowest frequency measures  
30 indicating best hearing sensitivity, flanked by decreased sensitivity at frequencies above  
31 and below. The region where hearing thresholds are within some range from the lowest  
32 overall threshold is often referred to as the overall range of functional hearing.  
33 Audiograms quickly provide an indication of the range of frequencies where the best  
34 hearing capabilities are found.

**Figure 3-4. Audiogram from a California Sea Lion (From: Southall et al. 2005; Southall 2012)**



### *Marine Mammal Hearing Weighting Functions*

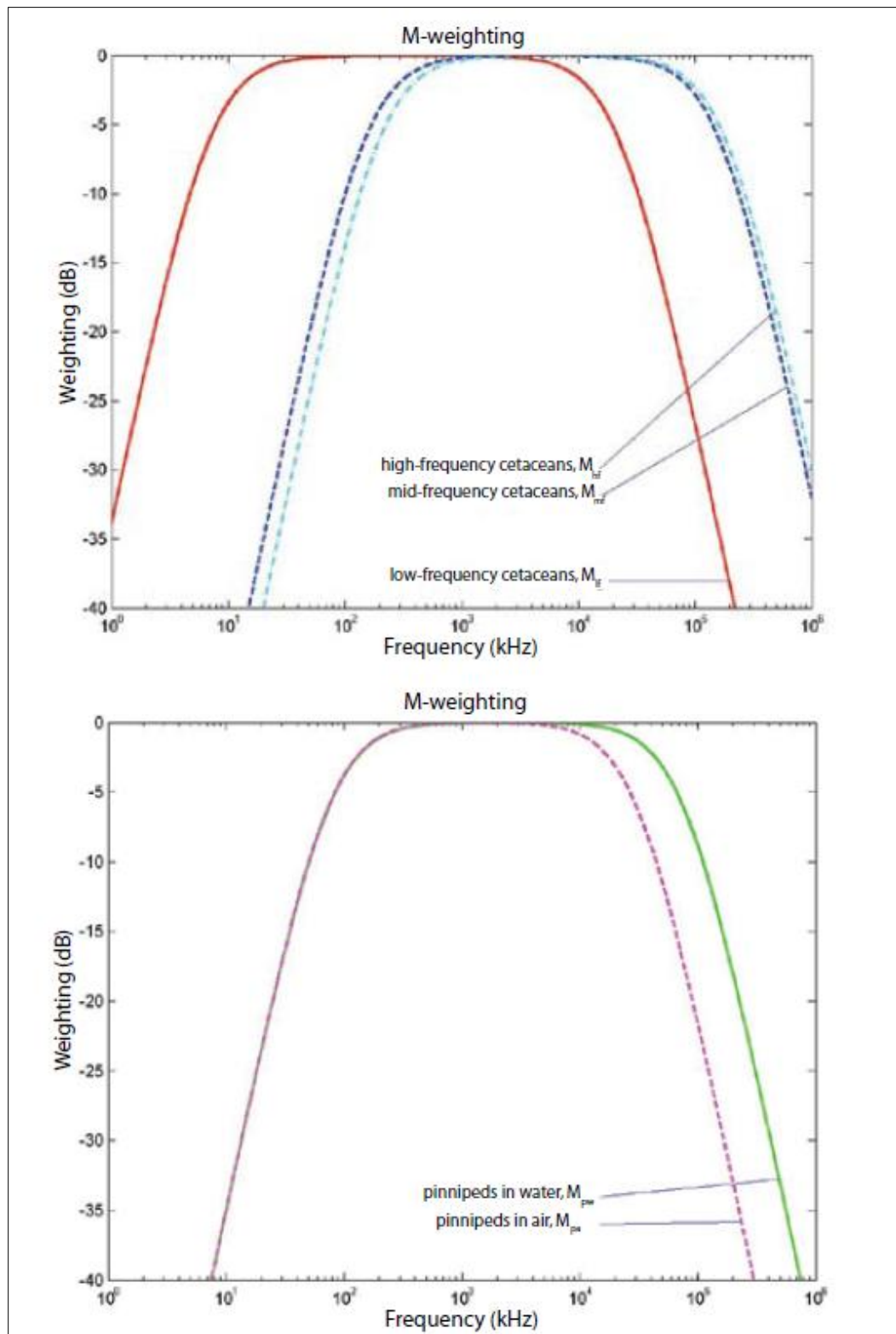
Because marine mammals do not hear equally well at all frequencies, frequency-weighting functions were developed by Southall et al. (2007) for five functional hearing groups as a method for quantitatively compensating for differential frequency responses for different marine mammal species. Weighting functions are commonly applied to assess the potential for the detection of a sound at a specific frequency and to assess the potential impact arising from noise exposure.

**Table 3-27** outlines the five functional hearing groups and estimated functional hearing ranges for marine mammals proposed by Southall et al. (2007). Using the estimated lower and upper frequency cut-off limits as 6-dB down points on an exponential roll-off for the frequency-weighting functions, Southall et al. (2007) developed frequency-weighting filters for each of the five functional hearing groups as shown in **Figure 3-5**.

**Table 3-27. Marine Mammal Functional Hearing Groups and Estimated Functional Hearing Ranges (Adapted from: Southall et al. 2007)**

Functional Hearing Group	Estimated Auditory Bandwidth	Genera Represented (Number Species/Subspecies)	Frequency-Weighting Network
Low-frequency Cetaceans	7 Hz to 22 kHz	<i>Balaena</i> , <i>Caperea</i> , <i>Eschrichtius</i> , <i>Megaptera</i> , <i>Balaenoptera</i> (13 species/subspecies)	M <sub>lf</sub>
Mid-frequency Cetaceans	150 Hz to 160 kHz	<i>Steno</i> , <i>Sousa</i> , <i>Sotalia</i> , <i>Tursiops</i> , <i>Stenella</i> , <i>Delphinus</i> , <i>Lagenodelphis</i> , <i>Lagenorhynchus</i> , <i>Lissodelphis</i> , <i>Grampus</i> , <i>Peponocephala</i> , <i>Feresa</i> , <i>Pseudorca</i> , <i>Orcinus</i> , <i>Globicephala</i> , <i>Orcacella</i> , <i>Physeter</i> , <i>Delphinapterus</i> , <i>Monodon</i> , <i>Ziphius</i> , <i>Berardius</i> , <i>Tasmacetus</i> , <i>Hyperoodon</i> , <i>Mesoplodon</i> (57 species/subspecies)	M <sub>mf</sub>
High-frequency Cetaceans	200 Hz to 180 kHz	<i>Phocoena</i> , <i>Neophocaena</i> , <i>Phocoenoides</i> , <i>Platanista</i> , <i>Inia</i> , <i>Kogia</i> , <i>Lipotes</i> , <i>Pontoporia</i> , <i>Cephalorhynchus</i> (20 species/subspecies)	M <sub>hf</sub>
Pinnipeds (in water)	75 Hz to 75 kHz	<i>Arctocephalus</i> , <i>Callorhinus</i> , <i>Zalophus</i> , <i>Eumetopias</i> , <i>Neophoca</i> , <i>Phocarctos</i> , <i>Otaria</i> , <i>Erignathus</i> , <i>Phoca</i> , <i>Pusa</i> , <i>Halichoerus</i> , <i>Histiophoca</i> , <i>Pagophilus</i> , <i>Cystophora</i> , <i>Monachus</i> , <i>Mirounga</i> , <i>Leptonychotes</i> , <i>Ommatophoca</i> , <i>Lobodon</i> , <i>Hydrurga</i> , <i>Odobenus</i> (41 species/subspecies)	M <sub>pw</sub>
Pinnipeds (in air)	75 Hz to 30 kHz	<i>Arctocephalus</i> , <i>Callorhinus</i> , <i>Zalophus</i> , <i>Eumetopias</i> , <i>Neophoca</i> , <i>Phocarctos</i> , <i>Otaria</i> , <i>Erignathus</i> , <i>Phoca</i> , <i>Pusa</i> , <i>Halichoerus</i> , <i>Histiophoca</i> , <i>Pagophilus</i> , <i>Cystophora</i> , <i>Monachus</i> , <i>Mirounga</i> , <i>Leptonychotes</i> , <i>Ommatophoca</i> , <i>Lobodon</i> , <i>Hydrurga</i> , <i>Odobenus</i> (41 species/subspecies)	M <sub>pa</sub>
Abbreviations: Hz = Hertz; kilohertz = kHz; M <sub>lf</sub> = low-frequency cetaceans; M <sub>mf</sub> = mid-frequency cetaceans; M <sub>hf</sub> = high-frequency cetaceans; M <sub>pw</sub> = pinnipeds (in water); M <sub>pa</sub> = pinnipeds (in air).			

1 **Figure 3-5. Frequency-Weighting Functions for Cetaceans (Top) and Pinnipeds in**  
 2 **Air and Water (Bottom) Proposed by Southall et al. (2007)**



3

Most of the marine mammals likely to be present in State waters are cetaceans, with several pinnipeds and a single mustelid also present. Hearing group designations for each of California's marine mammals are shown in **Table 3-28**.

**Table 3-28. Marine Mammals of California, Including Habitat and Hearing Group Classification**

Taxonomic Classification and Common Name	Scientific Name	Habitat	Hearing Group
<b>Mysticetes – Baleen Whales</b>			
Family: Eschrichtiidae (gray whales)			
California gray whale	<i>Eschrichtius robustus</i>	CN	LF
Family: Balaenopteridae (rorquals)			
Minke whale	<i>Balaenoptera acutorostrata scammoni</i>	CN, O	LF
Sei whale	<i>Balaenoptera borealis borealis</i>	O	LF
Bryde's whale	<i>Balaenoptera edeni</i>	O	LF
Blue whale	<i>Balaenoptera musculus musculus</i>	CN, O	LF
Fin whale	<i>Balaenoptera physalus physalus</i>	CN, O	LF
Humpback whale	<i>Megaptera novaeangliae</i>	CN, O	LF
Family: Balaenidae (right whales)			
North Pacific right whale	<i>Eubalaena japonica</i>	CN, O	LF
<b>Odontocetes – Toothed Whales</b>			
Family: Delphinidae (dolphins)			
Short-beaked common dolphin	<i>Delphinus delphis</i>	CN, O	MF
Long-beaked common dolphin	<i>Delphinus capensis</i>	CN	MF
Short-finned pilot whale	<i>Globicephala macrorhynchus</i>	O	MF
Risso's dolphin	<i>Grampus griseus</i>	CN, O	MF
Pacific white-sided dolphin	<i>Lagenorhynchus obliquidens</i>	CN, O	MF
Northern right whale dolphin	<i>Lissodelphis borealis</i>	CN, O	MF
Killer whale	<i>Orcinus orca</i>	CN, O	MF
False killer whale	<i>Pseudorca crassidens</i>	CN, O	MF
Striped dolphin	<i>Stenella coeruleoalba</i>	O	MF
Bottlenose dolphin	<i>Tursiops truncatus</i>	CN, O	MF
Family: Phocoenidae (porpoises)			
Dall's porpoise	<i>Phocoenoides dalli</i>	CN, O	HF
Harbor porpoise	<i>Phocoena phocoena</i>	CN, O	HF
Family: Physeteridae (sperm whales)			
Pygmy sperm whale	<i>Kogia breviceps</i>	O	HF
Dwarf sperm whale	<i>Kogia sima</i>	O	HF
Sperm whale	<i>Physeter macrocephalus</i>	O	MF
Family: Ziphiidae (beaked whales)			
Baird's beaked whale	<i>Berardius bairdii</i>	O	MF
Hubbs' beaked whale	<i>Mesoplodon carlhubbsi</i>	O	MF
Blainville's beaked whale	<i>Mesoplodon densirostris</i>	O	MF
Ginkgo-toothed beaked whale	<i>Mesoplodon ginkgodens</i>	O	MF
Perrin's beaked whale	<i>Mesoplodon perrini</i>	O	MF
Pygmy beaked whale	<i>Mesoplodon peruvianus</i>	O	MF
Stejneger's beaked whale	<i>Mesoplodon stejnegeri</i>	O	MF
Cuvier's beaked whale	<i>Ziphius cavirostris</i>	O	MF

Taxonomic Classification and Common Name	Scientific Name	Habitat	Hearing Group
<b>Pinnipeds – Seals and Sea Lions</b>			
Family: Otariidae (eared seals)			
Guadalupe fur seal	<i>Arctocephalus townsendi</i>	CN	PW
Northern fur seal	<i>Callorhinus ursinus</i>	CN	PW
Northern (Steller) sea lion	<i>Eumetopias jubatus</i>	CN, O	PW
California sea lion	<i>Zalophus californianus</i>	CN	PW
Family: Phocidae (earless seals)			
Northern elephant seal	<i>Mirounga angustirostris</i>	CN, O	PW
Harbor seal	<i>Phoca vitulina</i>	CN	PW
<b>Mustelid – Sea Otter</b>			
Family: Mustelidae (weasels)			
Southern sea otter	<i>Enhydra lutris nereis</i>	CN	Broad

Habitat: CN = coastal and/or nearshore; O = offshore and/or deep water.

Hearing Group: LF = low-frequency cetaceans; MF = mid-frequency cetaceans; HF = high-frequency cetaceans; PW = pinnipeds (in water).

California's mysticetes are found in the low-frequency hearing group, while California's odontocetes are routinely found in the mid-frequency hearing group, with minor exception (i.e., porpoises, pygmy and dwarf sperm whales). For some of these species (e.g., bottlenose dolphins), relatively good information exists about hearing and behavioral responses to some types of sounds (e.g., Nowacek et al. 2001). For most of the mid-frequency cetaceans, including the endangered sperm whale, the injury criteria proposed by Southall et al. (2007) and general conclusions on behavioral response are generally applicable; direct recent information on behavioral responses in sperm whales to other forms of anthropogenic noise are available as well (e.g., Miller et al. 2009).

For the endangered mysticetes that occur in offshore California waters (e.g., blue, fin, humpback, and sei whales), as for all low-frequency cetaceans, no direct information regarding hearing is available. Current exposure criteria for injury are based on assumptions and extrapolations from mid-frequency cetacean data that may need to be reassessed to some degree based on the subsequent measurements of lower TTS-onset levels in bottlenose dolphins within their range of best hearing sensitivity (Finneran and Schlundt 2010).

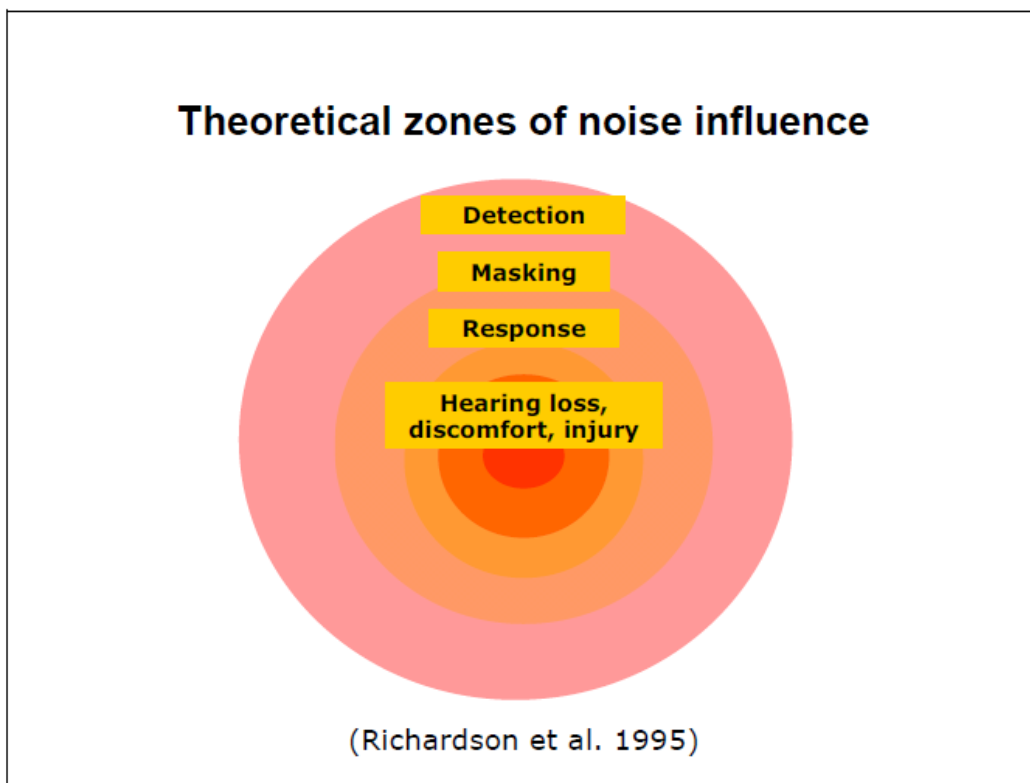
In terms of behavioral response, substantial effort has been made and data are available for anthropogenic impulsive noise sources (e.g., seismic airguns, sonars) for mysticetes, though not for all of the species present offshore California. Recently, Southall et al. (2011) demonstrated behavioral responses, and an apparent context-dependence response based on behavioral state, in some blue and fin whales exposed to simulated sonar sounds off the coast of California.

The effects of anthropogenic sound on marine mammals varies depending on a variety of biological and environmental influences, and have been summarized by several

1 authors, including Richardson et al. (1995), National Research Council (NRC 2003a,  
2 2005), Nowacek et al. (2007), and Southall et al. (2007). Important biological influences  
3 may include the activity of the animals involved (e.g., feeding, migration, reproduction),  
4 their social structure (e.g., aggregations of individuals or presence of mother-calf pairs),  
5 their previous individual experience with the sound (i.e., sound novelty, association with  
6 predator/prey sounds), and the various other biological stressors affecting them.

7 Southall (2012) recently prepared a summary of marine mammal hearing and  
8 sound-related impacts. For a species to be affected noise, the amplitude, duration, and  
9 frequency of the noise influence how the animal is affected. Theoretical zones of noise  
10 influence are depicted in **Figure 3-6**. It is also important to consider the hearing ability  
11 and behavioral state of the animal to determine how sensitive it may be to the noise as  
12 well as whether the animal is likely to be in the vicinity of the noise source. Potential  
13 effects of noise may be classified into the following categories: (1) behavioral  
14 responses; (2) auditory masking; (3) hearing threshold shifts; (4) physiological effects;  
15 and (5) mortality. Additional discussion regarding the effects of noise exposure is  
16 provided in **Appendix H**.

17 **Figure 3-6. Theoretical Zones of Noise Influence**  
18 **(Adapted From: Richardson et al. 1995)**





## 1 *Behavioral Responses*

2 A wide range of behavioral responses to noise exposure is possible. Southall (2012)  
3 identifies at least seven levels of response, including (in increasing severity and  
4 decreasing likelihood): no observable response, increased alertness, minor behavioral  
5 responses (e.g., vocal modifications associated with masking), cessation of feeding or  
6 social interaction, temporary avoidance behavior, modification of group structure or  
7 activity state, and habitat abandonment. The context in which the noise exposure  
8 occurs is a critical factor in determining auditory impacts (Wartzok et al. 2004; Southall  
9 et al. 2007).

10 General observations regarding behavior responses include: (1) many of the responses  
11 observed across taxa were temporary avoidance behavior; (2) certain species  
12 (e.g., harbor porpoises, beaked whales) appear to be categorically more sensitive to  
13 noise than other observed species; and (3) certain behavioral states (e.g., migrating)  
14 can make species, such as bowhead whales, more sensitive to noise exposure  
15 (Richardson et al. 1999). Recent results are available from both controlled exposure  
16 experiments and opportunistic observations of anthropogenic noise source operations  
17 on the behavioral responses of particularly sensitive marine mammals, including harbor  
18 porpoises (Kastelein et al. 2008a,b; Gilles et al. 2009) and beaked whales (Caretta et al.  
19 2008; McCarthy et al. 2011; Southall et al. 2011; Tyack et al. 2011).

20 Key references regarding behavioral response to anthropogenic noise include Ljungblad  
21 et al. (1988); Richardson et al. (1995); McCauley et al. (1998; 2003); Ridgway and  
22 Carder (2001); Miller et al. (2005); NRC (2005); Southall et al. (2007); Würsing et al.  
23 (2008); Bejder et al. (2009); Barber et al. (2010).

## 24 *Auditory Masking*

25 Auditory masking results from the spectral, temporal, and/or spatial overlap between a  
26 noise source and an organism, whether a sender or receiver, and causes a reduction in  
27 the ability of the organism to effectively communicate, detect predators, prey, and/or  
28 conspecific signals, and/or properly determine its spatial orientation. Elevated  
29 low-frequency underwater noise levels near busy shipping routes and ports have the  
30 potential to interfere significantly with whale calls used to maintain contact, aggregate to  
31 feed, and locate potential mates, potentially affecting critical life-history events  
32 (Nowacek et al. 2007; Weilgart 2007; Clark et al. 2009; Tyack 2008). Reported whale  
33 responses to increases in background noise have included: habitat displacement; and  
34 behavioral changes and alterations in vocalization patterns, such as shifting the  
35 frequency band or energy level of calls, making signals longer or more repetitive, or  
36 waiting to signal until the noise is reduced (Nowacek et al. 2007; Weilgart 2007).

Masking has received only limited scientific study. Clark et al. (2009) provided a quantitative means of determining the relative loss of acoustic communication range for marine mammals using specific calls in conditions in which the mammals are exposed to specific anthropogenic noise sources. A recent summary by Reichmuth (2012) addresses psychophysical studies of masking in marine mammals. Key references regarding masking include work done with odontocetes (Branstetter and Finneran 2008; Branstetter et al. 2011; Erbe 2000; Erbe and Farmer 1998; Kastelein and Wensween 2008; Kastelein et al. 2009; Lemonds 1999) and pinnipeds (Holt and Schusterman 2007; Southall et al. 2000, 2003; Turnbull 1994).

#### Hearing Threshold Shifts

Sound impulse duration, peak amplitude, rise time, number of pulses, and inter-pulse interval are the main factors thought to determine the onset and extent of PTS (NMFS 2012). Both TTS and PTS can result either from physical damage (e.g., cell structure fatigue) or metabolic change (e.g., inner ear hair cell metabolism). Per Southall (2012), intense sound exposure more often results in mechanical processes, whereas prolonged exposure more typically results in metabolic changes (e.g., Saunders et al. 1985). Two important factors were noted by Southall (2012) regarding threshold shifts:

- The exposure level relative to the subject's absolute hearing sensitivity (i.e., the sensation level) is particularly important in determining TTS onset; and
- Exposure levels in the region of best hearing sensitivity should be used as generic TTS-onset values against which frequency weighting functions could be applied to correct for frequency-specific hearing.
- Key references pertinent to threshold shifts specifically in marine mammals include Schlundt et al. (2000), Finneran et al. (2002, 2005, 2010a,b), Lucke et al. (2009), Mooney et al. (2009a,b), Finneran and Schlundt (2010), and Gedamke et al. (2011).

#### Physiological Effects

Physiological effects result from damaging but non-lethal exposure to high levels of sound or shock waves, with similar short duration, high peak pressure sources; these may include stress responses and direct physical injury (e.g., tissue damage). Busch and Hayward (2009) and Wright et al. (2007a,b) had prepared recent reviews addressing physiological effects.

Direct measurements of physical stress responses in marine mammals from sound exposure are relatively limited. Key data sources pertinent to physiological effects include Thomas et al. (1990), Miksis et al. (2001), and Romano et al. (2004). Rolland et al. (2012) recently summarized elevated stress levels in North Atlantic right whales (*Eubalaena glacialis*) resulting from vessel noise.

1 *Mortality*

2 Mortality results from direct physical injury as a consequence of exposure to high levels  
3 of sound or shock waves (e.g., from high intensity events, explosions), characterized by  
4 short duration, high peak pressures that damage air-filled body cavities (e.g., lungs) and  
5 other internal organs (e.g., see Yelverton et al. 1973; Goertner 1982; Young 1991).

6 Key data sources pertaining to noise-induced mortality include Todd et al. (1996) and  
7 Cudahy and Ellison (2002). More recently, another form of physiological damage among  
8 marine mammals has been investigated – the formation of gas bubble lesions and fat  
9 emboli. This damage has been noted in several beaked whale species that have  
10 stranded in the vicinity of naval mid-frequency sonar training exercises (Jepson et al.  
11 2003; Fernández et al. 2005; Tyack et al. 2011). Currently, these tissue impacts are  
12 thought to result from a behavioral response that changes diving patterns in some way  
13 and subsequently causes lesion/emboli formation, rather than as a direct physical effect  
14 of sound exposure (Cox et al. 2006; Zimmer and Tyack 2007).

15 *Existing Studies on Noise Exposure from Low Energy Geophysical Survey Equipment*

16 Most studies addressing the effects of anthropogenic sound on marine mammals have  
17 focused on the effects of sound from airguns and similar low-frequency sources. Few  
18 studies have been directed specifically at the effects of low energy geophysical survey  
19 equipment; however, the potential impacts of such sources have received increasing  
20 attention over the past several years, particularly in regard to research-based survey  
21 activity. For example, the National Science Foundation (NSF) issued an Environmental  
22 Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) which  
23 evaluated the effects of research-based seismic and oceanographic sonar emissions on  
24 marine mammals (NSF 2010); equipment evaluated included an airgun array, as well as  
25 oceanographic survey equipment previously thought be relatively benign  
26 (e.g., subbottom profiler, multibeam echosounder, pingers, and ADCP).

27 Environmental analyses of similar equipment types have also considered the impacts to  
28 other marine fauna, including sea turtles, fishes, and invertebrates (e.g., NSF 2011).  
29 Summary study findings pertinent to low energy geophysical equipment noise exposure  
30 to marine mammals are provided in **Table 3-29**.

**Table 3-29. Summary of Study Results for Marine Mammals Exposed to Low Energy Geophysical Equipment Emissions (Adapted From: NSF 2010)**

Species/Group	Major Findings	Source
<b><i>Mysticetes – Baleen Whales</i></b>		
Humpback whale	Movement away from the source upon exposure to 3.3- kHz sonar pulses; increased swimming speeds and track linearity in response to 3.1- to 3.6-kHz sonar sweeps	Maybaum 1990, 1993
Humpback whale	Documented changes in vocalization (songs) and swimming patterns upon exposure to low-frequency active (LFA) sonar transmissions	Miller et al. 2000; Clark et al. 2001
Gray whale	Migrating gray whales reacted to a 21- to 25-kHz whale-finding sonar (source level: 215 dB re 1 $\mu$ Pa at 1 m) by orienting slightly away from the source and deflecting from their course by approximately 200 m; responses were not obvious in the field and were only determined later during data analysis	Frankel 2005
Mysticetes, general	Reactions of marine mammals to a 38-kHz echosounder and a 150-kHz Acoustic Doppler Current Profiler (ADCP) were documented; results indicated that mysticetes showed no significant responses when the echosounder and ADCP were transmitting	Gerrodette and Pettis 2005
Mysticetes, general	Whaling catcher boats reported that baleen whales showed strong avoidance of echosounders that were sometimes used to track baleen whales underwater	Richardson et al. 1995
Mysticetes, general	Ultrasonic pulses emitted by whale scarers during whaling operations tended to scare baleen whales to the surface	Richardson et al. 1995
Right, humpback, and fin whales	No reactions were noted following exposure to pingers and sonars at and above 36 kHz, although these species often reacted to sounds at frequencies of 15 Hz to 28 kHz	Watkins 1986
<b><i>Odontocetes – Toothed Whales</i></b>		
Dolphins, beaked whales	When the echosounder and ADCP were on, spotted and spinner dolphins were detected slightly more often and beaked whales less often during visual surveys	Gerrodette and Pettis 2005
Sperm whale	Some sperm whales stopped emitting pulses in response to 6- to 13-kHz pingers	Watkins and Schevill 1975
Sperm whale	Sperm whales usually continued calling and did not appear to otherwise react to continual pulsing from echosounders emitting at 12 kHz	Backus and Schevill 1966; Watkins 1977
Bottlenose dolphin	Behavior of captive, open-sea enclosed dolphins appeared to change in response to sounds from a close and/or approaching marine geophysical survey vessel operating a 1-kHz sparker, 375-kHz side-scan sonar, 95-kHz multibeam echosounder, and two 20-to 50-kHz single beam echosounders	van der Woude 2007
Killer whale	Occurrence was significantly lower during a 7-year period when acoustic harassment devices (10 kHz at 194 dB re 1 $\mu$ Pa at 1 m) were installed in the area; whales returned to baseline numbers when these sound sources were removed	Morton and Symonds 2002
Harbor porpoise	Acoustic alarms operating at 10 kHz with a source level of 132 dB re 1 $\mu$ Pa at 1 m were an effective deterrent	Kraus et al. 1997

Harbor porpoise	Subjected one harbor porpoise in a large floating pen to a continuous 50-kHz pure tone with a source level of $122 \pm 3$ dB re 1 $\mu$ Pa rms at 1 m; the porpoise moved away from the sound at an estimated avoidance threshold of $108 \pm 3$ dB re 1 $\mu$ Pa rms and did not habituate to it despite 66 exposures	Kastelein et al. 2008
<b>Pinnipeds – Seals and Sea Lions</b>		
Gray seal	Two gray seals, exposed to operation of a 375-kHz multibeam imaging sonar that included significant signal components down to 6 kHz, reacted by significantly increasing dive duration; no significant differences were found in swimming direction relative to the operating sonar	Hastie and Janik 2007

Ireland et al. (2005) noted numerous observations and acoustic detection of mysticetes, odontocetes, and pinnipeds during research surveys that utilized low energy geophysical equipment. Results suggest that marine mammals often appear to tolerate the presence of these sources when operating within several kilometers, and sometimes within a few hundred meters, of the source. Given the directional nature of the sounds from these sonars, only a fraction of the marine mammals seen by observers were likely to have been within the beams before or during the time of the sightings, and many were probably not exposed to the sonar sounds despite the proximity of the ship (NSF 2010).

Little is known about reactions of odontocetes to underwater noise pulses, including sonar. Available data on responses to sonar are limited to a small number of species and conditions, including studies of captive animals. Most available data on odontocete responses to sonar are associated with beaked whales and high-intensity, mid-frequency military sonars, and are not applicable to the low energy geophysical equipment sources being utilized under permit in State waters.

In addition, the highly directional (i.e., directed downward) nature of low energy geophysical equipment indicates that marine mammals and other sensitive fauna are only susceptible to impact when passing immediately beneath the equipment. Per NSF (2010), the behavioral reactions of free-ranging odontocetes to echosounders, pingers, and other acoustic equipment appear to vary by species and circumstance. Various dolphin and porpoise species have been seen bowriding while this equipment was operational during NSF-sponsored seismic surveys (e.g., see Smultea and Holst 2008; Smultea et al. 2004).

Very few data are available on the reactions of pinnipeds to sonar sounds at frequencies similar to those used during marine seismic operations, and no studies were identified regarding exposure of mustelids to low energy geophysical equipment emissions.

NSF (2010) also addressed the potential for TTS and PTS to occur in marine mammals exposed to noise from geophysical survey operations; however, there has been no

specific documentation of TTS in free-ranging marine mammals exposed to sonar pulses from the types of equipment used during marine geophysical surveys. Important findings include:

- For mysticetes, there are no data, direct or indirect, on levels or properties of sound that are required to induce TTS from active sonar of any type. In general, auditory thresholds of mysticetes within their frequency band of best hearing are believed to be higher (less sensitive) than are those of odontocetes at their best frequencies (Clark and Ellison 2004). If so, their TTS thresholds may also be higher (Southall et al. 2007).
- The TTS threshold for the beluga whale and bottlenose dolphin has been measured in captivity to be approximately 195 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  for exposure to a single non-impulsive tonal sound (Schlundt et al. 2000; Finneran et al. 2005; reviewed in Southall et al. 2007).
- Kremser et al. (2005), among others, have noted that the probability of a cetacean swimming through the area of exposure when a multibeam echosounder emits a pulse is small. The animal would have to pass the transducer at close range and be swimming at a speed and direction similar to the vessel in order to be subjected to repeated pulses and cumulative sound energy levels that could cause TTS.
- TTS thresholds for the sounds produced by multibeam echosounders, subbottom profilers, ADCPs, and pingers have not been measured in pinnipeds; however, studies of TTS onset upon exposure to prolonged non-impulse sounds have been done on the harbor seal, California sea lion, and northern elephant seal (Kastak et al. 2005, 2008; Southall et al. 2007). Study results suggest that some pinnipeds (e.g., harbor seal) may incur TTS at somewhat lower received energy levels than do small odontocetes exposed for similar durations (Kastak et al. 1999, 2005; Ketten et al. 2001; Southall et al. 2007). In harbor seals, the TTS threshold for non-impulse sounds is approximately 183 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$ , as compared with approximately 195 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  in odontocetes (Kastak et al. 2005; Southall et al. 2007). TTS onset occurs at higher received energy levels in the California sea lion and northern elephant seal than in the harbor seal.

Given the many uncertainties in predicting the quantity and types of impacts of noise on marine mammals, it is common practice to estimate how many mammals would be present within a particular distance of industrial activities and/or exposed to a particular level of sound. In most cases, this approach likely overestimates the numbers of marine mammals that would be affected in some biologically important manner.

# Marine Mammal Noise Exposure Criteria

The MMPA defines two levels of harassment: Level A harassment covers activities with the potential to cause physical injury, while Level B harassment involves the potential for behavioral disruption. NMFS subsequently developed noise exposure criteria that currently consider both continuous and intermittent sound sources based on SPL exposure, with differing thresholds for injury and behavioral disruption. Thresholds for injury from sound exposure are 180 dB rms for cetaceans and 190 dB rms for pinnipeds (in water). Thresholds for behavioral response from impulse sounds are 160 dB rms for all marine mammals, based on behavioral response data for marine mammals exposed to seismic airgun operations (Malme et al. 1983, 1984; Richardson et al. 1986). Thresholds for behavioral response from “continuous” (non-impulsive) sounds (e.g., sounds produced by chirps) have been set at 120 dB rms (for some but not all sound sources) based on the results of Malme et al. (1984) and Richardson et al. (1990).

Recognizing that the available data on hearing and noise impacts were rapidly evolving, NMFS supported an expert working group to develop a more comprehensive and scientifically robust method of assessment than the simplistic thresholds currently in place. This process ultimately resulted in the Southall et al. (2007) marine mammal noise exposure criteria. Two key determinations were made as part of the Southall et al. (2007) analysis – the establishment of marine mammal “functional hearing groups” and the categorization of sound sources into “functional categories,” based on their acoustic and repetitive properties. While NMFS currently considers SEL in its incidental take authorizations, it has yet to establish formal SEL criteria. Proposed energy (SEL) criteria include:

- Level A harassment (injury);
  - 198 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  for cetaceans;
  - 186 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  for pinnipeds;
- Use of flat- and M-weighting; and
- Consideration of the site-specific environmental context for noise exposure, including factors such as seafloor type, temperature, salinity, and water column stratification.

The review and recommendations offered by Southall et al. (2007) indicated that the lowest received SELs for impulsive sounds (e.g., airgun pulses) that might elicit slight auditory injury (PTS) are 198 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  in cetaceans and 186 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  in pinnipeds. As noted by Southall (2012), the noise criteria group also concluded that receipt of an instantaneous flat-weighted peak pressure exceeding 230 dB re 1  $\mu\text{Pa}$

(peak) for cetaceans or 218 dB re 1  $\mu$ Pa (peak) for pinnipeds might also lead to auditory injury even if the aforementioned cumulative energy-based criterion was not exceeded.

Southall (2012) noted that most of the earlier research addressing acoustic impacts was directed at determining exposure levels that produce injury (e.g., hearing/tissue damage; mass strandings). In recent years, there has been an increase in interest on population level effects (e.g., what constitutes a biologically significant behavior) and the overall acoustic ecology of marine life (NRC 2005; Southall et al. 2007). Southall et al. (2007) proposed explicit and numerical exposure level values for injury from sound exposure for each of the marine mammal functional hearing groups. Using measured TTS-onset levels where possible, and extrapolating for related species when measurements were not available, Southall et al. (2007) were able to estimate TTS and PTS levels for sound exposure. For SEL values, the frequency weighting functions would be applied to the received sound to account for differential frequency sensitivity among the different marine mammal groups. The resulting thresholds for injury from sound exposure for different marine mammal groups, via these general methods and using all available relevant data as proposed by Southall et al. (2007), are summarized in **Table 3-30**.

**Table 3-30. Marine Mammal Noise Exposure Criteria for Injury for Different Marine Mammal Functional Hearing Groups, for Either Single or Multiple Exposures During a 24-Hr Period (From: Southall et al. 2007; Wood et al. 2012)**

Marine Mammal Group	Sound Type		
	Single Pulses	Multiple Pulses	Non-Pulses
<b>Low-frequency Cetaceans</b>			
SPL	230 dB <sub>peak</sub> re 1 $\mu$ Pa (flat)	230 dB <sub>peak</sub> re 1 $\mu$ Pa (flat)	230 dB <sub>peak</sub> re 1 $\mu$ Pa (flat)
SEL	192 dB re 1 $\mu$ Pa <sup>2</sup> -s ( $M_{lf}$ )	198 dB re 1 $\mu$ Pa <sup>2</sup> -s ( $M_{lf}$ )	215 dB re 1 $\mu$ Pa <sup>2</sup> -s ( $M_{lf}$ )
<b>Mid-frequency Cetaceans</b>			
SPL	230 dB <sub>peak</sub> re 1 $\mu$ Pa (flat)	230 dB <sub>peak</sub> re 1 $\mu$ Pa (flat)	230 dB <sub>peak</sub> re 1 $\mu$ Pa (flat)
SEL	198 dB re 1 $\mu$ Pa <sup>2</sup> -s ( $M_{mf}$ )	198 dB re 1 $\mu$ Pa <sup>2</sup> -s ( $M_{mf}$ )	215 dB re 1 $\mu$ Pa <sup>2</sup> -s ( $M_{mf}$ )
<b>High-frequency Cetaceans</b>			
SPL	230 dB <sub>peak</sub> re 1 $\mu$ Pa (flat)	230 dB <sub>peak</sub> re 1 $\mu$ Pa (flat)	230 dB <sub>peak</sub> re 1 $\mu$ Pa (flat)
SEL	179 dB re 1 $\mu$ Pa <sup>2</sup> -s ( $M_{hf}$ )	198 dB re 1 $\mu$ Pa <sup>2</sup> -s ( $M_{hf}$ )	215 dB re 1 $\mu$ Pa <sup>2</sup> -s ( $M_{hf}$ )
<b>Pinnipeds (in water)</b>			
SPL	218 dB <sub>peak</sub> re 1 $\mu$ Pa (flat)	218 dB <sub>peak</sub> re 1 $\mu$ Pa (flat)	218 dB <sub>peak</sub> re 1 $\mu$ Pa (flat)
SEL	186 dB re 1 $\mu$ Pa <sup>2</sup> -s ( $M_{pw}$ )	186 dB re 1 $\mu$ Pa <sup>2</sup> -s ( $M_{pw}$ )	203 dB re 1 $\mu$ Pa <sup>2</sup> -s ( $M_{pw}$ )
<b>Pinnipeds (in air)</b>			
SPL	149 dB <sub>peak</sub> re 20 $\mu$ Pa (flat)	149 dB <sub>peak</sub> re 20 $\mu$ Pa (flat)	149 dB <sub>peak</sub> re 20 $\mu$ Pa (flat)
SEL	144 dB re 20 $\mu$ Pa <sup>2</sup> -s ( $M_{pa}$ )	144 dB re 20 $\mu$ Pa <sup>2</sup> -s ( $M_{pa}$ )	144.5 dB re 20 $\mu$ Pa <sup>2</sup> -s ( $M_{pa}$ )

Acronyms and Abbreviations: SEL = sound exposure level; SPL = sound pressure level;  $M_{lf}$  = low-frequency cetaceans;  $M_{mf}$  = mid-frequency cetaceans;  $M_{hf}$  = high-frequency cetaceans;  $M_{pw}$  = pinnipeds (in water);  $M_{pa}$  = pinnipeds (in air).



Based on the recent review of Southall (2012), several notable conclusions pertinent to these criteria were identified: (1) the predicted received levels necessary to induce injury are relatively high; and (2) all of the cetaceans have numerically-identical threshold values, with the exception of the frequency-weighting functions. The first conclusion is a function of the relatively high TTS-onset values in the marine mammal species tested to date. The second conclusion is a reflection of available data when the Southall et al. (2007) findings were published; there were no direct data on auditory fatigue in low- or high-frequency cetaceans, and the mid-frequency cetacean TTS-onset levels were used for these other groups. Subsequently, Lucke et al. (2009) have shown significantly lower onset values for TTS in high-frequency cetaceans.

Southall (2012) also notes that newer TTS measurements for mid-frequency cetaceans (Finneran and Schlundt 2010; Finneran et al. 2010a,b) will require reanalysis of the appropriate TTS onset and, correspondingly, injury onset for this category. Per Southall (2012), despite recent findings regarding TTS among several odontocete species, the Southall et al. (2007) approach to marine mammal noise exposure continues to represent a major evolution in the complexity and scientific basis for predicting the effects of noise on hearing in marine mammals over the extremely simplistic historical NMFS thresholds for injury. In terms of behavioral impacts, the Southall et al. (2007) noise exposure criteria took a dual approach depending on the sound type (Southall 2012). For exposure to single impulses, the acoustic component of the event was considered sufficiently intense to constitute behavioral harassment at levels consistent with TTS onset (**Table 3-31**).

**Table 3-31. Marine Mammal Noise Exposure Criteria for Behavior for Different Marine Mammal Functional Hearing Groups (From: Southall et al. 2007)**

Marine Mammal Group	Sound Type		
	Single Pulses	Multiple Pulses	Non-Pulses
<b>Low-frequency Cetaceans</b>			
SPL	224 dB <sub>peak</sub> re 1 µPa (flat)	Variable <sup>a</sup> , ranging from 110-180 dB rms re 1 µPa (flat)	Variable <sup>f</sup> , ranging from 90-160 dB rms re 1 µPa (flat)
SEL	183 dB re 1 µPa <sup>2</sup> -s (M <sub>lf</sub> )	Not Applicable	Not Applicable
<b>Mid-frequency Cetaceans</b>			
SPL	224 dB <sub>peak</sub> re 1 µPa (flat)	Variable <sup>b</sup> , ranging from 100-180 dB rms re 1 µPa (flat)	Variable <sup>g</sup> , ranging from 80-200 dB rms re 1 µPa (flat)
SEL	183 dB re 1 µPa <sup>2</sup> -s (M <sub>mf</sub> )	Not applicable	Not applicable
<b>High-frequency Cetaceans</b>			
SPL	224 dB <sub>peak</sub> re 1 µPa (flat)	Variable <sup>c</sup> , ranging from 80-160 dB rms re 1 µPa (flat)	Variable <sup>c</sup> , ranging from 80-160 dB rms re 1 µPa (flat)
SEL	183 dB re 1 µPa <sup>2</sup> -s (M <sub>hf</sub> )	Not Applicable	Not Applicable
<b>Pinnipeds (in water)</b>			
SPL	212 dB <sub>peak</sub> re 1 µPa (flat)	Variable <sup>d</sup> , ranging from 150-200 dB rms re 1 µPa (flat)	Variable <sup>h</sup> , ranging from 80-140 dB rms re 1 µPa (flat)
SEL	171 dB re 1 µPa <sup>2</sup> -s (M <sub>pw</sub> )	Not Applicable	Not Applicable

<b>Pinnipeds (in air)</b>			
SPL	109 dB <sub>peak</sub> re 20 µPa (flat)	Variable <sup>e</sup> , ranging from 60-80 dB rms re 1 µPa (flat)	Variable <sup>i</sup> , ranging from 60-120 dB rms re 1 µPa (flat)
SEL	100 dB re 20 µPa <sup>2</sup> -s (M <sub>pa</sub> )	Not applicable	Not applicable
<p>Acronyms and Abbreviations: SEL = sound exposure level; SPL = sound pressure level; rms = root mean square; M<sub>lf</sub> = low-frequency cetaceans; M<sub>mf</sub> = mid-frequency cetaceans; M<sub>hf</sub> = high-frequency cetaceans; M<sub>pw</sub> = pinnipeds (in water); M<sub>pa</sub> = pinnipeds (in air).</p> <p>Note: SPLs noted as Variable show ranges that are species-specific, reflecting exposures to different sound sources. Southall et al. (2007) also characterized severity scores for exposures.</p> <p><sup>a</sup> see Southall et al. 2007, Tables 6 and 7; <sup>b</sup> see Southall et al. 2007, Tables 8 and 9; <sup>c</sup> see Southall et al. 2007, Tables 18 and 19; <sup>d</sup> see Southall et al. 2007, Tables 10 and 11; <sup>e</sup> see Southall et al. 2007, Tables 12 and 13; <sup>f</sup> see Southall et al. 2007, Tables 14 and 15; <sup>g</sup> see Southall et al. 2007, Tables 16 and 17; <sup>h</sup> see Southall et al. 2007, Tables 20 and 21; <sup>i</sup> see Southall et al. 2007, Tables 22 and 23.</p>			

1 The rationale for this determination rested with the nature of the sound – single impulse  
2 events are brief and transient. Any responses other than those affecting hearing would  
3 likely be similar in nature, and would not affect the long-term health or fitness of the  
4 exposed mammal. Southall et al. (2007), however, did note that startle responses could  
5 trigger stress and other physiological responses, the biological significance of which  
6 remains poorly understood.

7 For all other sound types, Southall et al. (2007)  
8 did not propose explicit threshold criteria given  
9 the influences of “context-dependence” and other  
10 complexities inherent in behavioral responses. In  
11 lieu of explicit threshold criteria, it was concluded  
12 that significant behavioral effects would: (1) likely  
13 occur at exposure levels below those required for  
14 TTS and PTS; and (2) that the simple  
15 step-function (all-or-none) thresholds established  
16 by NMFS for behavior were inconsistent with the  
17 best available science. Southall et al. (2007)  
18 concluded that the type and magnitude of  
19 behavioral responses to noise exposure involve a  
20 multitude of factors, and cannot be as readily  
21 determined as thresholds for injury.

22 To begin addressing some of these issues,  
23 Southall et al. (2007) derived a severity scaling  
24 approach (**Table 3-32**) to attempt to determine  
25 the likely significance of observed responses.

**Why are the NMFS Level A  
and Southall et al. (2007)  
Criteria Different?**

The fundamental difference between NMFS criteria for injury (Level A) and the Southall et al. (2007) criteria for TTS and PTS (Injury) is the metric employed. The NMFS criteria use SPLs based on “rms” or root mean squared values of noise levels, which represent averaged levels. The “derived Southall criteria” thresholds are based on total sound energy over time (SEL), and account for the peak of the noise impulse.

**Table 3-32. Severity Scale Developed by Southall et al. (2007) to Rank Observed Behavioral Responses of Free-Ranging Marine Mammals to Various Types of Anthropogenic Sound**

Response Score	Corresponding Behavior(s) for Free-ranging Subjects
0	No observable response
1	Brief orientation response (investigation/visual orientation)
2	Moderate or multiple orientation behaviors Brief or minor cessation/modification of vocal behavior Brief or minor change in respiration rates
3	Prolonged orientation behavior Individual alert behavior Minor changes in locomotion speed, direction, and/or dive profile but no avoidance of sound source Moderate change in respiration rate Minor cessation or modification of vocal behavior (duration < duration of source operation), including the Lombard Effect
4	Moderate changes in locomotion speed, direction, and/or dive profile but no avoidance of sound source Brief, minor shift in group distribution Moderate cessation or modification of vocal behavior (duration ≈ duration of source operation)
5	Extensive or prolonged changes in locomotion speed, direction, and/or dive profile but not avoidance of sound source Moderate shift in group distribution Change in inter-animal distance and/or group size (aggregation or separation) Prolonged cessation or modification of vocal behavior (duration > duration of source operation)
6	Minor or moderate individual and/or group avoidance of sound source Brief or minor separation of females and dependent offspring Aggressive behavior related to noise exposure (e.g., tail/flipper slapping, fluke display, jaw clapping/gnashing teeth, abrupt directed movement, bubble clouds) Extended cessation or modification of vocal behavior Visible startle response Brief cessation of reproductive behavior
7	Extended or prolonged aggressive behavior Moderate separation of females and dependent offspring Clear anti-predator response Severe and/or sustained avoidance of sound source Moderate cessation of reproductive behavior
8	Obvious aversion and/or progressive sensitization Prolonged or significant separation of females and dependent offspring with disruption of acoustic reunion mechanisms Prolonged cessation of reproductive behavior
9	Outright panic, flight, stampede, attack of conspecifics, or stranding events Avoidance behavior related to predator detection

1 This effort, in part, was intended to highlight the importance of marine mammal  
2 responses that have the potential to affect vital rates and survivorship (*sensu* NRC  
3 2005). An ordinal ranking of behavioral response severity was developed as an initial  
4 step in separating relatively minor and/or brief behaviors from those more likely to affect  
5 vital rates and survivorship. The observed behavioral responses in all ten conditions for  
6 multiple pulses and continuous noise for each of the five functional hearing groups were  
7 reviewed in detail, and individual responses were assessed according to this severity  
8 scaling and measured or reasonably estimated exposure levels (Southall 2012).

9 As noted by Southall (2012), the primary advances made in the Southall et al. (2007)  
10 criteria in terms of behavioral response were to demonstrate very clearly that  
11 step-function thresholds for response using a single received level and no other  
12 considerations related to behavioral context are overly simplistic and outdated, and to  
13 develop at least a qualitative means of addressing behavioral response severity issues.  
14 The Southall et al. (2007) criteria for behavior represent a starting point in the  
15 development of a working framework to evaluate and characterize the type and  
16 magnitude of biologically-significant behavioral responses of marine mammals to noise.

17 Broad application of the Southall et al. (2007) criteria for both injury and behavior has  
18 been relatively slow in evolving, per Southall (2012) due, in part, to the increased  
19 complexity of the recommendations over the previous more simplistic approaches  
20 (e.g., step-functions used by NMFS). However, NMFS has used exposure criteria  
21 consistent with the Southall et al. (2007) thresholds for injury from sound exposure for  
22 assessing potential impacts of Navy active sonar operations (*Federal Register*,  
23 2009a,b) for a variety of species, including large whales and pinnipeds. Additionally,  
24 NMFS regulations (*Federal Register* 2009a,b) have also begun to use a more  
25 graduated dose-function based approach to behavioral response rather than the  
26 historical step-function thresholds. NMFS is preparing acoustic exposure guidelines that  
27 are expected to increasingly consider the increased complexity and  
28 context-dependence of responses of marine mammals to sound (Southall 2012).

### 29 *Noise Modeling from Single Pulse*

30 Analysis of impacts from acoustic sources associated with low energy geophysical  
31 surveys is based on: (1) marine mammal presence and likely habitat usage offshore  
32 California; (2) hearing sensitivities of California marine mammals; and (3) the sound  
33 fields created by representative low energy geophysical equipment. Marine mammal  
34 presence and likely habitat usage have been previously summarized in **Tables 3-14**  
35 and **3-15**. Hearing sensitivity determinations have been previously addressed in  
36 **Tables 3-27** and **3-28**. The equipment, parameters, and received sound level  
37 thresholds employed in the noise modeling are summarized at the beginning of the  
38 impact analysis.

Per Wood et al. (2012), the approach used is similar to the method employed by NMFS in their analyses of acoustic impacts – step-function thresholds (190 dB re 1  $\mu$ Pa rms for pinniped [in water] injury; 180 dB re 1  $\mu$ Pa rms for marine mammal injury; 160 dB re 1  $\mu$ Pa rms for marine mammal behavioral modification) from impulse noise. Most marine mammals exposed to impulse noise demonstrate responses of varying magnitude in the 140 to 180 dB re 1  $\mu$ Pa rms exposure range, including the mysticetes in the Malme et al. (1983; 1984) studies on which the NMFS threshold is based. Potential disturbance levels for SPLs greater than 140 dB re 1  $\mu$ Pa rms were also highlighted, consistent with the HESS panel findings (1999).

Calculations of sound fields and the technical aspects of acoustic beam theory as applied to each piece of equipment are provided in **Appendix G**. For each sound level threshold, two statistical estimates of the safety radii were developed: (1) the maximum range ( $R_{max}$ , in meters); and (2) the 95 percent range ( $R_{95\%}$ , in meters). The  $R_{95\%}$  for a given sound level is defined as the radius of the circle, centered on the source, encompassing 95 percent of the grid points with sound levels at or above the given value. This definition is relevant to impact determinations for biological resources because, regardless of the shape of the contour for a given sound level, the  $R_{95\%}$  range would account for noise exposure to 95 percent of the population present within that range (Wood et al. 2012).

The  $R_{max}$  for a given exposure level represents the maximum distance for each respective threshold level (i.e., equivalent to  $R_{100\%}$ ). The  $R_{max}$  distance calculation is more conservative than  $R_{95\%}$  but may overestimate the effective exposure zone. For cases where the volume ensonified to a specific level is discontinuous and small pockets of higher received levels occur far beyond the main ensonified volume (e.g., due to convergence),  $R_{max}$  would be much larger than  $R_{95\%}$  and could therefore be misleading if not given along with  $R_{95\%}$  (Wood et al. 2012).

The rationale for calculating radial distances to thresholds of interest from a single pulse is based on instantaneous exposure. Once the equipment is activated with its first pulse, the area around the equipment is ensonified. Single pulse calculations allow for a comparison to current NMFS acoustic exposure thresholds, and provide a basis for estimating incidental take. The radial distance to each isopleth, using the SPL metric, also provides an appropriate metric for determining mitigation (i.e., how far from the OGPP survey vessel and equipment should we monitor for the presence of marine mammals and turtles so as to minimize or eliminate acoustic impacts).

The rationale for calculating cumulative exposure is based on a need to understand and quantify sound exposure levels over a period of time, using the SEL metric. In the case of a representative OGPP survey, this approach considers various OGPP survey operations over a prescribed period. Results of the modeling for cumulative exposure allow for a comparison to the Southall et al. (2007) SEL criteria.

1 *Predicted Impacts (Single Pulse)*

2 Single Beam Echosounder

3 **Less than Significant.** Modeling results for a single pulse exposure from the single  
4 beam echosounder are provided in **Table 3-33**. Both SPL and SEL threshold distances  
5 are shown. Non-shaded entries for SEL are applicable to the respective SEL and  
6 M-weighted group combination (e.g., 183 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  is the threshold for behavioral  
7 modification).

8 The SEL radii are much smaller than the SPL radii, primarily because the SEL source  
9 level accounts for a very short pulse length. Single beam echosounders also produce a  
10 very narrow beam ( $5^\circ$ ).

11 M-weighted SPL determinations ( $R_{95\%}$ ) using the NMFS exposure criteria for injury  
12 (190/180 dB) and behavioral modification (160 dB) are less than 20 m, or significantly  
13 less than 20 m (i.e., blank table entries). Due to its narrow beam, marine mammals  
14 present near the survey vessel (e.g., at the surface or in near surface waters) would be  
15 exposed to SPL levels considerably lower than if they were within the beam  
16 (i.e., immediately below the vessel). Given the SPL source level of 230 dB rms for the  
17 single beam echosounder, unweighted distances to the threshold of concern for low-,  
18 mid-, and high-frequency cetaceans are 29 m.

19 SEL determinations for the single beam echosounder are less than 20 m for the four  
20 injury thresholds and two behavioral modification thresholds for marine mammals. Any  
21 marine mammals within 20 m of the source would need to be located immediately below  
22 the transducer to be adversely affected. In light of the foregoing discussion, impacts to  
23 marine mammals, sea turtles, fish, and invertebrates from single pulse exposure from a  
24 single beam echosounder are considered to be less than significant.

25 Multibeam Echosounder

26 **Less than Significant.** Modeling results for a single pulse exposure from the multibeam  
27 echosounder are provided in **Table 3-34**. Both SPL and SEL threshold distances are  
28 shown. The SEL radii are much smaller than the SPL radii, primarily because the SEL  
29 source level accounts for a relatively short pulse length. Multibeam echosounders also  
30 produce a relatively narrow beam fore and aft of the vessel, and a broader beam  
31 athwartship (i.e., perpendicular to vessel travel direction).

**Table 3-33. Single Beam Echosounder: Maximum ( $R_{\max}$ , m) and 95% ( $R_{95\%}$ , m) Horizontal Distances from the Source to Modeled Maximum-Over-Depth Sound Level Thresholds, with and without M-Weighting Applied**

<b>Sound Pressure Level (SPL) Thresholds (dB re 1 <math>\mu</math>Pa rms)</b>										
<b>SPL Threshold</b>	<b>No Weighting</b>		<b>M-Weighted</b>							
			<b>LF Cetaceans</b>		<b>MF Cetaceans</b>		<b>HF Cetaceans</b>		<b>Pinnipeds (in water)</b>	
	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$
190	-	-	-	-	-	-	-	-	-	-
180	<20	<20	-	-	-	-	-	-	-	-
160	29	29	-	-	<20	<20	<20	<20	<20	<20
140	127	123	<20	<20	72	71	79	76	34	34
120	391	365	34	34	275	250	290	267	138	133
<b>Sound Exposure Level (SEL) Thresholds (dB re 1 <math>\mu</math>Pa<sup>2</sup>·s)</b>										
<b>SEL Threshold</b>	<b>No Weighting</b>		<b>M-Weighted</b>							
			<b>LF Cetaceans</b>		<b>MF Cetaceans</b>		<b>HF Cetaceans</b>		<b>Pinnipeds (in water)</b>	
	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$
198	-	-	-	-	-	-	-	-	-	-
192	-	-	-	-	-	-	-	-	-	-
186	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
179	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
183	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
171	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Specifications: Device: Odom CV-100; Type: Single beam sonar; Source: SMSW200-4A; Frequency: 200 kHz; Beam width: 5°; Source level (rms SPL): 230 dB re 1  $\mu$ Pa at 1 m; Pulse length: 0.1 msec; Source level (SEL): 190 dB re 1  $\mu$ Pa<sup>2</sup>·s at 1 m.

Notes: SELs of 198 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{mf}$ ), 192 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{lf}$ ), 186 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{pw}$ ), and 179 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{hf}$ ) for injury, from Southall et al. (2007), and subsequently modified by Wood et al. (2012). SELs of 183 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{hf}$ ,  $M_{mf}$ ,  $M_{lf}$ ) and 171 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{pw}$ ) for behavioral modification, from Southall et al. (2007) and Wood et al. (2012).

Abbreviations: LF = low-frequency; MF = mid-frequency; HF = high-frequency.

1 **Table 3-34. Multibeam Echosounder: Maximum ( $R_{\max}$ , m) and 95% ( $R_{95\%}$ , m) Horizontal Distances from the Source**  
 2 **to Modeled Maximum-Over-Depth Sound Level Thresholds, with and without M-Weighting Applied**

<b>Sound Pressure Level (SPL) Thresholds (dB re 1 <math>\mu</math>Pa rms)</b>										
<b>SPL Threshold</b>	<b>No Weighting</b>		<b>M-Weighted</b>							
			<b>LF Cetaceans</b>		<b>MF Cetaceans</b>		<b>HF Cetaceans</b>		<b>Pinnipeds (in water)</b>	
	<b><math>R_{\max}</math></b>	<b><math>R_{95\%}</math></b>	<b><math>R_{\max}</math></b>	<b><math>R_{95\%}</math></b>	<b><math>R_{\max}</math></b>	<b><math>R_{95\%}</math></b>	<b><math>R_{\max}</math></b>	<b><math>R_{95\%}</math></b>	<b><math>R_{\max}</math></b>	<b><math>R_{95\%}</math></b>
190	28	28	-	-	<20	<20	<20	<20	<20	<20
180	71	71	<20	<20	35	35	35	35	<20	<20
160	290	258	<20	<20	205	184	219	191	85	85
140	612	477	85	85	467	396	495	403	332	283
120	933	612	318	279	778	548	803	559	626	492
<b>Sound Exposure Level (SEL) Thresholds (dB re 1 <math>\mu</math>Pa<sup>2</sup>·s)</b>										
<b>SEL Threshold</b>	<b>No Weighting</b>		<b>M-Weighted</b>							
			<b>LF Cetaceans</b>		<b>MF Cetaceans</b>		<b>HF Cetaceans</b>		<b>Pinnipeds (in water)</b>	
	<b><math>R_{\max}</math></b>	<b><math>R_{95\%}</math></b>	<b><math>R_{\max}</math></b>	<b><math>R_{95\%}</math></b>	<b><math>R_{\max}</math></b>	<b><math>R_{95\%}</math></b>	<b><math>R_{\max}</math></b>	<b><math>R_{95\%}</math></b>	<b><math>R_{\max}</math></b>	<b><math>R_{95\%}</math></b>
198	-	-	-	-	-	-	-	-	-	-
192	-	-	-	-	-	-	-	-	-	-
186	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
179	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
183	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
171	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Specifications: Device: R2Sonic; Type: Multibeam echosounder; Frequency: 200 kHz and 400 kHz; Beam width: 2°x2°, 1°x1°, x256 (10° to 160° swath); Source level (rms SPL): 1-221 dB re 1  $\mu$ Pa at 1 m; Pulse length: 0.015-0.5 msec; Source level (SEL): 173-188 dB re 1  $\mu$ Pa<sup>2</sup>·s at 1 m.

Notes: SELs of 198 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{mf}$ ), 192 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{lf}$ ), 186 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{pw}$ ), and 179 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{hf}$ ) for injury, from Southall et al. (2007), and subsequently modified by Wood et al. (2012). SELs of 183 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{hf}$ ,  $M_{mf}$ ,  $M_{lf}$ ) and 171 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{pw}$ ) for behavioral modification, from Southall et al. (2007) and Wood et al. (2012).

Abbreviations: LF = low-frequency; MF = mid-frequency; HF = high-frequency.



M-weighted SPL determinations ( $R_{95\%}$ ) using the NMFS exposure criteria for injury (190/180 dB) and behavioral modification (160 dB) are less than 20 m for low-frequency cetaceans, 35 m and 184 m for mid-frequency cetaceans, 35 m and 191 m for high-frequency cetaceans, and less than 20 m and 85 m for pinnipeds in water, respectively. Due to its narrow beam along the vessel's direction of travel, marine mammals present fore and aft of the survey vessel (e.g., at the surface or in near surface waters) would be exposed to SPL levels considerably lower than if they were within the beam (i.e., immediately below the vessel). Marine mammals lateral to the vessel in surface or near surface waters would also be exposed to lower levels.

SEL determinations for the multibeam echosounder are less than 20 m for the four injury thresholds and two behavioral modification thresholds for marine mammals. Any marine mammals within 20 m of the source would need to be located immediately below the transducer to be adversely affected.

Therefore, impacts to marine mammals from single pulse exposure from a multibeam echosounder are considered to be less than significant.

#### Side-Scan Sonar

**Less than Significant.** Modeling results for single pulse exposure from the side-scan sonar are provided in **Table 3-35**. Both SPL and SEL threshold distances are shown. The SEL radii are much smaller than the SPL radii, primarily because the SEL source level accounts for a relatively short pulse length. Side-scan sonars also produce two very narrow beams fore and aft of the vessel, and a relatively narrow beam athwartship (i.e., 40°).

M-weighted SPL determinations ( $R_{95\%}$ ) using the NMFS exposure criteria for injury (190/180 dB) and behavioral modification (160 dB) are less than 20 m and 102 m for low-frequency cetaceans, 181 m and 512 m for mid-frequency cetaceans, 195 m and 526 m for high-frequency cetaceans, and 96 m and 399 m for pinnipeds in water, respectively.

As was the case with echosounders, the narrow beam along the vessel's direction of travel limits the potential for exposure of marine mammals present fore and aft of the survey vessel (e.g., at the surface or in near surface waters). Marine mammals lateral to the vessel in surface or near surface waters would also be exposed to lower levels given a relatively narrow, 40° beam directed at the seafloor. Marine mammals would have to be below the vessel and within the side-scan sonar beam to realize impact.

**Table 3-35. Side-Scan Sonar: Maximum ( $R_{\max}$ , m) and 95% ( $R_{95\%}$ , m) Horizontal Distances from the Source to Modeled Maximum-Over-Depth Sound Level Thresholds, with and without M-Weighting Applied**

<b>Sound Pressure Level (SPL) Thresholds (dB re 1 <math>\mu</math>Pa rms)</b>										
<b>SPL Threshold</b>	<b>No Weighting</b>		<b>M-Weighted</b>							
			<b>LF Cetaceans</b>		<b>MF Cetaceans</b>		<b>HF Cetaceans</b>		<b>Pinnipeds (in water)</b>	
	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$
190	130	124	<20	<20	73	68	96	88	31	31
180	257	243	<20	<20	187	181	209	195	102	96
160	682	576	110	102	611	512	625	526	441	399
140	1,106	690	455	413	1,007	689	1,021	696	837	675
120	1,544	917	880	683	1,445	860	1,445	867	1,261	795
<b>Sound Exposure Level (SEL) Thresholds (dB re 1 <math>\mu</math>Pa<sup>2</sup>·s)</b>										
<b>SEL Threshold</b>	<b>No Weighting</b>		<b>M-Weighted</b>							
			<b>LF Cetaceans</b>		<b>MF Cetaceans</b>		<b>HF Cetaceans</b>		<b>Pinnipeds (in water)</b>	
	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$
198	<20	<20	-	-	<20	<20	<20	<20	<20	<20
192	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
186	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
179	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
183	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
171	31	31	<20	<20	<20	<20	<20	<20	<20	<20

Specifications: Klein 3000; Type: Side-scan sonar; Frequency: 132 kHz; Beam width: 2 beams 40°x1°; Source level (rms SPL): 234 dB re 1  $\mu$ Pa at 1 m; Pulse length: 0.4 msec; Source level (SEL): 200 dB re 1  $\mu$ Pa<sup>2</sup>·s at 1 m.

Notes: SELs of 198 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{mf}$ ), 192 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{lf}$ ), 186 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{pw}$ ), and 179 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{hf}$ ) for injury, from Southall et al. (2007), and subsequently modified by Wood et al. (2012). SELs of 183 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{hf}$ ,  $M_{mf}$ ,  $M_{lf}$ ) and 171 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{pw}$ ) for behavioral modification, from Southall et al. (2007) and Wood et al. (2012).

Abbreviations: LF = low-frequency; MF = mid-frequency; HF = high-frequency.

SEL determinations for side-scan sonar are less than 20 m for the four injury thresholds and two behavioral modification thresholds for marine mammals. Any marine mammals within 20 m of the source would need to be located immediately below the transducer to be adversely affected. Impacts to marine mammals from a single pulse exposure from side-scan sonar are considered to be less than significant.

#### Subbottom Profiler

**Less than Significant.** Modeling results for single pulse exposure from the subbottom profiler are provided in **Table 3-36**. Both SPL and SEL threshold distances are shown.

The SEL radii are smaller than the SPL radii, primarily because the SEL source level accounts for a moderate pulse length. Despite the fact that subbottom profilers emit the longest pulse among the five equipment types modeled, its pulse length is only 20 milliseconds (msec). In addition, subbottom profilers produce a narrow beam (i.e., 24°).

M-weighted SPL determinations ( $R_{95\%}$ ) using the NMFS exposure criteria for injury (190/180 dB) and behavioral modification (160 dB) are less than 20 m and 32 m for low-frequency cetaceans and less than 20 m and 36 m for mid-frequency cetaceans, high-frequency cetaceans, and pinnipeds in water, respectively.

The narrow beam produced by a subbottom profiler limits the potential for exposure of marine mammals in the vicinity of a survey vessel; exposure levels for marine mammals at the surface or in near surface waters, or beyond the focus of the pulse, would realize a lower level of exposure. Marine mammals would have to be below the vessel and within the subbottom profiler beam to realize impact. Given the SPL source level of 210 dB, unweighted distances to the threshold of concern for invertebrates and fish (i.e., 208 dB) would be significantly less than less than 20 m.

SEL determinations for the subbottom profiler are less than less than 20 m for the four injury thresholds and two behavioral modification thresholds for marine mammals. Any marine mammals within 20 m of the source would need to be located immediately below the transducer to be adversely affected.

Impacts to marine mammals, sea turtles, fish, and invertebrates from a single pulse exposure from a subbottom profiler are considered to be less than significant.

#### Boomer

**Less than Significant.** Modeling results for a single pulse exposure from a boomer are provided in **Table 3-37**. Both SPL and SEL threshold distances are shown. The SEL radii are much smaller than the SPL radii, primarily because the SEL source level accounts for a relatively short pulse length.

1 **Table 3-36. Subbottom Profiler: Maximum ( $R_{\max}$ , m) and 95% ( $R_{95\%}$ , m) Horizontal Distances from the Source to**  
 2 **Modeled Maximum-Over-Depth Sound Level Thresholds, with and without M-Weighting Applied**

<b>Sound Pressure Level (SPL) Thresholds (dB re 1 <math>\mu</math>Pa rms)</b>										
<b>SPL Threshold</b>	<b>No Weighting</b>		<b>M-Weighted</b>							
			<b>LF Cetaceans</b>		<b>MF Cetaceans</b>		<b>HF Cetaceans</b>		<b>Pinnipeds (in water)</b>	
	<b><math>R_{\max}</math></b>	<b><math>R_{95\%}</math></b>	<b><math>R_{\max}</math></b>	<b><math>R_{95\%}</math></b>	<b><math>R_{\max}</math></b>	<b><math>R_{95\%}</math></b>	<b><math>R_{\max}</math></b>	<b><math>R_{95\%}</math></b>	<b><math>R_{\max}</math></b>	<b><math>R_{95\%}</math></b>
190	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
180	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
160	36	36	32	32	36	36	36	36	36	36
140	607	292	240	225	607	291	607	291	602	283
120	6,699	5,439	6,151	4,888	6,699	5,424	6,699	5,426	6,689	5,383
<b>Sound Exposure Level (SEL) Thresholds (dB re 1 <math>\mu</math>Pa<sup>2</sup>·s)</b>										
<b>SEL Threshold</b>	<b>No Weighting</b>		<b>M-Weighted</b>							
			<b>LF Cetaceans</b>		<b>MF Cetaceans</b>		<b>HF Cetaceans</b>		<b>Pinnipeds (in water)</b>	
	<b><math>R_{\max}</math></b>	<b><math>R_{95\%}</math></b>	<b><math>R_{\max}</math></b>	<b><math>R_{95\%}</math></b>	<b><math>R_{\max}</math></b>	<b><math>R_{95\%}</math></b>	<b><math>R_{\max}</math></b>	<b><math>R_{95\%}</math></b>	<b><math>R_{\max}</math></b>	<b><math>R_{95\%}</math></b>
198	-	-	-	-	-	-	-	-	-	-
192	-	-	-	-	-	-	-	-	-	-
186	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
179	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
183	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
171	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Specifications: Edgetech X-Star; Type: Subbottom profiler; Source: SBP-216; Frequency: 9 kHz; Beam width: 24°; Source level (rms SPL): 210 dB re 1  $\mu$ Pa at 1 m; Pulse length: 20 msec; Source level (SEL): 193 dB re 1  $\mu$ Pa<sup>2</sup>·s at 1 m.

Notes: SELs of 198 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{mf}$ ), 192 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{lf}$ ), 186 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{pw}$ ), and 179 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{hf}$ ) for injury, from Southall et al. (2007), and subsequently modified by Wood et al. (2012). SELs of 183 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{hf}$ ,  $M_{mf}$ ,  $M_{lf}$ ) and 171 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{pw}$ ) for behavioral modification, from Southall et al. (2007) and Wood et al. (2012).

Abbreviations: LF = low-frequency; MF = mid-frequency; HF = high-frequency.

**Table 3-37. Boomer: Maximum ( $R_{\max}$ , m) and 95% ( $R_{95\%}$ , m) Horizontal Distances from the Source to Modeled Maximum-Over-Depth Sound Level Thresholds, with and without M-Weighting Applied**

<b>Sound Pressure Level (SPL) Thresholds (dB re 1 <math>\mu</math>Pa rms)</b>										
<b>SPL Threshold</b>	<b>No Weighting</b>		<b>M-Weighted</b>							
			<b>LF Cetaceans</b>		<b>MF Cetaceans</b>		<b>HF Cetaceans</b>		<b>Pinnipeds (in water)</b>	
	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$
190	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
180	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
160	50	45	45	45	45	45	45	45	45	45
140	2329	1567	2329	1563	2228	1462	2224	1393	2329	1538
120	28110	19229	28110	19184	27820	18446	27818	17909	28110	18968
<b>Sound Exposure Level (SEL) Thresholds (dB re 1 <math>\mu</math>Pa<sup>2</sup>·s)</b>										
<b>SEL Threshold</b>	<b>No Weighting</b>		<b>M-Weighted</b>							
			<b>LF Cetaceans</b>		<b>MF Cetaceans</b>		<b>HF Cetaceans</b>		<b>Pinnipeds (in water)</b>	
	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$	$R_{\max}$	$R_{95\%}$
198	-	-	-	-	-	-	-	-	-	-
192	-	-	-	-	-	-	-	-	-	-
186	-	-	-	-	-	-	-	-	-	-
179	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
183	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
171	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Specifications: Device: AP3000; Type: Boomer plate; Source: 3 x AA202; Frequency: 200 Hz - 16 kHz; Beam width: Variable, omnidirectional to 8°; Source level (rms SPL): 205.9 dB re 1  $\mu$ Pa at 1 m; Pulse length: 0.2 msec; Source level (SEL): 174 dB re 1  $\mu$ Pa<sup>2</sup>·s at 1 m.

Notes: SELs of 198 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{mf}$ ), 192 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{lf}$ ), 186 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{pw}$ ), and 179 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{hf}$ ) for injury, from Southall et al. (2007), and subsequently modified by Wood et al. (2012). SELs of 183 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{hf}$ ,  $M_{mf}$ ,  $M_{lf}$ ) and 171 dB re 1  $\mu$ Pa<sup>2</sup>·s ( $M_{pw}$ ) for behavioral modification, from Southall et al. (2007) and Wood et al. (2012).

Abbreviations: LF = low-frequency; MF = mid-frequency; HF = high-frequency.

Boomers are typically towed behind a vessel and produce a pulse of varying beam widths. With frequency characteristics ranging between 200 Hz and 16 kHz, the boomer is considered a strongly directive source for frequencies above 1 kHz.

M-weighted SPL determinations ( $R_{95\%}$ ) using the NMFS exposure criteria for injury (190/180 dB) and behavioral modification (160 dB) are less than 20 m and 45 m for all marine mammal hearing groups – low-frequency cetaceans, mid-frequency cetaceans, high-frequency cetaceans, and pinnipeds in water.

When operating at frequencies about 1 kHz, the boomer is a directional source. Under these conditions, marine mammals in surface or near surface waters would be exposed to lower pulse levels.

SEL determinations for the boomer are less than 20 m for only three of the thresholds; remaining threshold distances were blank, indicating that SEL determinations were below model calculation limits. When operating above 1 kHz, any marine mammals within 20 m of the source would need to be located immediately below the boomer to be adversely affected. When operating below 1 kHz, any marine mammals within 20 m of the source, regardless of their location, would be affected.

Impacts to marine mammals, sea turtles, fish, and invertebrates from a single pulse exposure from a boomer are considered to be less than significant.

#### Equipment Testing Results for Similar Projects

NMFS is currently evaluating incidental take associated with the use of chirp and boomer subbottom profiler systems proposed for use during geophysical surveys off the Massachusetts coast (NMFS 2013). In the opinion of NMFS, operation of this survey equipment has the potential to harass marine mammals. Harassment of marine mammals in Massachusetts Bay is a key concern given the presence of critical habitat for the endangered North Atlantic right whale.

The applicant, Cape Wind Associates, will use a chirp (EdgeTech 216S or similar) to provide shallow, high-resolution data of the upper 15 m of the seafloor. The chirp will be towed near the center of the survey vessel directly adjacent to the gunwale of the boat, about 1 to 1.5 m beneath the water surface. Sources such as the chirp produce non-impulsive, intermittent (as opposed to continuous) sounds. The frequency range for this instrument is generally 2 to 16 kHz, a range audible by a variety of marine mammal species. The estimated SPL source level was 201 dB re 1  $\mu$ Pa rms at 1 m, with a typical pulse length of 32 msec, and a pulse repetition rate of 4 per second.

Cape Wind Associates has also proposed use of a boomer (AP3000 [dual plate] or similar) to obtain deeper, high-resolution imaging of geologic layers that cannot be imaged by the chirp. The AP3000 (dual plate) boomer is the same unit modeled for the

current CSLC analysis. The boomer will be towed 3 to 5 m behind the stern of the survey vessel at the water surface. Unlike the chirp, the boomer emits an impulse sound, characterized by a relatively rapid rise time to maximum pressure followed by a period of diminishing and oscillating pressures (Southall et al. 2007). The boomer has a broad frequency range of 0.3 to 14 kHz, a range audible by a variety of marine mammal species.

Cape Wind Associates and JASCO performed sound source verification monitoring in 2012 on the type of chirp and boomer systems that will be used during the 2013-2014 survey season. Underwater sound was recorded with two Autonomous Multichannel Acoustic Recorders, deployed 100 m apart, in the vicinity of the project area. The received 90-percent rms SPLs from the subbottom profilers did not exceed 175 dB re 1  $\mu$ Pa. The loudest source, the dual-plate boomer, produced a received 90-percent rms SPL of less than 140 dB re 1  $\mu$ Pa at a 500-m range. The distance to the 160-dB isopleth was 12 m for the dual-plate boomer and 10 m for the chirp (Martin et al. 2012). Zykov and MacDonnell (2013) have produced similar results in field measurements of side-scan sonar and subbottom profiler systems off Massachusetts.

#### Summary of Single Pulse Exposure

**Table 3-38** summarizes radial distances ( $R_{95\%}$ ) to SPL and SEL injury and behavioral modification thresholds calculated for single pulses from representative equipment types, by functional hearing group. The table provides distances using two sets of criteria – the current NMFS acoustic exposure thresholds using SPLs and energy-based exposure levels (SELs) based on the work of Southall et al. (2007) and Wood et al. (2012).

These modeled distances take into account the narrow beam nature of several of the acoustic sources. In the absence of ramp up or soft start procedures, survey equipment will be activated at or near full power. Implementation of ramp up procedures, when coupled with the use of permit-required marine wildlife monitors and visual clearance of an equipment-specific safety (or exclusion) zone, will reduce the potential for acoustic-related impact to marine mammals which may be present in close proximity to the survey vessel. Equipment-specific safety zones are discussed in **Section 3.3.4.4**.

1 **Table 3-38. Comparison of Radial Distances ( $R_{95\%}$ ) to SPL and SEL Injury and Behavioral Modification Threshold**  
 2 **Levels, for Single Pulses from Representative Equipment Types, by Functional Hearing Group**

Threshold Level and Hearing Group	$R_{95\%}$ Distance (m)				
	Single Beam Echosounder	Multibeam Echosounder	Side-Scan Sonar	Subbottom Profiler	Boomer
<b>National Marine Fisheries Service (NMFS) Acoustic Exposure Criteria</b>					
<b>180 dB re 1 <math>\mu</math>Pa SPL for cetaceans/190 dB re 1 <math>\mu</math>Pa for pinnipeds in water (Injury)</b>					
Low- Frequency Cetaceans	-	<20	<20	<20	<20
Mid-Frequency Cetaceans	-	35	181	<20	<20
High- Frequency Cetaceans	-	35	195	<20	<20
Pinnipeds (in water)	-	<20	31	<20	<20
<b>160 dB re 1 <math>\mu</math>Pa SPL (Behavioral Modification)</b>					
Low Frequency Cetaceans	-	<20	102	32	45
Mid-Frequency Cetaceans	<20	184	512	36	45
High Frequency Cetaceans	<20	191	526	36	45
Pinnipeds (in water)	<20	85	399	36	45
<b>Energy-Based Criteria (Southall et al. 2007 and Wood et al. 2012)</b>					
<b>198 dB re 1 <math>\mu</math>Pa<sup>2</sup>-s SEL (Injury)</b>					
Mid-Frequency Cetaceans	<20	-	<20	-	-
<b>192 dB re 1 <math>\mu</math>Pa<sup>2</sup>-s SEL (Injury)</b>					
Low-Frequency Cetaceans	-	-	<20	-	-
<b>186 dB re 1 <math>\mu</math>Pa<sup>2</sup>-s SEL (Injury)</b>					
Pinnipeds (in water)	<20	<20	<20	<20	-
<b>179 dB re 1 <math>\mu</math>Pa<sup>2</sup>-s SEL (Injury)</b>					
High-Frequency Cetaceans	-	-	<20	-	-
<b>183 dB re 1 <math>\mu</math>Pa<sup>2</sup>-s SEL (Behavioral Modification)</b>					
Low-Frequency Cetaceans	<20	<20	<20	<20	<20
Mid-Frequency Cetaceans	<20	<20	<20	<20	<20
High-Frequency Cetaceans	<20	<20	<20	<20	<20
<b>171 dB re 1 <math>\mu</math>Pa<sup>2</sup>-s SEL (Behavioral Modification)</b>					
Pinnipeds (in water)	<20	<20	<20	<20	<20

Acronyms and Abbreviations: SPL = sound pressure level; SEL = sound exposure level.



1 *Predicted Impacts (Cumulative Exposure)*

2 Analyses of cumulative sound exposure using the cSEL metric have been conducted in  
 3 a variety of project-specific environmental assessments. In the analysis conducted by  
 4 Wood et al. (2012), 24-hr cSELs were determined as the basis for Level A take  
 5 determinations, using group-specific hearing sensitivities (M-weightings). The area  
 6 ensonified to a 24-hr cSEL isopleth was calculated and used to estimate a cSEL take  
 7 representative of the entire survey. In that instance, high energy seismic survey  
 8 operations were to be conducted continuously over multiple days.

9 A key question in the current context of OGPP survey activity is whether the 10-hr cSEL  
 10 determinations should stand alone as estimators of impact, or whether each 10 hr day  
 11 should be additive for multi-day surveys.

12 In OGPP surveys, operations are generally limited to daylight hours; with addition of  
 13 nighttime restrictions as a mitigation measure (see **Section 3.3.4.4**), sound exposure  
 14 within a survey area will be limited to a 10-hr window. Multi-day OGPP surveys typically  
 15 encompass broader areas, suggesting that survey activity over several days will not  
 16 occur over the same location. Further, marine resources which may be a risk from  
 17 acoustic exposure are characteristically mobile, with minor exceptions. Marine  
 18 mammals, in particular, may have ranges which extend tens to hundreds of kilometers,  
 19 although there are several species which exhibit strong site fidelity (e.g., pinnipeds,  
 20 southern sea otter). On this basis, there is merit in viewing the 10-hr cSEL as a  
 21 fundamental estimator of impact associated with cumulative sound exposure from  
 22 OGPP survey activity.

23 The cumulative exposure scenario employed a central California location, with a  
 24 three-trackline survey area representative of an infrastructure survey (e.g., pipeline),  
 25 extending from the outer edge of the surf zone out to 3 nm. Trackline spacing was 75 m  
 26 between each line. The cumulative scenario considered maximum daylight operations  
 27 (i.e., 14 hr), with 10 hrs of equipment operation, which is considered a worst case  
 28 scenario for routine, daytime low energy geophysical survey operations. With a survey  
 29 vessel moving at 4 knots, and equipment pulsing every 4 seconds, all three survey lines  
 30 can be completed by one piece of equipment in 3 hrs. In a 10-hr work day, the survey  
 31 area can be covered by three instruments.

32 The cSELs were calculated for all pieces of survey equipment. Threshold levels  
 33 considered included 198, 192, 186, and 179 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  to address potential injury to  
 34 mid-frequency cetaceans, low-frequency cetaceans, pinnipeds in water, and high-  
 35 frequency cetaceans, respectively. This approach is consistent with Wood et al. (2012)  
 36 in their analysis of potential injury associated with a proposed high energy seismic  
 37 survey off Diablo Canyon. As an additional metric, threshold levels of 183 and 171 dB re

1 1  $\mu\text{Pa}^2\cdot\text{s}$  were also calculated to address potential behavioral modification to low-, mid-,  
2 and high-frequency cetaceans and pinnipeds in water, respectively.

3 The cSELs for the single beam echosounder and boomer are less than 171 dB re  
4 1  $\mu\text{Pa}^2\cdot\text{s}$ ; this is due to the low source level and downward-directed beam of the single  
5 beam echosounder, and the 173 dB re 1  $\mu\text{Pa}$  (field measurement) source level and  
6 frequency-dependent beam of the boomer. The cSEL determinations for the three  
7 remaining equipment types are presented in **Tables 3-39** through **3-41**.

8 Non-shaded entries are applicable to the respective cSEL and M-weighted group  
9 combination (e.g., 198 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  is the threshold for injury to mid-frequency  
10 cetaceans; 183 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  is the threshold for behavioral modification for low-, mid-,  
11 and high-frequency cetaceans). In all cases, the total area (ensonified) calculations  
12 were very small, routinely less than 0.05  $\text{km}^2$ . Equipment-based results are discussed  
13 below. For the multibeam echosounder, cSEL calculations were only available for  
14 potential injury to high-frequency cetaceans (i.e., radial distances for other thresholds  
15 and M-weighted groups were too low to calculate area ensonified). For high-frequency  
16 cetaceans, the area ensonified as a consequence of cumulative sound exposure was  
17 0.002  $\text{km}^2$ .

18 For side-scan sonar, cSEL calculations for both injury and behavioral modification were  
19 available. Potential injury to high-frequency cetaceans from cumulative sound exposure  
20 was calculated at a total area of 0.011  $\text{km}^2$ . For both mid- and high-frequency  
21 cetaceans, the area ensonified as a consequence of cumulative sound exposure which  
22 may produce behavioral modification was 0.009  $\text{km}^2$ , while for pinnipeds in water the  
23 area ensonified was 0.01  $\text{km}^2$ .

24 For the subbottom profiler, cSEL calculations for both injury and behavioral modification  
25 were available. Potential injury to high-frequency cetaceans from cumulative sound  
26 exposure was calculated for a total area of 0.03  $\text{km}^2$ . For all cetaceans, the area  
27 ensonified as a consequence of cumulative sound exposure which may produce  
28 behavioral modification was 0.02  $\text{km}^2$ , while for pinnipeds in water the area ensonified  
29 was 0.05  $\text{km}^2$ .

1 **Table 3-39. Cumulative Sound Exposure Levels for Multibeam Echosounder, with Unweighted and M-Weighted**  
 2 **Radial Distances and Area Ensonified**

cSEL (dB re 1 $\mu\text{Pa}^2\cdot\text{s}$ )		No Weighting		M-Weighted							
				LF Cetaceans		MF Cetaceans		HF Cetaceans		Pinnipeds	
		Area ( $\text{km}^2$ )	Radius (m)	Area ( $\text{km}^2$ )	Radius (m)	Area ( $\text{km}^2$ )	Radius (m)	Area ( $\text{km}^2$ )	Radius (m)	Area ( $\text{km}^2$ )	Radius (m)
Injury	198	-	-	-	-	-	-	-	-	-	-
	192	-	-	-	-	-	-	-	-	-	-
	186	-	-	-	-	-	-	-	-	-	-
	179	0.011	1.5	-	-	-	-	0.002	0.5	-	-
Behavioral Modification	183	0.008	1.0	-	-	-	-	-	-	-	-
	171	0.020	2.0	-	-	0.011	1.5	0.013	1.5	-	-

Injury: 198 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  = mid-frequency (MF) cetaceans; 192 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  = low-frequency (LF) cetaceans; 186 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  = pinnipeds (in water); 179 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  = high-frequency (HF) cetaceans.

Behavioral Modification: 183 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  = low- (LF), mid- (MF), and high-frequency (HF) cetaceans; 171 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  = pinnipeds (in water).

1 **Table 3-40. Cumulative Sound Exposure Levels for Side-Scan Sonar, with Unweighted and M-Weighted Radial**  
2 **Distances and Area Ensonified**

cSEL (dB re 1 $\mu\text{Pa}^2\cdot\text{s}$ )		No Weighting		M-Weighted							
				LF Cetaceans		MF Cetaceans		HF Cetaceans		Pinnipeds	
		Area (km <sup>2</sup> )	Radius (m)	Area (km <sup>2</sup> )	Radius (m)	Area (km <sup>2</sup> )	Radius (m)	Area (km <sup>2</sup> )	Radius (m)	Area (km <sup>2</sup> )	Radius (m)
Injury	198	-	-	-	-	-	-	-	-	-	-
	192	-	-	-	-	-	-	-	-	-	-
	186	0.009	1.0	-	-	-	-	-	-	-	-
	179	0.015	1.5	-	-	0.011	1.5	0.011	1.5	-	-
Behavioral Modification	183	0.011	1.5	-	-	0.009	1.0	0.009	1.0	-	-
	171	0.04	3.0	-	-	0.02	2.0	0.02	2.0	0.01	1.5

Injury: 198 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  = mid-frequency (MF) cetaceans; 192 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  = low-frequency (LF) cetaceans; 186 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  = pinnipeds (in water); 179 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  = high-frequency (HF) cetacean.

Behavioral Modification: 183 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  = low- (LF), mid- (MF), and high-frequency (HF) cetaceans; 171 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  = pinnipeds (in water).

1 **Table 3-41. Cumulative Sound Exposure Levels for Subbottom Profiler, with Unweighted and M-Weighted Radial**  
 2 **Distances and Area Ensonified**

cSEL (dB re 1 $\mu\text{Pa}^2\cdot\text{s}$ )		No Weighting		M-Weighted							
				LF cetaceans		MF Cetaceans		HF Cetaceans		Pinnipeds	
		Area (km <sup>2</sup> )	Radius (m)	Area (km <sup>2</sup> )	Radius (m)	Area (km <sup>2</sup> )	Radius (m)	Area (km <sup>2</sup> )	Radius (m)	Area (km <sup>2</sup> )	Radius (m)
Injury	198	-	-	-	-	-	-	-	-	-	-
	192	-	-	-	-	-	-	-	-	-	-
	186	0.01	1.5	0.01	1.5	0.01	1.5	0.01	1.5	0.01	1.5
	179	0.03	2.5	0.03	2.5	0.03	2.5	0.03	2.5	0.03	2.5
Behavioral Modification	183	0.02	2.0	0.02	2.0	0.02	2.0	0.02	2.0	0.02	2.0
	171	0.05	3.0	0.05	3.0	0.05	3.0	0.05	3.0	0.05	3.0

Injury: 198 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  = mid-frequency (MF) cetaceans; 192 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  = low-frequency (LF) cetaceans; 186 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  = pinnipeds (in water); 179 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  = high-frequency (HF) cetaceans.

Behavioral Modification: 183 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  = low- (LF), mid- (MF), and high-frequency (HF) cetaceans; 171 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  = pinnipeds (in water).

1 In all cases, the total area ensonified by any of the three equipment types, whether  
2 assessing potential injury or behavioral modification, was very small – less than  
3  $0.05 \text{ km}^2$ . In terms of equipment type, the potential for injury or behavioral modification  
4 from cumulative sound exposure is variable and limited. Multibeam echosounders and  
5 side-scan sonars used during a typical OGPP survey are not expected to result in injury  
6 to low- and mid-frequency cetaceans and pinnipeds, and will produce a very small area  
7 of potential injury to high-frequency cetaceans ( $0.002 \text{ km}^2$  for the multibeam  
8 echosounder;  $0.011 \text{ km}^2$  for the side-scan sonar). Cumulative sound exposure from the  
9 side-scan sonar may produce minor behavioral modification to mid- and high-frequency  
10 cetaceans within a small area ( $0.009 \text{ km}^2$ ).

11 In a similar fashion, subbottom profilers used during a typical OGPP survey are not  
12 expected to result in injury to low- and mid-frequency cetaceans and pinnipeds, and will  
13 produce a very small area of potential injury to high-frequency cetaceans ( $0.03 \text{ km}^2$ ).  
14 Cumulative sound exposure from subbottom profilers may produce minor behavioral  
15 modification to low-, mid-, and high-frequency cetaceans within a small area ( $0.02 \text{ km}^2$ ),  
16 or to pinnipeds within  $0.05 \text{ km}^2$ .

#### 17 Estimate of Numbers of Individuals Potentially Affected Based on Cumulative Exposure

18 The single pulse exposure calculations discussed previously provide a measure of the  
19 initial sound field created when OGPP equipment is activated, based on maximum  
20 horizontal distances to thresholds of interest (e.g.,  $180 \text{ dB re } 1 \text{ } \mu\text{Pa}$ ). While these  
21 measures are important when considering potential mitigation, single pulse analyses do  
22 not provide an indication of cumulative sound exposure (i.e., exposure to multiple  
23 pulses which occur during an OGPP survey).

24 The cSEL calculations (i.e., three tracklines; nearshore to offshore, perpendicular to the  
25 shoreline) completed for each modeled piece of low energy geophysical survey  
26 equipment produced estimates of total area ensonified to threshold levels of interest.  
27 Total area ensonified ranged from  $0.009$  to  $0.05 \text{ km}^2$ . Using calculated areas for each  
28 appropriate hearing group and estimates of marine mammal densities, an estimate of  
29 the total number of individuals potentially affected were calculated for each species  
30 based on cumulative exposure. In all cases, the cSEL values (i.e., total area ensonified)  
31 produced estimates of total numbers of individuals affected which were significantly less  
32 than one (i.e., range:  $0.01$  to  $0.14$  individuals).

33 A multi-equipment survey scenario was also modeled where three equipment types  
34 were employed sequentially – a multibeam echosounder, a side-scan sonar, and a  
35 subbottom profiler, all of which are commonly used. The multi-equipment scenario  
36 considered three survey tracklines, plus a fourth trackline for geophysical data  
37 refinement. The total survey time modeled in the multi-equipment scenario was  
38 10 hours, representative of a typical survey day. Results of the multi-equipment

scenario, calculated for each of the six cSEL levels, are provided in **Table 3-42**. Non-shaded entries are applicable to the respective cSEL and M-weighted group combination (e.g., 198 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  is the threshold for injury to mid-frequency cetaceans; 183 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  is the threshold for behavioral modification for low-, mid-, and high-frequency cetaceans, etc.).

**Table 3-42. Number of Individuals Potentially Affected by Cumulative Sound Exposure Levels (cSEs) for the 10 Hour Operational Scenario, by Species**

Species	cSEL (dB re 1 $\mu\text{Pa}^2\cdot\text{s}$ )					
	Injury				Behavioral Modification	
	198	192	186	179	183	171
Bryde's whale	-	0.00	0.00	0.00	0.00	0.00
Sei whale	-	0.00	0.00	0.00	0.00	0.00
Minke whale	-	0.00	0.00	0.00	0.00	0.00
Fin whale	-	0.00	0.00	0.00	0.00	0.00
Blue whale	-	0.00	0.00	0.00	0.00	0.00
Humpback whale	-	0.00	0.00	0.00	0.00	0.00
North Pacific right whale	-	0.00	0.00	0.00	0.00	0.00
California gray whale	-	0.00	0.00	0.00	0.00	0.00
Short-finned pilot whale	0.00	0.00	0.00	0.00	0.00	0.00
Killer whale	0.00	0.00	0.00	0.00	0.00	0.00
Striped dolphin	0.00	0.00	0.00	0.00	0.00	0.00
Pygmy and dwarf sperm whales	0.00	0.00	0.00	0.00	0.00	0.00
Small beaked whales (Ziphiidae)	0.00	0.00	0.00	0.00	0.00	0.00
Sperm whale	0.00	0.00	0.00	0.00	0.00	0.00
Bottlenose dolphin (offshore)	0.00	0.00	0.00	0.00	0.00	0.00
Bottlenose dolphin (coastal)	0.00	0.00	0.01	0.01	0.01	0.03
Long-beaked common dolphin	0.00	0.00	0.00	0.00	0.00	0.00
Short-beaked common dolphin	0.00	0.01	0.01	0.02	0.02	0.07
Northern right whale dolphin	0.00	0.00	0.00	0.00	0.00	0.01
Dall's porpoise	0.00	0.00	0.00	0.00	0.00	0.00
Risso's dolphin	0.00	0.00	0.00	0.00	0.00	0.01
Pacific white-sided dolphin	0.00	0.00	0.00	0.00	0.00	0.02
Common dolphin (long- and short-beaked)	0.00	0.03	0.04	0.06	0.05	0.20
Harbor porpoise	0.00	0.02	0.02	0.03	0.03	0.12
Harbor seal	-	0.00	0.00	0.00	0.00	0.00
Northern elephant seal	-	0.00	0.00	0.00	0.00	0.00
Northern fur seal	-	0.00	0.00	0.00	0.00	0.01
California sea lion	-	0.01	0.02	0.03	0.02	0.09
Northern (Steller) sea lion	ND	ND	ND	ND	ND	ND
Guadalupe fur seal	ND	ND	ND	ND	ND	ND
Southern sea otter	-	0.01	0.02	0.03	0.03	0.10

Injury: 198 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  = mid-frequency (MF) cetaceans; 192 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  = low-frequency (LF) cetaceans; 186 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  = pinnipeds (in water); 179 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  = high-frequency (HF) cetaceans.

Behavioral Modification: 183 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  = low- (LF), mid- (MF), and high-frequency (HF) cetaceans; 171 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$  = pinnipeds (in water).

1 The number of individuals exposed to cSELs was greater than zero for only seven  
2 species or species groups – bottlenose dolphin (coastal), common dolphin (long- and  
3 short-beaked), California sea lion, harbor porpoise, southern sea otter, and northern fur  
4 seal. The potential for injury from cumulative sound exposure is extremely low, with  
5 species-specific cSELs estimated at 0.02 individual for the California sea lion and  
6 southern sea otter, and 0.03 individual for the harbor porpoise (**Table 3-42**). The  
7 potential for behavioral modification is also extremely low. The number of individuals  
8 potentially realizing behavioral modification from cumulative sound exposure included  
9 0.01 (bottlenose dolphin [coastal]; northern fur seal), 0.02 (short-beaked common  
10 dolphin), 0.03 (harbor porpoise), 0.05 (common dolphin<sup>13</sup> [long- and short-beaked]),  
11 0.09 (California sea lion), and 0.10 (southern sea otter).

12 It is important to note that the range of several of these species is limited. For example,  
13 the southern sea otter only occurs along the mainland coast between San Mateo County  
14 and Santa Barbara County (Point Conception region). The northern fur seal is restricted  
15 to waters around San Miguel Island, the westernmost of the northern Channel Islands.  
16 Harbor porpoises are represented by four geographic stocks in California waters, with a  
17 combined range extending from the California-Oregon border to Point Conception.  
18 Seasonal presence should also be considered when assessing the potential for acoustic  
19 impact and the potential for injury or behavioral modification. Results indicate that  
20 marine mammals within the Project area are at minimal risk of either injury or behavioral  
21 modification from cumulative sound exposure resulting from a 10 hour survey.

22 While cSEL estimates were addressed previously, the NMFS-based approach  
23 employing SPL values was used to estimate incidental take with and without mitigation.  
24 The probabilistic approach was also used to address those species or groups which  
25 may have elevated sensitivity to acoustic disturbance (e.g., beaked whales, migrating  
26 mysticetes, porpoises). Using a similar survey scenario (i.e., three tracklines; nearshore  
27 to offshore, perpendicular to the shoreline), the total area ensonified to the 190/180 dB  
28 and 160 dB isopleths was calculated; a similar approach was taken with areas  
29 ensonified at 140 and 120 dB. Marine mammal densities were then used to calculate  
30 estimated take, with appropriate probabilistic factors applied at 160, 140, and 120 dBs,  
31 per CSLC (2012a).

32 Cumulative Sound Exposure, Multiple Equipment – three representative equipment  
33 types (multibeam echosounder, boomer, and subbottom profiler) were modeled  
34 sequentially within a survey area. The highest cSELs were greater than zero for only  
35 seven species at the lowest threshold – 171 dB re 1  $\mu\text{Pa}^2\cdot\text{s}$ : bottlenose dolphin  
36 (coastal), common dolphin (long- and short-beaked), California sea lion, harbor  
37 porpoise, southern sea otter, and northern fur seal. The potential for injury from

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<sup>13</sup> Stock assessment reports and cetacean surveys list *Delphinus* species rather than distinguish between long- and short-beaked common dolphins; consequently, this species group has been additionally considered as a whole throughout this document.



cumulative sound exposure is extremely low, with species-specific cSELs estimated at 0.02 individual for the California sea lion and southern sea otter, and 0.03 individual for the harbor porpoise. The number of individuals potentially realizing behavioral modification from cumulative sound exposure included 0.01 (bottlenose dolphin [coastal], northern fur seal), 0.02 (short-beaked common dolphin), 0.03 (harbor porpoise), 0.05 (common dolphin, [long- and short-beaked]), 0.09 (California sea lion), and 0.10 (southern sea otter).

Species-specific range limits and seasonal presence should be considered when assessing the potential for acoustic impact and the potential for injury or behavioral modification. Results indicate that marine mammals within the Project area are at minimal risk from cumulative sound exposure resulting from a 10 hour survey. Impacts from cumulative sound exposure, based on the survey scenario, are less than significant.

### *Estimation of Incidental Take*

A basic model was developed to utilize radial distances to sound pressure levels (SPL) of regulatory concern for impulsive sound – 190 dB re 1  $\mu$ Pa rms for pinnipeds in water (injury), 180 dB re 1  $\mu$ Pa rms for cetaceans (injury), and 160 dB re 1  $\mu$ Pa rms for marine mammals (behavioral modification). The basic model employed densities for California marine mammals and total area ensonified by five different equipment types to 190, 180, and 160 dB levels to estimate incidental take resulting from a representative low energy geophysical survey in State waters. The analysis produced incidental take estimates (i.e., Level A and Level B) individually for each equipment type.

### Level A Take

**Less than Significant with Mitigation.** In order to estimate Level A take (i.e., using the NMFS SPL thresholds of 180 dB re 1  $\mu$ Pa for cetaceans and 190 dB re 1  $\mu$ Pa for pinnipeds in water) that may result from low energy geophysical survey activity, several elements are necessary, including: (1) calculated radii to the 180 dB threshold; these values were determined based on modeling exercises conducted for each piece of equipment (**Tables 3-33 through 3-37**) and length of survey lines, the product of which provides the total area ensonified; (2) species- or group-specific marine mammal densities (**Table 3-15**); in many cases, both summer and winter density estimates were available. In those instances, the higher of the two density values were used; and (3) correction or weighting factors that account for (a) marine mammal presence in California waters; (b) preferred water depth range and/or habitat (e.g., offshore, deep vs. nearshore and coastal); (c) probability of presence in State waters; (d) estimations of behavioral avoidance reactions (BAR, per Wood et al. 2012); (e) species- or group-specific habitat activity patterns (e.g., active throughout the water column, or deep divers vs. surface active species); and (f) factors to account for equipment-specific beam width variability.

**Table 3-43** outlines several of the weighting factors considered in calculating take, including presence, habitat, and likelihood of encounter.

**Table 3-43. Summary of Marine Mammals in California Waters – Hearing Group, Presence, Habitat, and Likelihood of Encounter within State Waters**

Species	Hearing Group	Presence	Habitat	Probability of Presence
Bryde's whale	LF	Irregular	O	0.1
Sei whale	LF	Rare	O	0.05
Minke whale	LF	Common	CN,O	0.75
Fin whale	LF	Common; Southern/Central CA	CN,O	0.75
Blue whale	LF	Seasonal; Summer and Fall	CN,O	0.5
Humpback whale	LF	Common	CN,O	0.75
North Pacific right whale	LF	Rare	CN,O	0.1
California gray whale	L43	Seasonal; Northbound Feb-May, Cows/ Newborns Mar-Jun; Southbound Nov-Jan	CN	0.5
Short-finned pilot whale	MF	Irregular	O	0.1
Killer whale	MF	Common	CN,O	0.75
Striped dolphin	MF	Common	O	0.25
Pygmy and dwarf sperm whales	HF	Common	O	0.25
Small beaked whales (Ziphiidae)	MF	Infrequent	O	0.1
Sperm whale	MF	Common; Peak Abundances Apr-Jun, Sept-Nov	O	0.25
Bottlenose dolphin (offshore)	MF	Common; Southern CA	O	0.25
Bottlenose dolphin (coastal)	MF	Common; Southern CA	CN	1
Long-beaked common dolphin	MF	Infrequent	CN	0.5
Short-beaked common dolphin	MF	Common	CN,O	0.75
Northern right whale dolphin	MF	Seasonal	CN,O	0.5
Dall's porpoise	HF	Common; Southern CA	CN,O	0.75
Risso's dolphin	MF	Common; Southern CA	CN,O	0.75
Pacific white-sided dolphin	MF	Common	CN,O	0.75
Common dolphin (long- and short-beaked)	MF	Common	CN,O	0.75
Harbor porpoise	HF	Common	CN,O	0.75
Harbor seal	PW	Common	CN	1
Northern elephant seal	PW	Common; Seasonal; Offshore Islands, Dec-Mar, San Francisco Southward; Adults on Land Mar-Aug	CN,O	0.5
Northern fur seal	PW	Common; Seasonal; Southern CA	CN	0.5
California sea lion	PW	Common	CN	1
Northern (Steller) sea lion	PW	Seasonal; Northern CA-Ano Nuevo Is. Breeding May-Jul	CN,O	0.5
Guadalupe fur seal	PW	Rare	CN	0.25
Southern sea otter	Broad	Common; San Mateo County to Santa Barbara County	CN	1

Abbreviations: CN = coastal, nearshore; O = offshore; LF = low-frequency cetaceans; MF = mid-frequency cetaceans; HF = high-frequency cetaceans; PW = pinnipeds (in water).

1 Based on equipment specifications and modeling, weighting factors were used in the  
2 calculations to account for the narrow or focused beam characteristics of each piece of  
3 modeled equipment. An explanation of the corrections or weighting factors is provided  
4 in **Appendix I**.

5 Two separate calculations of Level A take were completed. The first estimates the  
6 number of individuals per species in the absence of mitigation (**Table 3-44**), including  
7 no onboard marine wildlife monitors or biological observers. The second set of  
8 calculations considers the same with mitigation (**Table 3-45**) including onboard  
9 monitors.

10 For most species or groups, Level A take estimates are less than one individual even  
11 when no mitigation has been employed. Exceptions include the bottlenose dolphin  
12 (coastal form), short-beaked common dolphin, Risso's dolphin, Pacific white-sided  
13 dolphin, and harbor porpoise. Given the OGPP permit-required placement of marine  
14 wildlife monitors or biological observers aboard each survey vessel, the second  
15 calculation of Level A take considered mitigation effectiveness (**Table 3-43**). This latter  
16 set of take estimates not only reflects the effectiveness of this mitigation measure, but it  
17 also indicates the level of residual impact calculated under the NMFS acoustic take  
18 approach.

19 Level A take calculations for all species or species groups, with mitigation, were below  
20 one. No Level A acoustic take is expected from the use of low energy geophysical  
21 equipment and exposure to a single pulse when marine wildlife monitors are being used  
22 and mitigation is effective. Mitigation effectiveness is based on several factors, including  
23 survey location (i.e., within 3 nm of shore), minimal vessel speed, daytime only  
24 operations, inherent limitations on conditions under which survey operations can be  
25 conducted (e.g., at elevated wind and swell states when observations by the marine  
26 wildlife monitor may become compromised, operators are not able to distinguish data  
27 due to wave, surf, and bubble noise), the relatively small safety zones for most  
28 equipment (20 to 600 m; see **Section 3.3.4.4**), and species activity patterns.

29 Calculations of Level A take with mitigation consider several weighting or correction  
30 factors, including habitat and seasonal presence, probability of presence in State  
31 waters, behavioral avoidance reactions, habitat activity patterns, and equipment-specific  
32 beam width variability. Level A take calculations for all species or species groups, with  
33 mitigation, were below unity, and no Level A acoustic take is expected during OGPP  
34 surveys when marine wildlife monitors are being used and mitigation is effective.

1 **Table 3-44. Summary of Estimated Level A Take (180 dB re 1  $\mu$ Pa rms for Cetaceans; 190 dB re 1  $\mu$ Pa rms for**  
 2 **Pinnipeds in Water) without Mitigation by Equipment Type**

Species or Group	Single Beam Echosounder	Multibeam Echosounder	Side-Scan Sonar	Subbottom Profiler	Boomer
Bryde's whale	0.00	0.00	0.00	0.00	0.00
Sei whale	0.00	0.00	0.00	0.00	0.00
Minke whale	0.00	0.00	0.00	0.00	0.00
Fin whale	0.00	0.00	0.00	0.00	0.00
Blue whale	0.00	0.00	0.00	0.00	0.00
Humpback whale	0.00	0.00	0.00	0.00	0.00
North Pacific right whale	0.00	0.00	0.00	0.00	0.00
California gray whale	0.01	0.03	0.03	0.03	0.03
Short-finned pilot whale	0.00	0.00	0.00	0.00	0.00
Killer whale	0.00	0.00	0.00	0.00	0.00
Striped dolphin	0.00	0.00	0.01	0.00	0.00
Pygmy and dwarf sperm whales	0.00	0.00	0.01	0.00	0.00
Small beaked whales	0.00	0.00	0.02	0.00	0.00
Sperm whale	0.00	0.00	0.00	0.00	0.00
Bottlenose dolphin (offshore)	0.01	0.05	0.28	0.02	0.02
Bottlenose dolphin (coastal)	0.06	0.42	2.18	0.18	0.18
Long-beaked common dolphin	0.01	0.05	0.26	0.02	0.02
Short-beaked common dolphin	0.15	1.08	5.56	0.46	0.46
Northern right whale dolphin	0.02	0.13	0.68	0.06	0.06
Dall's porpoise	0.01	0.04	0.25	0.02	0.02
Risso's dolphin	0.03	0.20	1.05	0.09	0.09
Pacific white-sided dolphin	0.04	0.26	1.36	0.11	0.11
Common dolphin (long- & short-beaked)	0.47	0.06	0.33	0.03	0.03
Harbor porpoise	0.26	1.82	10.12	0.78	0.78
Harbor seal	0.00	0.00	0.00	0.00	0.00
Northern elephant seal	0.00	0.01	0.02	0.01	0.01
Northern fur seal	0.03	0.08	0.16	0.08	0.08
California sea lion	0.25	0.75	1.55	0.75	0.75
Northern (Steller) sea lion	ND	ND	ND	ND	ND
Guadalupe fur seal	ND	ND	ND	ND	ND
Southern sea otter	0.27	0.80	1.65	0.80	0.80

ND = no density data available; shaded entries indicate a take level >1.

**Table 3-45. Summary of Estimated Level A Take (180 dB re 1  $\mu$ Pa rms for Cetaceans; 190 dB re 1  $\mu$ Pa rms for Pinnipeds in Water) with Mitigation by Equipment Type**

Species or Group	Single Beam Echosounder	Multibeam Echosounder	Side-Scan Sonar	Subbottom Profiler	Boomer
Bryde's whale	0.00	0.00	0.00	0.00	0.00
Sei whale	0.00	0.00	0.00	0.00	0.00
Minke whale	0.00	0.00	0.00	0.00	0.00
Fin whale	0.00	0.00	0.00	0.00	0.00
Blue whale	0.00	0.00	0.00	0.00	0.00
Humpback whale	0.00	0.00	0.00	0.00	0.00
North Pacific right whale	0.00	0.00	0.00	0.00	0.00
California gray whale	0.00	0.00	0.00	0.00	0.00
Short-finned pilot whale	0.00	0.00	0.00	0.00	0.00
Killer whale	0.00	0.00	0.00	0.00	0.00
Striped dolphin	0.00	0.00	0.00	0.00	0.00
Pygmy and dwarf sperm whales	0.00	0.00	0.00	0.00	0.00
Small beaked whales	0.00	0.00	0.00	0.00	0.00
Sperm whale	0.00	0.00	0.00	0.00	0.00
Bottlenose dolphin (offshore)	0.00	0.00	0.00	0.00	0.00
Bottlenose dolphin (coastal)	0.00	0.00	0.00	0.00	0.00
Long-beaked common dolphin	0.00	0.00	0.00	0.00	0.00
Short-beaked common dolphin	0.00	0.00	0.01	0.00	0.00
Northern right whale dolphin	0.00	0.00	0.00	0.00	0.00
Dall's porpoise	0.00	0.00	0.00	0.00	0.00
Risso's dolphin	0.00	0.00	0.00	0.00	0.00
Pacific white-sided dolphin	0.00	0.00	0.00	0.00	0.00
Common dolphin (long- & short-beaked)	0.00	0.00	0.00	0.00	0.00
Harbor porpoise	0.00	0.00	0.00	0.00	0.00
Harbor seal	0.00	0.00	0.00	0.00	0.00
Northern elephant seal	0.00	0.00	0.00	0.00	0.00
Northern fur seal	0.00	0.00	0.00	0.00	0.00
California sea lion	0.00	0.00	0.00	0.00	0.00
Northern (Steller) sea lion	ND	ND	ND	ND	ND
Guadalupe fur seal	ND	ND	ND	ND	ND
Southern sea otter	0.00	0.00	0.00	0.00	0.00

ND = no density data available.

1 Level B Take

2 **Less than Significant with Mitigation.** Given the many uncertainties associated with  
3 determining the quantity and types of impacts of noise on marine mammals, it is  
4 common practice to estimate how many mammals would be present within a particular  
5 distance of industrial activities and/or exposed to a particular level of sound. In most  
6 cases, this approach likely overestimates the numbers of marine mammals that would  
7 be affected in some biologically-important manner (NMFS 2013)

8 In order to estimate Level B take (i.e., using the NMFS SPL threshold of 160 dB re  
9 1  $\mu$ Pa for impulsive sound) which may result from low energy geophysical survey  
10 activity, the same elements employed in the Level A analysis are necessary. However,  
11 radial distances to the 160 dB threshold are used instead of the 190/180 dB distances.  
12 Calculated radii to the 160 dB threshold were provided for each piece of modeled  
13 survey equipment in **Tables 3-33** through **3-37**.

14 Three separate calculations of Level B take were completed. The first calculation of  
15 Level B take estimates the number of individuals per species in the absence of  
16 mitigation (i.e., without onboard marine wildlife monitors; **Table 3-46**). Non-mitigated  
17 Level B takes are associated with all equipment types, but are most frequently  
18 associated with the use of side-scan sonar and multibeam echosounder. Take  
19 estimates without mitigation are below one for nearly two-thirds of the species or  
20 groups. Exceptions include: (1) bottlenose dolphin (coastal), short-beaked common  
21 dolphin, northern right whale dolphin, Risso's dolphin, Pacific white-sided dolphin,  
22 common dolphin (long- and short-beaked), and harbor porpoise; (2) northern fur seal;  
23 and (3) southern sea otter.

24 Given the OGPP permit-required placement of marine wildlife monitors or biological  
25 observers aboard each survey vessel, the second calculation of Level B take is  
26 considered to be more representative of the potential for behavioral modification  
27 (**Table 3-47**). Potential behavioral modification did not exceed unity for any species.  
28 Non-zero calculations (i.e., all  $<0.03$  individual) were evident for only four species:  
29 bottlenose dolphin (coastal), short-beaked common dolphin, California sea lion, and sea  
30 otter, and involved only two low energy geophysical equipment types: multibeam  
31 echosounder and side-scan sonar.

1 **Table 3-46. Summary of Estimated Level B Take (160 dB re 1  $\mu$ Pa rms) without Mitigation by Equipment Type**

Species or Group	Single Beam Echosounder	Multibeam Echosounder	Side-Scan Sonar	Subbottom Profiler	Boomer
Bryde's whale	0.00	0.00	0.00	0.00	0.00
Sei whale	0.00	0.00	0.00	0.00	0.00
Minke whale	0.00	0.00	0.00	0.00	0.00
Fin whale	0.00	0.00	0.02	0.01	0.01
Blue whale	0.00	0.00	0.02	0.01	0.01
Humpback whale	0.00	0.00	0.01	0.00	0.01
North Pacific right whale	0.00	0.00	0.00	0.00	0.00
California gray whale	0.01	0.03	0.17	0.05	0.08
Short-finned pilot whale	0.00	0.00	0.01	0.00	0.00
Killer whale (southern resident stock)	0.00	0.00	0.01	0.00	0.00
Striped dolphin	0.00	0.01	0.03	0.00	0.00
Pygmy and dwarf sperm whales	0.00	0.01	0.02	0.00	0.00
Small beaked whales	0.00	0.02	0.05	0.00	0.00
Sperm whale	0.00	0.00	0.01	0.00	0.00
Bottlenose dolphin (offshore)	0.02	0.29	0.79	0.06	0.07
Bottlenose dolphin (coastal)	0.18	2.22	6.16	0.43	0.54
Long-beaked common dolphin	0.02	0.26	0.74	0.05	0.06
Short-beaked common dolphin	0.15	1.08	5.56	0.46	0.46
Northern right whale dolphin	0.06	0.69	1.92	0.14	0.17
Dall's porpoise	0.02	0.24	0.66	0.05	0.06
Risso's dolphin	0.09	1.07	2.98	0.21	0.26
Pacific white-sided dolphin	0.11	1.38	3.85	0.27	0.34
Common dolphin (long- & short-beaked)	1.41	0.34	0.94	0.07	0.08
Harbor porpoise	0.78	9.92	27.31	1.87	2.34
Harbor seal	0.00	0.00	0.00	0.00	0.00
Northern elephant seal	0.01	0.07	0.31	0.03	0.03
Northern fur seal	0.08	0.44	2.05	0.18	0.23
California sea lion	0.75	4.25	19.96	1.80	2.25
Northern (Steller) sea lion	ND	ND	ND	ND	ND
Guadalupe fur seal	ND	ND	ND	ND	ND
Southern sea otter	0.80	4.51	21.19	1.91	2.39

ND = no density data available; shaded entries indicate a take level >1.

1 **Table 3-47. Summary of Estimated Level B Take (160 dB re 1  $\mu$ Pa rms) with Mitigation by Equipment Type**

Species or Group	Single Beam Echosounder	Multibeam Echosounder	Side-Scan Sonar	Subbottom Profiler	Boomer	Potential Biological Removal (PBR)
Bryde's whale	0.00	0.00	0.00	0.00	0.00	Not determined
Sei whale	0.00	0.00	0.00	0.00	0.00	0.17
Minke whale	0.00	0.00	0.00	0.00	0.00	2
Fin whale	0.00	0.00	0.00	0.00	0.00	16
Blue whale	0.00	0.00	0.00	0.00	0.00	3.1
Humpback whale	0.00	0.00	0.00	0.00	0.00	11.3
North Pacific right whale	0.00	0.00	0.00	0.00	0.00	0.05
California gray whale	0.00	0.00	0.00	0.00	0.00	360
Short-finned pilot whale	0.00	0.00	0.00	0.00	0.00	4.6
Killer whale (southern resident stock)	0.00	0.00	0.00	0.00	0.00	0.14
Striped dolphin	0.00	0.00	0.00	0.00	0.00	82
Pygmy and dwarf sperm whales	0.00	0.00	0.00	0.00	0.00	2.7 (pygmy); No calculation (dwarf)
Small beaked whales	0.00	0.00	0.00	0.00	0.00	25
Sperm whale	0.00	0.00	0.00	0.00	0.00	1.5
Bottlenose dolphin (offshore)	0.00	0.00	0.00	0.00	0.00	5.5
Bottlenose dolphin (coastal)	0.00	0.00	0.01	0.00	0.00	2.4
Long-beaked common dolphin	0.00	0.00	0.00	0.00	0.00	610
Short-beaked common dolphin	0.00	0.00	0.01	0.00	0.00	3,440
Northern right whale dolphin	0.00	0.00	0.00	0.00	0.00	48
Dall's porpoise	0.00	0.00	0.00	0.00	0.00	257
Risso's dolphin	0.00	0.00	0.00	0.00	0.00	39
Pacific white-sided dolphin	0.00	0.00	0.00	0.00	0.00	193
Common dolphin (long- & short-beaked)	0.00	0.00	0.00	0.00	0.00	610 (long); 3,440 (short)
Harbor porpoise	0.00	0.00	0.00	0.00	0.00	19 (Morro Bay); 10 (Monterey Bay); 67 (SF-Russian R.); 577 (N CA/S OR)
Harbor seal	0.00	0.00	0.00	0.00	0.00	1,600
Northern elephant seal	0.00	0.00	0.00	0.00	0.00	4,382
Northern fur seal	0.00	0.00	0.00	0.00	0.00	324
California sea lion	0.00	0.01	0.03	0.00	0.00	9,200
Northern (Steller) sea lion	ND	ND	ND	ND	ND	2,378
Guadalupe fur seal	ND	ND	ND	ND	ND	91
Southern sea otter	0.00	0.00	0.01	0.00	0.00	8

ND = no density data available; shaded entries indicate a take level &gt;1.



1 The effects of survey equipment noise on marine mammals would be limited to short-  
2 term startle responses and localized behavioral changes. Any marine mammals  
3 affected are expected to return to the area shortly after cessation of equipment  
4 operations. No marine mammals are expected to permanently abandon the survey  
5 area.

6 Under the probabilistic approach, for all low energy geophysical equipment, nearly all  
7 California marine mammals will be exposed to survey noise which is insufficient to  
8 produce behavioral modification (**Table 3-48**) when mitigation is in effect. Non-zero  
9 calculations were only noted for one species, the California sea lion (0.02 individual),  
10 from a single equipment type – side-scan sonar.

11 Assuming a 10-hour hypothetical survey of three tracklines, 75 m apart, 5.5 km long,  
12 extending from just beyond the surf zone to the 3 nm offshore, the impact analysis for  
13 Level B incidental take considered a worst case scenario. For this hypothetical survey,  
14 the total area surveyed and radial distances to isopleths of interest (190/180 dB and  
15 160 dB) were used to estimate the total area ensonified.

16 Calculations of Level A and Level B take, with mitigation, considered several weighting  
17 or correction factors, including habitat and seasonal presence, probability of presence in  
18 State waters, behavioral avoidance reactions, habitat activity patterns, and  
19 equipment-specific beam width variability. Level B take, with mitigation, was zero for all  
20 species except for the California sea lion (0.02 individual).

21 The effects of the low energy geophysical surveys are expected to be limited to  
22 short-term startle responses and localized behavioral changes. Minor and brief  
23 responses, such as short-duration startle or alert reactions, are not likely to constitute  
24 disruption of behavioral patterns, such as migration, nursing, breeding, feeding, or  
25 sheltering. Similarly, impacts from cumulative exposure, based on the survey scenario,  
26 are less than significant.

### 27 *Probabilistic Determinations*

28 For the current assessment, the probabilistic metric employed by CSLC (2012a) has  
29 been applied to porpoises and beaked whales, at which 10 percent, 50 percent, and  
30 90 percent of individuals exposed are assumed to produce a behavioral response at  
31 exposures of 140, 160, and 180 dB re 1  $\mu$ Pa rms, respectively. Frequency-weighting  
32 curves (i.e., M-weighting, per Southall et al. 2007) were also applied to these exposure  
33 estimates, consistent with the approach used in CSLC (2012a). Migrating mysticetes  
34 are also known to exhibit behavioral modifications at lower exposure levels; to account  
35 for this, 10 percent, 50 percent, and 90 percent response probabilities were estimated to  
36 occur at M-weighted exposure levels of 120, 140, and 160 dB re 1  $\mu$ Pa rms.

**Table 3-48. Summary of Estimated Level B Take (160 dB re 1  $\mu$ Pa rms) under the Probabilistic Scenario with Mitigation by Equipment Type**

Species or Group	Single Beam Echosounder	Multibeam Echosounder	Side-Scan Sonar	Subbottom Profiler	Boomer	Potential Biological Removal (PBR)
Bryde's whale	0.00	0.00	0.00	0.00	0.00	Not determined
Sei whale	0.00	0.00	0.00	0.00	0.00	0.17
Minke whale	0.00	0.00	0.00	0.00	0.00	2
Fin whale	0.00	0.00	0.00	0.00	0.00	16
Blue whale	0.00	0.00	0.00	0.00	0.00	3.1
Humpback whale	0.00	0.00	0.00	0.00	0.00	11.3
North Pacific right whale	0.00	0.00	0.00	0.00	0.00	0.05
California gray whale	0.00	0.00	0.00	0.00	0.00	360
Short-finned pilot whale	0.00	0.00	0.00	0.00	0.00	4.6
Killer whale (southern resident stock)	0.00	0.00	0.00	0.00	0.00	0.14
Striped dolphin	0.00	0.00	0.00	0.00	0.00	82
Pygmy and dwarf sperm whales	0.00	0.00	0.00	0.00	0.00	2.7 (pygmy); No calculation (dwarf)
Small beaked whales	0.00	0.00	0.00	0.00	0.00	25
Sperm whale	0.00	0.00	0.00	0.00	0.00	1.5
Bottlenose dolphin (offshore)	0.00	0.00	0.00	0.00	0.00	5.5
Bottlenose dolphin (coastal)	0.00	0.00	0.00	0.00	0.00	2.4
Long-beaked common dolphin	0.00	0.00	0.00	0.00	0.00	610
Short-beaked common dolphin	0.00	0.00	0.00	0.00	0.00	3,440
Northern right whale dolphin	0.00	0.00	0.00	0.00	0.00	48
Dall's porpoise	0.00	0.00	0.00	0.00	0.00	257
Risso's dolphin	0.00	0.00	0.00	0.00	0.00	39
Pacific white-sided dolphin	0.00	0.00	0.00	0.00	0.00	193
Common dolphin (long- & short-beaked)	0.00	0.00	0.00	0.00	0.00	610 (long); 3,440 (short)
Harbor porpoise	0.00	0.00	0.00	0.00	0.00	19 (Morro Bay); 10 (Monterey Bay); 67 (SF-Russian R.); 577 (N CA/S OR)
Harbor seal	0.00	0.00	0.00	0.00	0.00	1,600
Northern elephant seal	0.00	0.00	0.00	0.00	0.00	4,382
Northern fur seal	0.00	0.00	0.00	0.00	0.00	324
California sea lion	0.00	0.00	0.02	0.00	0.00	9,200
Northern (Steller) sea lion	ND	ND	ND	ND	ND	2,378
Guadalupe fur seal	ND	ND	ND	ND	ND	91
Southern sea otter	0.00	0.00	0.00	0.00	0.00	8

ND = no density data available; shaded entries indicate a take level >1.

In addition, certain species, including harbor porpoises and beaked whales, appear to have a categorically different level of response than other marine mammals to lower received levels (Southall et al. 2007). Consequently, as a conservative approach which accommodates increased sensitivities to noise exposure, 50 percent and 90 percent response probabilities were estimated to occur at M-weighted exposure levels of 120 and 140 dB re 1  $\mu$ Pa rms. Probabilistic disturbance thresholds employing M-weighting, consistent with CSLC (2012a), are summarized in **Table 3-49**.

**Table 3-49. Probabilistic Disturbance Thresholds for Marine Mammals  
(From: CSLC 2012a)**

Marine Mammal Group	M-Weighted Disturbance Thresholds (dB re 1 $\mu$ Pa rms)			
	120	140	160	180
Porpoises, Beaked Whales	50%	90%		
Mysticetes, Migrating	10%	50%	90%	
All Other Species/Behaviors		10%	50%	90%

Acoustically sensitive species, such as migrating mysticetes, are known to exhibit behavioral modifications at lower exposure levels; to account for this, 10 percent, 50 percent, and 90 percent response probabilities were estimated to occur at M-weighted exposure levels of 120, 140, and 160 dB re 1  $\mu$ Pa rms. In addition, certain other species, including harbor porpoises and beaked whales, appear to have a categorically different level of response than other marine mammals to lower received levels (Southall et al. 2007). In consideration of this differential acoustic sensitivity, **Tables 3-50 and 3-51** present the probabilistic determinations for exposures at 140 and 120 dB, respectively. For the 140 dB sound field, the boomer exhibited the greatest radial distances and corresponding areas ensonified. The 140 dB calculations are presented to three decimal places to distinguish between species. Non-zero calculations (all less than 0.003 individual) were only noted for bottlenose dolphin (coastal form), short-beaked common dolphin, Risso's dolphin, common dolphin (long- and short-beaked), harbor porpoise, California sea lion, and southern sea otter, variably in association with multibeam echosounder, side-scan sonar, and boomer.

For the 120 dB sound field, with effects at this SPL limited to migrating mysticetes (i.e., California gray whale), beaked whales, and porpoises, no behavioral modification was predicted. The only non-zero calculation occurred with harbor porpoise (0.01 individual). Effects were also limited to a single piece of equipment – the boomer – due to the large sound field projected for this equipment.

#### *Take Estimates and Potential Biological Removal (PBR)*

Based on the Level A and Level B take analysis and a representative survey scenario, no injuries or behavioral modifications from low energy geophysical surveys are expected, with proper and effective mitigation in place.

**Table 3-50. Summary of Numbers of Individuals Affected using the Probabilistic Determination Approach (140 dB re 1  $\mu$ Pa rms), by Equipment Type**

Species	Single Beam Echosounder	Multibeam Echosounder	Side-Scan Sonar	Subbottom Profiler	Boomer
Bryde's whale	0.000	0.000	0.000	0.000	0.000
Sei whale	0.000	0.000	0.000	0.000	0.000
Minke whale	0.000	0.000	0.000	0.000	0.000
Fin whale	0.000	0.000	0.000	0.000	0.000
Blue whale	0.000	0.000	0.000	0.000	0.000
Humpback whale	0.000	0.000	0.000	0.000	0.000
North Pacific right whale	0.000	0.000	0.000	0.000	0.000
California gray whale	0.000	0.000	0.000	0.000	0.000
Short-finned pilot whale	0.000	0.000	0.000	0.000	0.000
Killer whale	0.000	0.000	0.000	0.000	0.000
Striped dolphin	0.000	0.000	0.000	0.000	0.000
Pygmy and dwarf sperm whales	0.000	0.000	0.000	0.000	0.000
Small beaked whales	0.000	0.000	0.000	0.000	0.000
Sperm whale	0.000	0.000	0.000	0.000	0.000
Bottlenose dolphin (offshore)	0.000	0.000	0.000	0.000	0.000
Bottlenose dolphin (coastal)	0.000	0.000	0.000	0.000	0.001
Long-beaked common dolphin	0.000	0.000	0.000	0.000	0.000
Short-beaked common dolphin	0.000	0.000	0.000	0.000	0.001
Northern right whale dolphin	0.000	0.000	0.000	0.000	0.000
Dall's porpoise	0.000	0.000	0.000	0.000	0.000
Risso's dolphin	0.000	0.001	0.001	0.000	0.002
Pacific white-sided dolphin	0.000	0.000	0.000	0.000	0.000
Common Dolphin (long- and short-beaked)	0.000	0.001	0.001	0.000	0.003
Harbor porpoise	0.000	0.000	0.001	0.000	0.002
Harbor seal	0.000	0.000	0.000	0.000	0.000
Northern elephant seal	0.000	0.000	0.000	0.000	0.000
Northern fur seal	0.000	0.000	0.000	0.000	0.000
California sea lion	0.000	0.000	0.001	0.000	0.003
Northern (Steller) sea lion	ND	ND	ND	ND	ND
Guadalupe fur seal	ND	ND	ND	ND	ND
Southern sea otter	0.000	0.000	0.000	0.000	0.001

Shaded entries indicate one or more individuals affected.

**Table 3-51. Summary of Numbers of Individuals Affected using the Probabilistic Determination Approach (120 dB re 1  $\mu$ Pa rms), by Equipment Type**

Species	Single Beam Echosounder	Multibeam Echosounder	Side-Scan Sonar	Subbottom Profiler	Boomer
California gray whale	0.00	0.00	0.00	0.00	0.00
Small beaked whales	0.00	0.00	0.00	0.00	0.00
Dall's porpoise	0.00	0.00	0.00	0.00	0.00
Harbor porpoise	0.00	0.00	0.00	0.00	0.01

Shaded entries indicate one or more individuals affected.

It is important to reiterate the definition and purpose of the PBR metric. PBR, as defined under the MMPA, is the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population. The purpose of the PBR metric is to minimize or eliminate those activities which may adversely affect a marine mammal population.

It is also important to understand the relationship between incidental take and PBR. In the current analysis, no incidental take of marine mammals is expected when mitigation measures are applied. In the absence of mitigation, potential injury and behavioral modification are possible.

The CSLC currently requires OGPP permit holders to develop a Marine Wildlife Contingency Plan (MWCP), a requirement that is also proposed in the OGPP Update. Permit requirements for the MWCP currently include:

- Measures that specify the distance, speed, and direction transiting vessels would maintain when in proximity to a marine mammal or reptile;
- Qualifications, number, location, and authority of onboard marine mammal and reptile monitors (Marine Wildlife Monitors);
- Methods of reducing noise levels generated by geophysical equipment; and
- Reporting requirements in the event of an observed impact to marine organisms.

Use of the above-referenced Marine Wildlife Monitors (MWM), particularly for those species (e.g., southern sea otter; harbor porpoise) or locations (e.g., Monterey Bay, Morro Bay, southern sea otter range) where PBR levels for the local population are low, will provide effective mitigation within several hundred meters of the survey vessel. To minimize potential disturbance to marine mammals, **MM BIO-2** requires permittees to use qualified onboard MWMs, approved pursuant to the protocols specified in the MWCP. In addition, **MM BIO-3** defines the “safety zones,” listed below (**Table 3-52**), that the wildlife monitors can feasibly observe. The onboard marine wildlife monitors will have the authority to stop operations if a mammal or turtle is observed within the

specified safety zone and may be negatively affected by survey activities. Typically, the safety zone is based on the area in which marine mammals could be exposed to injurious (Level A) levels of sound. The proposed safety zones exceed both the Level A and Level B isopleths for marine mammal harassment for all pieces of equipment. The use of a safety zone will minimize impacts to marine mammals from increased sound exposures.

**Table 3-52. Radial Distance ( $R_{95\%}$ ) to be Monitored around Low Energy Geophysical Survey Operations, by Equipment Type**

Equipment Type	Safety Zone (radius, m)	Distance to 180 dB isopleth (m)	Distance to 160 dB isopleth (m)
Single Beam Echosounder	50	<20	<20
Multibeam Echosounder	200	<20-35	<20-191
Side-Scan Sonar	600	<20-195	102-526
Subbottom Profiler	50	<20	32-36
Boomer System	75	<20	45

Parente and de Araujo (2011) evaluated the effectiveness of marine mammal visual observations as mitigation associated with high energy seismic survey activity. They determined that limited observations occurred beyond 1,000 m, with best observations occurring in Beaufort 0-2 conditions. Authors also noted that the more frequent sightings of marine mammals within 500 m of the seismic source suggested that the visual surveys may not have been effective in detecting species before they reached the “risk zone” defined for seismic surveys in Brazilian waters. Likewise, the absence of information about the distance of whales from the sound source in greater than 50 percent of the records suggests that the marine mammal observers may have had difficulty estimating distances. The small proportion of sightings may also have been associated with the height of the observation point on the boats, which was no greater than five meters. These difficulties may have reduced the effectiveness of the monitoring method in answering key questions concerning the effects of seismic surveys on marine mammals.

OGPP survey equipment sound source characteristics are significantly different than airgun sources, in terms of energy output, waveform, and rise time. Consequently, the safety zone ranges established for OGPP surveys are equipment-specific and smaller. Smaller safety zones are more easily monitored, directly affecting mitigation effectiveness. Results from Parente and de Araujo (2011) suggest that monitoring to a maximum radial distance of 600 m can be effective.

The comparison of Level A and Level B take, with and without mitigation, highlighted the importance of the marine wildlife observers (as required by the permit) and establishment of equipment-specific safety zones. The effectiveness of both marine wildlife monitors and safety zones, however, is dependent upon good visibility; inclement weather such as fog or rain could impact an observers’ ability to monitor the

1 relevant safety zone. Therefore, **MM BIO-3** also provides the marine wildlife monitors  
2 with the authority to cease operations during periods of limited visibility, based on  
3 visibility and the observed abundance of marine wildlife.

4 Monitors would experience similar limitations during nighttime survey operations,  
5 affecting the effectiveness of implementing safety zones. **MM BIO-4** addresses this risk  
6 by prohibiting nighttime surveys using most types of equipment (i.e., multibeam  
7 echosounders, side-scan sonar, and boomers). Geophysical operators proposing  
8 nighttime surveys using these types of equipment will need to apply to the CSLC for  
9 separate authorization. Because the single beam echosounder and subbottom profiler  
10 are more benign and have less than significant impacts on marine wildlife even without  
11 the presence of marine wildlife monitors (See **Tables 3-29** and **3-32**), the CSLC will  
12 consider the use of these specific equipment types at night on a case-by-case basis,  
13 taking into consideration the equipment specifications, location, timing, and duration of  
14 survey activity.

15 One of the most common mitigation measures employed worldwide to minimize  
16 acoustic impact is the requirement for a soft start or “ramp-up.” Soft start incorporates a  
17 gradual build-up of a sound source over time, with the aim of warning marine mammals  
18 and allowing them to depart the area before sound levels peak. Soft start is the key  
19 mitigation component of **MM BIO-5**. In most regions where soft start is required,  
20 typically in association with high energy seismic surveys, the period required to reach  
21 full power is at least 20 min long; in some regions, an upper limit of 40 to 45 min is  
22 required to attempt to minimize airgun disturbance (Weir and Dolman 2007). The  
23 effectiveness of soft start or ramp-up as a mitigation measure has yet to be empirically  
24 verified. It is recognized, however, as a practical mitigation measure, and is applied in  
25 industrial seismic surveys and research seismic programs.

26 The received sound level experienced by marine wildlife could also be reduced through  
27 changes in the equipment’s operation. Pulse width and power affect geophysical data  
28 quality. These parameters are routinely adjusted in the field to accommodate variations  
29 in environmental conditions (e.g., water depth, changes in bottom type). Sound from low  
30 energy geophysical equipment with a long pulse width travels further in the water and  
31 can be heard better by the transducer (i.e., good signal-to-noise ratio), but has a lower  
32 range resolution. A shorter pulse cannot travel as far in the water and has a weaker  
33 signal-to-noise ratio, but has a higher range resolution that can detect smaller and more  
34 closely spaced objects in the water.

35 Many pieces of low energy geophysical survey equipment have a maximum power  
36 setting associated with a peak sound source level (measured in dB re 1  $\mu$ Pa); however,  
37 when the power is too high, the amount of unusable data increases. Power is typically  
38 set to the lowest level possible in order to receive a clear return with the best data.

1 Power level is also adjusted according to bottom type, as some bottom types have a  
2 stronger return and require less power to produce quality data (NMFS 2013b).

3 As a result, **MM BIO-6** requires that survey operators adjust survey equipment  
4 operations to minimize the produced sound levels. Zykov et al. (2013), in their analysis  
5 of side-scan sonar and subbottom profiler field measurements, have suggested  
6 adopting the following procedures when operating the subbottom profiler and side-scan  
7 sonar to reduce the ensonification of the surrounding environment:

- 8 • Use the highest frequency band possible for the subbottom profiler. The beam of  
9 the subbottom profiler is narrower at high frequencies, therefore, emitting less  
10 acoustic energy horizontally;
- 11 • While short pulses (5–20 ms) can result in higher rms SPLs than longer pulses,  
12 short duration pulses have lower SELs and are perceived as less loud by  
13 mammals than long duration pulses (Au and Hastings 2008); therefore, the  
14 measure requires that the shortest possible pulse length be used;
- 15 • The cSELs calculated over a specific period of a survey can be reduced by  
16 lowering the pulse rate (pings per second). Changes to the pulse rate do not  
17 affect rms SPL or SEL calculated over each pulse.

#### 18 *Disturbance Near Haul-Out Sites*

19 **Less than Significant with Mitigation.** Motorized vessel traffic, as well as  
20 non-motorized craft (e.g., kayaks), have the potential to cause disturbance to marine  
21 mammals (e.g., Schusterman and Moore 1981; Allen et al. 1985; Suryan and Harvey  
22 1999; Grigg et al. 2002; Johnson and Acevedo-Gutierrez 2007). Vessel noise, including  
23 noise produced by engines and generators, has previously been shown to cause  
24 disturbance to pinnipeds at the Farallon Islands (PRBO Conservation Science and  
25 USFWS, unpubl. data, as cited in Allen 2008). Repeated disturbance can lead to  
26 reductions in productivity or site abandonment, or can disrupt feeding activities and  
27 cause animals to leave foraging areas, further prohibiting feeding and leading to costly  
28 additional energy expenditures (Allen 2008).

29 Disturbances resulting from human activity can impact short- and long-term pinniped  
30 haul-out behavior (Renouf et al. 1981; Schneider and Payne 1983; Terhune and Almon  
31 1983; Allen et al. 1984; Stewart 1984; Suryan and Harvey 1999; Mortenson et al. 2000;  
32 Kucey and Trites 2006). For example, several studies have shown that human activity  
33 can flush harbor seals off haul-out sites (Allen et al. 1984; Calambokidis et al. 1991;  
34 Suryan and Harvey 1999; Mortenson et al. 2000). Disturbance includes a variety of  
35 effects, including subtle to conspicuous changes in behavior, movement, and  
36 displacement.



1 Reactions to sound, if any, depend on species, state of maturity, experience, current  
2 activity, reproductive state, time of day, and many other factors (Richardson et al. 1995;  
3 Wartzok et al. 2004; Southall et al. 2007; Weilgart 2007). However, if a sound source  
4 displaces marine mammals from an important feeding or breeding area for a prolonged  
5 period, impacts on individuals and populations could be significant (e.g., Lusseau and  
6 Bejder 2007; Weilgart 2007).

7 NMFS has regulated close vessel approaches to marine mammals in Hawaii, Alaska,  
8 and the North Atlantic. In 1995, NMFS published a final rule to establish a 100-yard  
9 (91-m) approach limit for humpback whales in Hawaii (60 FR 3775, January 19, 1995).  
10 In 1997, an interim final rule was published to prohibit approaching critically endangered  
11 North Atlantic right whales closer than 500 yards (457 m) (62 FR 6729, February 13,  
12 1997). In 2001, NMFS published a final rule (66 FR 29502, May 31, 2001) establishing  
13 a 100-yard (91-m) approach limit for humpback whales in Alaska that included a “slow,  
14 safe speed” provision for vessels operating near a humpback whale.

15 In 2011, NMFS published a final rule (76 FR 20870, April 14, 2011) prohibiting vessels  
16 from approaching killer whales within 200 yards (183 m) and from parking in the path of  
17 whales when in inland waters of Washington State. The purpose of the regulation was  
18 to protect killer whales from interference and noise associated with vessels. In March  
19 2013, NMFS issued a proposed rulemaking, considering whether to propose regulations  
20 to protect glacially-associated harbor seal habitats in Alaska used for pupping, nursing,  
21 resting, and molting, and limit vessel disturbance to harbor seals in those habitats.

22 Vessel equipment onboard representative low energy geophysical survey vessels may  
23 include one or two main vessel engines and generators. Engine and exhaust noise are  
24 the largest contributors to exterior vessel noise, with sound levels usually highest  
25 directly behind a vessel. Based on noise analyses conducted on research vessels of  
26 similar size and engine complement, the maximum topside (i.e., open deck) noise levels  
27 may be expected to range between 70 and 75 dBA (A-weighted) (NSF 2008). Low  
28 energy geophysical survey vessel operations will produce only minor contributions to  
29 existing noise levels in the Project survey area.

30 Low energy geophysical equipment, given its periodic, short pulse, and narrow beam  
31 nature, is barely audible to crew members aboard the survey vessel and will not  
32 contribute to ambient noise levels in the air. Survey vessels at their closest point to  
33 shore (i.e., just beyond the surf zone) may be several hundred meters from the beach.  
34 Levels of sound pressure and levels of sound intensity decrease equally with the  
35 distance from the sound source, at a rate of 6 dB per distance doubling. At source  
36 levels of 70 or 75 dBA originating aboard the survey vessel, received levels at 100 m  
37 would be 30 or 35 dBA, respectively (**Table 3-42**). Vessel sound levels, while  
38 contributing to ambient noise levels in the survey area, are not expected to affect  
39 pinnipeds (in air) at their haul-out sites.

Most pinnipeds (i.e., seals, sea lions) haul-out to rest between feeding trips, or to give birth, mate, and engage in social interactions (Salter 1979; Calambokidis et al. 1987; Watts 1996; Reder et al. 2003; Orsini 2004). Pinnipeds also haul-out to avoid predators and to thermoregulate. Seals and sea lions tend to re-occupy traditional sites that are predator-free and are located close to areas of optimum feeding. Several studies have indicated the effects of human disturbance on pinnipeds occupying haul-out sites. In some instances, seals have become tolerant of motorized vessels that have passed close to (within 39 m) haul-out sites, yet are disturbed by vessels that either linger or slowly move around these locations (e.g., kayakers, stopped powerboats).

In general, pinnipeds quickly recover from disturbance, generally returning to their haul-out location within 60 minutes or less following the disturbance (Johnson and Acevedo-Gutierrez 2007). However, there are instances where reoccupation of a haul-out site may be protracted; in some severe cases, haul-out sites used by select species may be abandoned following prolonged human disturbance (e.g., Steller sea lions, harbor seals).

NMFS has established guidelines to prevent harassment of marine mammals, both at sea and on land. As the guidelines pertain to vessel operations, NMFS has determined that vessels should not approach within 91 m of pinnipeds hauled-out on land.

OGPP vessels, during the course of survey operations, may approach the shoreline or offshore islands, depending upon the location, design, and purpose of the survey. Vessel safety considerations typically preclude a vessel from working too close to the surf zone. Vessel safety limits (e.g., avoidance of the surf zone or seafloor hazards) will also limit the airborne survey-based sound levels.

**MM BIO-7** would require that, for surveys near pinniped haul-outs, survey operations stay a minimum of 91 m away from haul-outs, expedite activities near the haul-outs, and continuously monitor and, if necessary, change survey operations according to pinniped reactions. With implementation of the existing OGPP requirement for a MWCP and addition of **MM BIO-7**, impacts to pinnipeds at haul-out sites are expected to be less than significant.

### *Non-Acoustic Marine Mammal Impacts*

#### Collision Risk

**Less than Significant with Mitigation.** Collisions between marine mammals, particularly cetaceans, and ships represent a potentially significant threat worldwide. Large ship collisions with whales are known from widespread areas where shipping takes place (Laist et al. 2001; Jensen and Silber 2003; Van Waerbeek 2006). While the frequency of collisions may not represent a threat at the population level, mortality from ship strikes needs to be minimized to the greatest extent possible. In at least some

cases (e.g. the North Atlantic right whale, *Eubalaena glacialis*) vessel collisions threaten the continued existence of a population or species (Knowlton et al. 2004, 2007).

While many fatal collisions have historically involved large commercial carriers or military ships (Wiley et al. 1995; Laist et al. 2001), many different vessel types can be involved in collisions with whales. Other categories of vessels that have been implicated in ship collisions include whale watch vessels (Laist et al. 2001; Weinrich 2005), recreational vessels (Ford et al. 1994), and ferries (Laist et al. 2001; Weinrich 2004; Jensen and Silber 2004; Panigada et al. 2006).

The use of dedicated MWMs to monitor for the presence of marine mammals has proven effective (Weinrich and Pekarcik 2007; Weinrich et al. 2010). In addition, in areas where the relative abundance of cetaceans is unknown, the use of MWMs can be used to gather a baseline to determine whether concern is warranted. Experienced MWMs are expected to play an important role in detecting marine mammals and reducing the risk of collision during OGPP surveys.

Current OGPP requirements and **MM BIO-2** ensure the mandatory use of MWMs or biological observers aboard each survey vessel. Observers are used during all survey activities, including transit to and from port where the risk of collision with a marine mammal is greatest. Use of marine wildlife monitors is expected to significantly reduce the risk of collision. Consequently, the impacts associated with collision risk are less than significant with mitigation.

#### *Impacts due to Invasive Species*

**Less than Significant.** Invasive species, or AIS, can be introduced from vessels via several different mechanisms, including planktonic and nektonic forms present in ballast water; attached and free-living fouling biota on vessel hulls, propellers, and propeller shafts; biota attached to anchors, anchor chains, and anchor chain lockers; and biota attached to cargo accidentally lost overboard (e.g., timber imports).

Geophysical survey vessels do not utilize ballast water; therefore, ballast water is not a critical AIS vector for the OGPP analysis. However, vessel transit between harbors may provide a mechanism for inter-harbor transfer, particularly if survey vessels remain idle for extended periods during which hull fouling may occur. For example, researchers believe that wakame (*Undaria pinnatifida*), a Japanese marine algae, may have been introduced to Monterey Bay by fishing vessels moving between California ports. Although the State currently regulates ballast water and may soon regulate hull fouling, it has no authority over vessels under 300 gross register tons in size (CDFG 2008b).

Vessels used for OGPP surveys would be expected to mobilize, overnight, and berth at the available port closest to a survey location. While vessel availability for such surveys is variable, it is expected that most vessels contracted for OGPP surveys will originate

1 from local ports, either within the survey region (e.g., a survey off Oceanside, in Region  
2 IV, might be mobilized from San Diego, Los Angeles-Long Beach, or Ventura-Oxnard)  
3 or from a California port.

4 Candidate vessels are in high demand and are in near constant use, either in support of  
5 OGPP surveys or other activities. The potential for long idle periods is very limited,  
6 indicating that the potential for hull fouling is also limited.

7 Given the absence of ballast water, the utilization of local vessels, and the low potential  
8 for hull fouling attributed to vessel use, impacts of OGPP surveys associated with the  
9 introduction or spreading of AIS is expected to be less than significant.

10 ***b) Would the Project have a substantial adverse effect on any riparian habitat or***  
11 ***other sensitive natural community identified in local or regional plans, policies,***  
12 ***regulations or by the California Department of Fish and Wildlife or U.S. Fish and***  
13 ***Wildlife Service?***

14 **No Impact.** Project activities will occur entirely in the offshore environment; therefore,  
15 no impacts to riparian habitat are expected. Marine habitats that could be considered  
16 “sensitive natural communities” pursuant to this guidance include but are not  
17 necessarily limited to kelp beds, rocky habitats or reefs. Because geophysical surveys  
18 do not place any structures into the water that could affect these natural communities,  
19 there would be no impact. Potential conflict with MPAs and NMSs are discussed both  
20 below in (f) and in **Section 3.3.9, Land Use and Planning.**

21 ***c) Would the Project have a substantial adverse effect on federally protected***  
22 ***wetlands as defined by Section 404 of the Clean Water Act (including, but not***  
23 ***limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling,***  
24 ***hydrological interruption, or other means?***

25 **No Impact.** All low energy geophysical surveys conducted under the OGPP occur  
26 within marine waters of the State, exclusive of San Francisco Bay. No federally  
27 protected wetlands will be affected.

28 ***d) Would the Project interfere substantially with the movement of any native***  
29 ***resident or migratory fish or wildlife species or with established native resident or***  
30 ***migratory wildlife corridors, or impede the use of native wildlife nursery sites?***

31 **Less than Significant.** Responses to various types of geophysical equipment were  
32 summarized previously, specifically within **Table 3-42**. Based on sound source levels  
33 and exposure estimates (i.e., **Tables 3-44 through 3-48, Tables 3-50 through 3-51**), no  
34 significant impacts to the movement of organisms, their migratory pathways, or nursery  
35 areas are expected as a result of low energy geophysical surveys conducted under the  
36 OGPP.

**e) Would the proposed Project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?**

**No Impact.** Surveys conducted under the OGPP will be located within State marine waters. Surveys will not occur within any areas that are protected by local policies or ordinances. Therefore, no conflicts between existing local policies and ordinances will occur.

**f) Would the proposed Project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?**

**Less than Significant with Mitigation.** For purposes of this analysis, the CSLC considers MPA designations to fall within the meaning of an approved conservation plan. Therefore, OGPP activities that conflict with the regulatory provisions of specific MPAs could be considered significant. Organisms within MPA boundaries that could be potentially affected by low energy geophysical surveys include marine mammals, sea turtles, fishes, and invertebrates. The following impacts are predicted in association with low energy geophysical survey operations:

- Marine mammals and sea turtles: no injury or mortality from acoustic sources will occur when complying with OGPP permit requirements and **MM BIO-1** through **MM BIO-9** below. Minor behavioral modification may be associated with select equipment.
- Fishes: no injury or mortality from acoustic sources is expected. Minor behavioral modification may be associated with select equipment, including startle reactions and possible short-term displacement from habitat.
- Invertebrates: limited, localized startle reactions are expected.
- Algae and macrophytes (e.g., kelp): no impacts from acoustic sources are expected.

To further reduce the potential for OGPP activities to conflict with MPA regulations, the CSLC will require survey operators to comply with **MM BIO-9** below. With implementation of these project requirements and additional mitigation measures, impacts related to impacts to living marine resources within MPAs would be less than significant. The potential for the OGPP to conflict with MPA regulations are discussed in additional detail in **Section 3.3.9, Land Use and Planning**.

**Cumulative Impacts**

Sound from low energy geophysical survey equipment has the potential to produce behavioral changes in marine mammals. However, it is unlikely that sound levels would be sufficiently intense, or prolonged to affect migration, feeding, breeding, and the ability

1 to avoid predators. Existing ambient underwater noise from natural and anthropogenic  
2 sources is part of the physical marine environment. Surface waves and animal  
3 vocalizations provide the greatest source of naturally occurring ocean noise. Sources of  
4 anthropogenic noise include vessel propellers, seismic airguns, explosives,  
5 construction, naval sonars, and standard vessel depth finders (NRC 2003a).

6 OGPP surveys to be conducted in Region I and the southern portion of Region II will  
7 represent an extremely small percentage of overall vessel activity in the area,  
8 particularly in the Los Angeles-Long Beach and San Diego port areas. In Region III, port  
9 operations at San Francisco and Oakland are extensive. Other commercial, military,  
10 and recreational traffic along the California coast is significant. The limited number of  
11 annual OGPP surveys represents a very minor contribution to total vessel traffic.

12 Low energy geophysical surveys conducted under the OGPP, and their associated  
13 transit operations, will add to the general vessel traffic present along the California  
14 coast. Survey vessels introduce an additional source of vessel noise into the existing  
15 baseline of underwater ambient sound, the latter of which is particularly heavy in high  
16 volume commercial traffic areas (i.e., major ports, traffic corridors). However, the  
17 cumulative impact of this additional source of noise is negligible in the context of  
18 existing commercial and recreational vessel traffic, particularly in those areas where  
19 large port operations are conducted. In addition, all vessels (with the possible exception  
20 of smaller boats) are typically equipped with a single beam depth finder that is used for  
21 navigational safety in conjunction with nautical charts. These depth finders determine  
22 the instantaneous depth underneath the vessel in real-time, although they operate in the  
23 same manner as a typical survey single beam echosounder.

#### 24 3.3.4.4 Mitigation and Residual Impacts

25 **Mitigation.** The CSLC requires compliance with all provisions of the OGPP permit  
26 including, but not limited to, provisions that require the permit holder to (1) notify the  
27 CSLC at least 15 days in advance of any survey activity; and (2) develop and provide a  
28 MWCP that includes:

- 29 • Measures that specify the distance, speed, and direction transiting vessels would  
30 maintain when in proximity to a marine mammal or reptile;
- 31 • Qualifications, number, location, and authority of onboard MWMs;
- 32 • Methods of reducing noise levels generated by geophysical equipment; and
- 33 • Reporting requirements in the event of an observed impact to marine organisms.

34 Permit holders under both the current and proposed OGPP are also required to develop  
35 an Oil Spill Contingency Plan (OSCP). OSCP requirements include preparation of a spill  
36 plan addressing the accidental releases of petroleum and/or non-petroleum products  
37 during survey operations and submittal of the plan to the CSLC for review and approval  
38 (See **MMs HAZ-1** through **HAZ-3**).

Implementation of the following measures will ensure no significant impacts to biological resources will occur as a result of the Project.

**MM BIO-1: Marine Mammal and Sea Turtle Presence – Current Information.** Prior to commencement of survey operations, the geophysical operator shall (1) contact the National Oceanic and Atmospheric Administration Long Beach office staff and local whale-watching operations and shall acquire information on the current composition and relative abundance of marine wildlife offshore, and (2) convey sightings data to the vessel operator and crew, survey party chief, and onboard Marine Wildlife Monitors (MWMs) prior to departure. This information will aid the MWMs by providing data on the approximate number and types of organisms that may be in the area.

**MM BIO-2: Marine Wildlife Monitors (MWMs).** A minimum of two qualified MWMs who are experienced in marine wildlife observations shall be onboard the survey vessel throughout both transit and data collection activities. The specific monitoring, observation, and data collection responsibilities shall be identified in the Marine Wildlife Contingency Plan required as part of all Offshore Geophysical Permit Program permits. Qualifications of proposed MWMs shall be submitted to the National Oceanic and Atmospheric Administration and CSLC at least two weeks in advance of the survey for their approval by the agencies. Survey operations shall not commence until the CSLC approves the MWMs.

**MM BIO-3: Safety Zone Monitoring.** Onboard Marine Wildlife Monitors (MWMs) responsible for observations during vessel transit shall be responsible for monitoring during the survey equipment operations. All visual monitoring shall occur from the highest practical vantage point aboard the survey vessel; binoculars shall be used to observe the surrounding area, as appropriate. The MWMs will survey an area (i.e., safety or exclusion zone) based on the equipment used, centered on the sound source (i.e., vessel, towfish), throughout time that the survey equipment is operating. Radial distances for the safety zone of each equipment type are as follows:

Equipment Type	Safety Zone (radius, m)
Single Beam Echosounder	50
Multibeam Echosounder	200
Side-Scan Sonar	600
Subbottom Profiler	50
Boomer System	75

The onboard MWMs shall have authority to stop operations if a mammal or turtle is observed within the specified safety zone and may be negatively affected by survey activities. The MWMs shall also have

authority to recommend continuation (or cessation) of operations during periods of limited visibility (i.e., fog, rain) based on the observed abundance of marine wildlife. Periodic reevaluation of weather conditions and reassessment of the continuation/cessation recommendation shall be completed by the onboard MWMs. During operations, if an animal's actions are observed to be irregular, the monitor shall have authority to recommend that equipment be shut down until the animal moves further away from the sound source. If irregular behavior is observed, the equipment shall be shut-off and will be restarted and ramped-up to full power, as applicable, or will not be started until the animal(s) is/are outside of the safety zone or have not been observed for 15 minutes.

**MM BIO-4: Limits on Nighttime Offshore Geophysical Permit Program (OGPP) Surveys.** Nighttime survey operations are prohibited under the OGPP, except as provided below. The CSLC will consider the use of single beam echosounders and subbottom profilers at night on a case-by-case basis, taking into consideration the equipment specifications, location, timing, and duration of survey activity.

**MM BIO-5: Soft Start.** The survey operator shall use a “soft-start” technique at the beginning of survey activities each day (or following a shut down) to allow any marine mammal that may be in the immediate area to leave before the sound sources reach full energy. Surveys shall not commence at nighttime or when the safety zone cannot be effectively monitored. Operators shall initiate each piece of equipment at the lowest practical sound level, increasing output in such a manner as to increase in steps not exceeding approximately 6 decibels (dB) per 5-minute period. During ramp-up, the marine wildlife monitors shall monitor the safety zone. If marine mammals are sighted within or about to enter the safety zone, a power-down or shut-down shall be implemented as though the equipment was operating at full power. Initiation of ramp-up procedures from shut-down requires that the marine wildlife monitors be able to visually observe the full safety zone.

**MM BIO-6: Verification of Sound Output and Practical Limitations on Equipment Use.** Prior to commencing survey operations, geophysical operators shall test the low energy geophysical equipment to verify the sound source levels are within manufacturer's specifications. Survey operations shall not proceed until equipment source levels are within specifications. Geophysical operators shall follow, to the maximum extent possible, the guidelines of Zykov et al. (2013) as they pertain to the use of subbottom profilers and side-scan sonar, including:

- Using the highest frequency band possible for the subbottom profiler;



- Using the shortest possible pulse length; and
- Lowering the pulse rate (pings per second) as much as feasible.

Geophysical operators shall consider the potential applicability of these measures to other equipment types (e.g., boomer).

**MM BIO-7: Avoidance of Pinniped Haul-Out Sites.** The Marine Wildlife Contingency Plan (MWCP) developed and implemented for each survey shall include identification of haul-out sites within or immediately adjacent to the proposed survey area. For surveys within 300 meters (m) of a haul-out site, the MWCP shall further require that:

(1) The (survey) vessel shall not approach within 91 m of a haul-out site, consistent with National Marine Fisheries Service (NMFS) guidelines;

(2) Survey activity close to haul-out sites shall be conducted in an expedited manner to minimize the potential for disturbance of pinnipeds on land; and

(3) Marine wildlife observers shall monitor pinniped activity onshore as the vessel approaches, observing and reporting on the number of pinnipeds potentially disturbed (e.g., via head lifting, flushing into the water). The purpose of such reporting is to provide CSLC and California Department of Fish and Wildlife with information regarding potential disturbance associated with OGPP surveys.

**MM BIO-8: Reporting Requirements – Collision.** If a collision with marine mammal or reptile occurs, the vessel operator shall document the conditions under which the accident occurred, including the following:

- Vessel location (latitude, longitude) where 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 monitoring marine wildlife at the time of collision; and,
- Name of vessel, vessel owner/operator, and captain or officer in charge of the vessel at time of collision.

After a collision, the vessel shall stop, 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 animal by doing so. The vessel will then

immediately communicate by radio or telephone all details to the vessel's base of operations, and shall immediately report the incident. Consistent with Marine Mammal Protection Act requirements, the vessel's base of operations or, if an onboard telephone is available, the vessel captain him/herself, will then immediately call the National Oceanic and Atmospheric Administration (NOAA) Stranding Coordinator to report the collision and follow any subsequent instructions. From the report, the Stranding Coordinator will coordinate subsequent action, including enlisting the aid of marine mammal rescue organizations, if appropriate. From the vessel's base of operations, a telephone call will be placed to the Stranding Coordinator, NOAA National Marine Fisheries Service (NMFS), Southwest Region, Long Beach, to obtain instructions. Although NOAA has primary responsibility for marine mammals in both State and Federal waters, The California Department of Fish and Wildlife will also be advised that an incident has occurred in State waters affecting a protected species. Reports should be communicated to the agencies listed below:

Federal	State
Southwest Region National Marine Fisheries Service Long Beach, CA (562) 980-4017	Enforcement Dispatch Desk California Department of Fish and Wildlife Long Beach, CA (562) 598-1032  California State Lands Commission Mineral Resources Management Division Long Beach, CA (562) 590-5071

**MM BIO-9: Limitations on Survey Operations in Select Marine Protected Areas (MPAs).** Prior to commencing survey activities, geophysical operators shall coordinate with the CLSC and California Department of Fish and Wildlife (CDFW) regarding proposed operations within MPAs. The scope and purpose of each survey proposed within a MPA shall be defined, and the applicability to the survey to the allowable MPA activities shall be conducted. No Offshore Geophysical Permit Program surveys shall be allowed within special closure areas. If deemed necessary by CDFW, geophysical operators will pursue a scientific collecting permit, or other appropriate permit, to secure approval to work within a MPA, and shall provide a copy of such authorization to the CSLC as part of the required 15-day notification. CSLC and/or CDFW may impose further restrictions on survey activities as conditions of approval.

**Residual Impacts.** With implementation and adherence to current OGPP requirements and **MMs BIO-1** through **BIO-9**, no residual impacts from OGPP survey operations are expected.

1 **3.3.5 Cultural Resources**

<b>V. CULTURAL RESOURCES: Would the Project:</b>	<b>Potentially Significant Impact</b>	<b>Less Than Significant with Mitigation</b>	<b>Less Than Significant Impact</b>	<b>No Impact</b>
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Disturb any human remains, including those interred outside of formal cemeteries?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

2 **3.3.5.1 Environmental Setting**

3 The Project area is located within State waters along the California coast, exclusive of  
 4 San Francisco Bay. As a result, any cultural and historic resources potentially affected  
 5 by survey operations would be limited to those nearshore and offshore areas.

6 This section summarizes existing conditions related to cultural resources along the  
 7 California coast, with the intent of defining the potential for impact to the historic,  
 8 archaeological, and paleontological sites that are present. Elements of this summary  
 9 have been derived from peer-reviewed and grey literature and relevant public  
 10 documents, with particular emphasis on the State Marine Life Protection Act (MLPA)  
 11 Initiative and the characterizations and data syntheses that have been developed from  
 12 these efforts.

13 Paleontological resources are the fossilized remains of plants and animals, including  
 14 vertebrates, invertebrates, and fossils of microscopic plants and animals (microfossils).  
 15 The age and abundance of fossils depend on the location, topographic setting, and  
 16 particular geologic formation in which they are found (Horizon Water and  
 17 Environment LLC 2012a,b). Fossil discoveries are of scientific value because they help  
 18 establish a historical record of past plant and animal life; they may also assist in  
 19 characterizing biological habitats that are also geologic features (e.g., rocky intertidal  
 20 zones, intertidal portions of beaches of varying grain sizes, rocky reefs, and underwater  
 21 pinnacles). Because low energy geophysical surveys occur in the water but do not  
 22 touch or disturb the seafloor, survey activities will not affect unique geologic features or  
 23 paleontological resources. Consequently, these resources are not considered further in  
 24 this analysis.

1 Archaeological resources – including fragments of tools or ceramic vessels; features  
2 such as remnants of walls, cooking hearths, or trash middens; and ecological evidence  
3 such as pollens remaining from plants that were in the area when the activities occurred  
4 – may provide material evidence for cultures that existed in the region prior to contact  
5 with European explorers and settlers. These resources have the potential to address  
6 missing information on early human history.

7 Cultural resource sites along the California coast and on its offshore islands include  
8 areas for precontact and ethnographic subsistence fishing (i.e., fishing camps), marine  
9 mammal hunting, and other resource-gathering activities. Archaeological records  
10 include Native American data from over 12,000 years ago but, because of  
11 inaccessibility and lack of development, archaeological survey information for smaller  
12 offshore islands and rock pinnacles is extremely limited (U.S. Department of the Interior,  
13 Bureau of Land Management [USDOI, BLM] 2004, 2005).

14 As described in the cultural analysis presented for the North Coast Marine Protected  
15 Area (MPA) EIR (Horizon Water and Environment LLC 2012a,b), a cultural resource is  
16 defined as a location of human activity, occupation, or use identified through field  
17 survey, historical documentation or research, or information from Native American tribal  
18 representatives (USDOI, BLM 2004, 2005). Cultural resources in the Project area are  
19 the remains and sites associated with past human activities and include shell mounds,  
20 burial grounds, historic village sites, Paleolithic art and petroglyphs, remnants of original  
21 structures, ceremonial artifacts and sites, tool-making sites, fossil remains, and other  
22 prehistoric artifacts. Cultural resources include archaeological sites as well as historic  
23 buildings and structures more than 50 years of age that may be important in history or  
24 have important scientific use. Cultural resources also include Traditional Cultural  
25 Properties (TCPs), which are sites or locations embodying the beliefs, customs, and  
26 practices of a living community of people that have been passed down through  
27 generations, usually orally or through practice (Parker and King 1998).

28 Cultural landscapes are the result of the interaction between people and the natural  
29 landscape. The features of a cultural landscape include topography, vegetation, water  
30 features, and structures. For a cultural landscape to be listed on the National Register of  
31 Historic Places (NRHP) as a TCP, it must have significant cultural worth. Examples of  
32 landscapes possessing such significance include:

- 33 • A location associated with the traditional beliefs of a Native American group  
34 about its origins, its cultural history, or the nature of the world;
- 35 • A rural community whose organization, buildings and structures, or patterns of  
36 land use reflect the cultural traditions valued by its long-term residents;
- 37 • An urban neighborhood that is the traditional home of a particular cultural group,  
38 and that reflects its beliefs and practices;

- A location where Native American religious practitioners have historically gone, and are known or thought to go today, to perform ceremonial activities in accordance with traditional cultural rules of practice; and
- A location where a community has traditionally carried out economic, artistic, or other cultural practices important in maintaining its historic identity.

## Prehistoric and Historic Setting

During the late Wisconsin glaciation (30,000 to 17,000 years Before Present), sea levels were as much as 400 feet (ft) (122 meters [m]) lower than they are today (CSLC 2012a). The California coastline would have been 6 nautical miles (nm) (11 kilometers [km]) or more farther offshore than at present. Even as recently as 8,000 years ago, sea levels were as much as 50 to 65 ft (15 to 20 m) lower than at present (Bickel 1978).

Areas of the continental shelf predicted to be sensitive for submerged prehistoric resources have been identified by the DOI (Pierson et al. 1987; Snethkamp et al. 1990). These areas correspond to locations of sensitive landforms (e.g., paleoembayments, submerged channel systems, and island complexes) along the shoreline at various periods ranging from approximately 18,000 to 7,500 years ago (CSLC 2012a).

Maritime peoples worldwide have developed some form of watercraft with which to traverse bodies of water and exploit marine resources otherwise unavailable to them. Local peoples used such craft to exploit the offshore environment. A summary of the Native American tribes who may have utilized the coastal zone and subsequently left cultural artifacts is provided in **Table 3-53**.

The first recorded European encounter of the California coast was the voyage of the Spanish explorer Juan Rodriguez Cabrillo in 1542, which landed in San Diego. The Englishman Sir Francis Drake sailed into Drake's Bay, north of San Francisco in 1579, during his voyage in search of the Northwest Passage to Asia across North America. Spanish explorers continued to explore the northern and southern American continents throughout the 16th and 17th Centuries. Throughout this period, Spanish ships frequented the California coast following a trans-Pacific trade route via Manila that was opened in 1565, although their efforts were more concentrated in South America, present-day Mexico, and the present-day eastern U.S. (Rawls 1998; Flynn et al. 2002).

Russian fur trappers also explored along the northern California coast in the early 19<sup>th</sup> century. Russian traders established Fort Ross north of Bodega Bay in 1812.

European occupation of California accelerated starting in 1769 with the establishment of the Spanish mission system. Spanish padres of the Franciscan order constructed a series of missions, reporting to the Catholic Church in Spain and exploiting converted Native Americans as labor (Cook 1976).

**Table 3-53. Summary of Ethnographic and Prehistoric Setting, by Region**

Region and Tribal Presence	Summary
<b>North Coast</b>	
Cahto, Chilula, Hupa, Karuk, Lassik, Mattole, Nogati, Pomo, Tolowa, Sinkyone, Wailaki, Whilkut, Wiyot, Yuki, and Yurok	Each tribe in the North Coast is unique and complex. Federally recognized tribes currently practicing traditional fishing and gathering in the North Coast region, include Bear River Band of the Rohnerville Rancheria; Big Lagoon Rancheria; Big Valley Band of Pomo Indians of the Big Valley Rancheria; Blue Lake Rancheria; Cahto Indian Tribe of the Laytonville Rancheria*; Cher-Ae Heights Indian Community of the Trinidad Rancheria; Coyote Valley Band of Pomo Indians*; Elem Indian Colony of Pomo Indians of the Sulphur Bank Rancheria; Elk Valley Rancheria, California; Guidiville Rancheria; Habematolel Pomo of Upper Lake; Hoopa Valley Tribe; Hopland Band of Pomo Indians of the Hopland Rancheria*; Lower Lake Rancheria; Manchester Band of Pomo Indians of the Manchester-Point Arena Rancheria; Middletown Rancheria of Pomo Indians; Pinoleville Pomo Nation*; Potter Valley Tribe*; Redwood Valley Rancheria of Pomo Indians*; Resighini Rancheria; Robinson Rancheria of Pomo Indians*; Round Valley Indian Tribes of the Round Valley Reservation*; Scotts Valley Band of Pomo Indians*; Sherwood Valley Rancheria of Pomo Indians*; Smith River Rancheria; Wiyot Tribe; and Yurok Tribe of the Yurok Reservation. Entities denoted with an asterisk (*) indicate the tribes that comprise the InterTribal Sinkyone Wilderness Council, a consortium of 10 federally recognized tribes in Mendocino and Lake Counties.
<b>North Central Coast</b>	
Pomo	The Pomo are divided into several groups, with the Kashaya, Southern, and Central Pomo inhabiting the coastal areas within the North Central Coast region. The history of the Kashaya Pomo differs from that of other Pomo groups in that the first direct contact was with Russians at Fort Ross rather than with the Spanish farther south. The Kashaya territory is within northern Sonoma County and Mendocino County. The territory of the Southern Pomo is within Sonoma County. Settlement along the coast typically involved one of two types of settlements: permanent villages at varying distances from the ocean and fresh water, and seasonal campsites located along the shoreline, mouths of rivers, etc. Most permanent villages were inland and had greater populations than coastal camps. Deer, elk, and antelope were exploited, as were smaller mammals such as bird and rabbits. The Pomo lived in three basic types of structures: dwelling houses, temporary structures, and subterranean houses.
Coast Miwok	The Coast Miwok territory is centered in Marin and adjacent Sonoma Counties. Miwok is one of the Penutian language groups and is traditionally divided into two Miwok groups: Coast Miwok and Lake Miwok. Several place names today are derived from the Miwok language: Olema, Tamalpais, Tomales, and Cotati to name a few. Much of the ethnographic accounts about the Coast Miwok come from early explorers to the Marin Coast. Both Drake in 1579 and Cermeno in 1595 encountered these groups. In 1811 and 1812, the well-known Russian colony of Fort Ross was established to hunt sea otters. Encounters with native Miwok and Pomo people are well documented. The environment of the Coast Miwok was partly coastal, with cliffs, bays, lagoons, and marshes forming the majority of the geography. Open valleys and grasslands slightly more inland also provided a rich supply of acorns, root plants, berries, and terrestrial game. Marine foods, such as fish and shellfish, were main staples of the Coast Miwok diet. Terrestrial game included rabbit, deer, bear, and elk. Acorns were the main starch, and numerous meals were made from acorn meal and acorn breads. Dwellings were mostly conical, grass-covered structures with interlocking poles. Large

**Table 3-53. Summary of Ethnographic and Prehistoric Setting, by Region**

Region and Tribal Presence	Summary
	villages traditionally had sweathouses, dance houses, and other ceremonial centers. Clamshell disk beads were used for both currency and adornment.
Ohlone	The Ohlone, formerly known as the Costanoan, occupied the coast from the San Francisco Bay in the north to just beyond present-day Carmel in the south, and as much as 60 mi inland. The Ohlone are a linguistically defined group, speaking eight different but related languages and composed of several smaller, autonomous groups. The Ohlone languages, together with Miwok, comprise the Utian language family of the Penutian stock. They were hunter-gatherers, utilizing only the native flora and fauna for subsistence and tool-making, practicing a rudimentary form of agriculture. Acorns and various kinds of seafood formed the basis of their diet, with a wide range of other foods exploited to a lesser extent, including assorted seeds, buckeye, berries, roots, land and sea mammals, waterfowl, reptiles, and insects. Their early agricultural practices entailed pruning and seasonally re-seeding locally occurring plants to optimize production. Acorns were among several of the foods stored for months at a time. Controlled burning of vast areas of land was carried out to promote the growth of seed-bearing annuals and to increase the available grazing areas for deer, elk, and antelope.
<b>Central Coast Region</b>	
Ohlone	The Ohlone, formerly known as the Costanoan, occupied the coast from the San Francisco Bay in the north to just beyond present-day Carmel in the south, and as much as 60 mi inland. The tribal summary is provided above.
Salinan	The Salinan inhabited parts of San Luis Obispo, Monterey, and perhaps San Benito Counties, with their territory extending from the sea to the main ridge of the coast range and from the head of the Salinas drainage to a short distance above Soledad. They hunted more than they fished, but depended for their subsistence principally on vegetal food, such as acorns and grass seed. They used stone mortars and coiled baskets, and buried or burned the dead. Year-round villages with conical shelters of willow and grass or rushes were built along major rivers and streams of the homeland. Villages were comprised of family groups (Access Genealogy 2006; Taylor 2006).
Chumash	The traditional Chumash homeland lies along the coast of California between Paso Robles in the north and Malibu in the south and including the Northern Channel Islands off Santa Barbara southeast of the study region. Before Spanish occupation of California, the Chumash lived in 150 independent villages with a total population of about 18,000 people. The area was first settled about 13,000 years ago and, over time, the population increased and the people adapted their lifestyles to the local environment. Villages along the coastline, on the islands, and in the interior had access to different resources that they traded with one another. Trade was enabled in part by the people's seagoing plank canoe, or <i>tomol</i> , which is thought to have been invented about 2,000 years ago. The last Chumash tomols used for fishing were made about 1850. Many archaeological artifacts have been found in the waters of the Central Coast region. Archaeologists have also predicted that "...more important sites remain to be discovered, particularly those related to submerged prehistoric living sites." Given the presence of Chumash in both the Central Coast and South Coast regions, additional discussion is provided below.

**Table 3-53. Summary of Ethnographic and Prehistoric Setting, by Region**

Region and Tribal Presence	Summary
<b>South Coast Region</b>	
Chumash	<p>The ethnohistoric Chumash are typically characterized as a linguistically related series of chiefdom societies occupying sedentary or semisedentary villages. The Chumash peoples occupied the area ranging from Estero Bay in San Luis Obispo County to Malibu in Los Angeles County, both coastal and interior valleys and plains, as well as the northern Channel Islands (San Miguel, Santa Rosa, Santa Cruz, Anacapa). They had developed a maritime adaptation that was quite complex and efficient. Fishing within the channel waters provided a tremendous amount of meat and was performed by use of the <i>Tomol</i> plank canoe (Glassow and Wilcoxon 1988). Shellfish and nearshore fish were available both in estuarine environments and along the sandy beaches, intertidal zones, and rocky outcrops on the ocean shore. In addition to marine foods, terrestrial foods in the form of terrestrial plants (most notably acorns) and terrestrial game (primarily rabbits and deer) were also available (Glassow 1996; Grenda and Altschul 2002; Glassow et al. 2007). Trade was facilitated by the existence of shell beads, primarily “cup” beads made from the <i>Olivella biplicata</i> shell (King 1990). The pre-European-contact Chumash population was probably between 10,000 and 18,000 individuals.</p>
Gabrieliño/ Tongva	<p>The Gabrieliño or Tongva territory is centered in the coastal, prairie, and mountain regions of western Los Angeles and Orange counties, as well as the Channel Islands of Santa Barbara, San Nicolas, Santa Catalina, and San Clemente. The Gabrieliño/Tongva practiced a subsistence living very similar to the Chumash in that they had a complex maritime adaptation, employed plank canoes in the open ocean, and had a heavy reliance on marine resources such as fish, shellfish, and sea mammals (Bean and Smith 1978). Similarly, interior terrestrial food sources such as deer, waterfowl, piñon nuts, acorns, and yucca supplemented their diets. The Gabrieliño/Tongva are especially known for their steatite industry, used to make carvings, cooking pots and bowls, pipes, jewelry, and ritual objects (McCawley 1996; Glassow et al. 2007). Steatite was also heavily traded with their neighbors. Pre-European-contact populations probably numbered around 5,000 individuals.</p>
Juaneño/ Acjachemem	<p>The Juaneño or Acjachemem occupied territory that extended from Las Pulgas Creek in northern San Diego County to the San Joaquin Hills along Orange County’s Central Coast. They were culturally and linguistically related to the Luiseño (Bean and Shipek 1978). Catholic priests called these indigenous people the Juaneño because they lived near Mission San Juan Capistrano. Today these groups call themselves the Juaneño Band of Mission Indians, Acjachemem Nation, and have been seeking federal recognition as a tribe. Ethnographically and prehistorically, local populations concentrated in semipermanent villages along major creeks and tributaries, particularly San Juan Creek and San Mateo Creek. The settlement and subsistence patterns of these groups involved annual movements from coastal areas to higher inland areas as different plant and animal species became seasonally available in different locations. Acorns, yucca, grasses, terrestrial game and shellfish, and marine fish all played dietary roles, with acorns serving as a primary staple (Kroeber 1925; Byrd and Raab 2007). Ethnographically, Juaneño society was hierarchically structured and included an elite ruling class, a middle class of established families, and a lower class (Sparkman 1908). Collectively, pre-European-contact Juaneño and Luiseño populations may have ranged from 4,000 to as many as 10,000 people (Bean and Shipek 1978).</p>



**Table 3-53. Summary of Ethnographic and Prehistoric Setting, by Region**

Region and Tribal Presence	Summary
Luiseño	<p>The ethnographic Luiseño, also known as the <i>Payomkowishum</i>, consisted of a collection of sedentary and autonomous villages occupying a territory centered on the coastal and interior regions from Aliso Creek in Orange County to Agua Hedionda Creek in central San Diego County. The Luiseño relied primarily on terrestrial food sources, such as deer, upland fowl, antelope, and small mammals. Coastal marine foods such as fish and shellfish were also collected (Bean and Shipek 1978; Byrd and Raab 2007). Acorns proved to be the primary staple of the Luiseño, and technology such as winnowing baskets and bedrock mortars were utilized in the process of utilizing this food source (Sparkman 1908). The Luiseño are one of the few California prehistoric groups known to manufacture pottery. Ethnographically, the Luiseño had a rigid social structure much like the Juaneño, including defined social statuses, ruling families, and elaborate and structured ritualistic behaviors (Sparkman 1908; White 1963; Bean and Shipek 1978). Pre-European-contact populations may have been as high as 10,000 individuals (White 1963).</p>
Kumeyaay (Ipai and Tipai)	<p>The Kumeyaay, formerly known as the Diegueño, include the Ipai and Tipai, two closely related groups that inhabited an area from Agua Hedionda Creek in northern San Diego County south into Baja California. The Ipai occupied the territory from San Diego Bay northward, and the Tipai from San Diego Bay south into Mexico. Their territory encompassed a number of environments, including coastal, mountain, and desert regions. The Ipai and Tipai migrated seasonally, and villages were often simple and ephemeral (Kroeber 1925; Luomala 1978). Seasonal movement was often vertical, and followed the ripening of major plants from canyon floors to mountain slopes, including coastal and slough bands. Acorns were the major food staple, although mesquite pods and various seed plants were also important. Deer was hunted, but the majority of meat protein was derived from small game such as rabbits and rodents (Byrd and Raab 2007). Trade was more often with each other than with foreign tribes, and both gourd and pottery vessels were produced to hold water. Pre-European-contact populations are estimated to be between 3,000 and 6,000 individuals (Luomala 1978).</p>
Sources: Horizon Water and Environment LLC 2012a,b; ICF Jones & Stokes 2009a,b; Jones & Stokes 2006, 2007; URS 2010a,b)	

Following its independence from Spain in 1821, Mexico controlled California as the northwestern edge of the Mexican state between 1821 and 1848, after which time, American settlers gradually settled California and continued to develop the agricultural and trade based economy inherited from the Mexican period. The Gold Rush of 1849 drastically increased trade ship traffic along the California coast, bringing about a significant increase in the population of Americans of European ancestry. Trade transport remained primarily maritime until completion of the first transcontinental railroad in 1869 and the proliferation of the railroad system throughout the west.

Maritime trade focused on the San Francisco Bay due to its proximity to the gold reserves being exploited and the subsequent population and economic boom in the surrounding area; although smaller ports such as Monterey also became economic and residential hubs and served as major destinations along the route (Delgado 2006).

### Cultural and Historical Resources

Offshore cultural resources in the region primarily are historic shipwrecks. The number of recognized shipwrecks by coastal county was compiled using the CSLC's California Shipwrecks Database (**Table 3-54**).

**Table 3-54. Number of Shipwrecks by Coastal California County**

County	Number of Recorded Shipwrecks
Del Norte	23
Humboldt	132
Mendocino	218
Sonoma	55
Marin	111*
San Francisco	140*
San Mateo	48*
Santa Cruz	14
Monterey	37
San Luis Obispo	16
Santa Barbara	69
Ventura	31
Los Angeles	156
Orange	37
San Diego	67
Total	1,154

\*May contain shipwrecks within San Francisco and/or San Pablo Bays.

There are several qualifiers regarding the current CSLC database, including: (1) precise locations of shipwrecks are usually unknown, with vague descriptive narratives of the area in which the ship was last known, or thought to have sunk, being provided; and (2) the current status of each shipwreck has not been verified, given that salvaging or refloating operations may have occurred and are not reflected in the CSLC's current

listing. As such, the database should only be used only as a guide for determining the potential for encountering offshore cultural or historic resources (CSLC 2012a). According to the CSLC’s Shipwrecks Database, 1,154 known shipwrecks are located within State waters. The majority of the shipwrecks are located, in decreasing number, off the coasts of Mendocino, Los Angeles, San Francisco, Humboldt, and Marin counties. Shipwrecks for San Francisco, Marin, and San Mateo counties may include several entities located within San Francisco and San Pablo bays, outside the boundaries of this analysis.

### 3.3.5.2 Regulatory Setting

Federal and State laws and regulations pertaining to this issue and relevant to the Project are identified in **Table 3-55**. Although Local Coastal Programs (LCPs) for each coastal county may contain policies for the protection of archaeological resources, prevention of vandalism, identification of archaeological sites, site surveys, protection of sites through mitigation, and protection of resources discovered during construction or other activities, these policies do not apply in the Project’s offshore areas.

**Table 3-55. Federal and/or State Laws, Regulations, and Policies Potentially Applicable to the Project (Cultural Resources)**

<b>U.S.</b>	Archaeological and Historic Preservation Act (AHPA)	The AHPA provides for the preservation of historical and archaeological data that might be irreparably lost or destroyed as a result of (1) flooding, the building of access roads, the erection of workmen’s communities, the relocation of railroads and highways, and other alterations of terrain caused by the construction of a dam by an agency of the U.S. or by any private person or corporation holding a license issued by any such agency; or (2) any alteration of the terrain caused as a result of a Federal construction project or federally licensed project, activity, or program. This Act requires Federal agencies to notify the Secretary of the Interior when they find that any federally permitted activity or program may cause irreparable loss or destruction of significant scientific, prehistoric, historical, or archaeological data. The AHPA built upon the national policy, set out in the Historic Sites Act of 1935, "...to provide for the preservation of historic American sites, buildings, objects, and antiquities of national significance...."
<b>U.S.</b>	Archaeological Resources Protection Act (ARPA)	The ARPA states that archaeological resources on public or Indian lands are an accessible and irreplaceable part of the nation’s heritage and: <ul style="list-style-type: none"> <li>• Establishes protection for archaeological resources to prevent loss and destruction due to uncontrolled excavations and pillaging;</li> <li>• Encourages increased cooperation and exchange of information between government authorities, the professional archaeological community, and private individuals having collections of archaeological resources prior to the enactment of this Act;</li> <li>• Establishes permit procedures to permit excavation or removal of archaeological resources (and associated activities) located on public or Indian land; and</li> <li>• Defines excavation, removal, damage, or other alteration or defacing of archaeological resources as a “prohibited act” and provides for criminal and monetary rewards to be paid to individuals furnishing information leading to the finding of a civil violation or conviction of a criminal violator.</li> </ul> ARPA has both enforcement and permitting components. The enforcement provision provides for the imposition of both criminal and civil penalties against

		violators of the Act. The ARPA's permitting component allows for recovery of certain artifacts consistent with the standards and requirements of the National Park Service (NPS) Federal Archeology Program.
U.S.	Executive Order (EO) 13158	EO 13158 requires Federal agencies to (1) identify actions that affect natural or cultural resources that are within a MPA; and (2) in taking such actions, to avoid harm to the natural and cultural resources that are protected by a MPA.
U.S.	National Historic Preservation Act (NHPA) (16 U.S.C. § 470 et seq.)	This applies only to Federal undertakings. Archaeological resources are protected through the NHPA, as amended, and its implementing regulation, Protection of Historic Properties (36 C.F.R. § 800), the AHPA, and the ARPA. This Act presents a general policy of supporting and encouraging the preservation of prehistoric and historic resources for present and future generations by directing Federal agencies to assume responsibility for considering the historic resources in their activities. The State implements the NHPA through its statewide comprehensive cultural resource surveys and preservation programs. The California Office of Historic Preservation (OHP), within the California Department of Parks and Recreation, implements the policies of the NHPA on a statewide level and advises Federal agencies regarding potential effects on historic properties. The OHP also maintains the California Historic Resources Inventory. The State Historic Preservation Officer (SHPO) is an appointed official who implements historic preservation programs within the State's jurisdictions, including commenting on Federal undertakings.
U.S.	NPS Abandoned Shipwreck Act of 1987 (43 U.S.C. § 2101–2106)	Under this Act, states have the responsibility for management of living and nonliving resources in State waters and submerged lands, including certain abandoned shipwrecks. The NPS has issued guidelines that are intended to: maximize the enhancement of cultural resources; foster a partnership among sport divers, fishermen, archeologists, sailors, and other interests to manage shipwreck resources of the states and the U.S.; facilitate access and utilization by recreational interests; and recognize the interests of individuals and groups engaged in shipwreck discovery and salvage. Specific provisions of the Act's guidelines include procedures for locating and identifying shipwrecks, methods for determining which shipwrecks are historic, and preservation and long-term management of historic shipwrecks.
CA	CEQA (Pub. Resources Code § 21000 et seq.)	As the CEQA lead agency, the CSLC is responsible for complying with all provisions of the CEQA and State CEQA Guidelines that relate to "historical resources." A historical resource includes: (1) a resource listed in, or eligible for listing in, the California Register of Historic Resources (CRHR); (2) a resource included in a local register of historical or identified as significant in an historical resource surveys; and (3) any resource that a lead agency determines to be historically significant for the purposes of CEQA, when supported by substantial evidence in light of the whole record. The CRHR was created to identify resources deemed worthy of preservation on a State level and was modeled closely after the National Register. The criteria, which are nearly identical to those of the National Register but focus on resources of statewide significance (see State CEQA Guidelines § 15064.5, subd. (a)(3)), are defined as any resource that meets any of the following criteria: (1) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage; (2) Is associated with lives of persons important in our past; (3) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or (4) Has yielded, or may be likely to yield, information important in prehistory or history. Properties listed, or formally designated as eligible for listing, on the National Register are automatically listed on the CRHR, as are certain State Landmarks and Points of Interest. A lead agency is not precluded from determining that the resource may be an historical resource as defined in Public Resources Code sections 5020.1, subdivision (j), or 5024.1 (State CEQA Guidelines § 15064.5, subd. (a)(4)).

CA	California Coastal Act Chapter 3 policies	Section 30244 states: Where development would adversely impact archaeological or paleontological resources as identified by the State Historic Preservation Officer, reasonable mitigation measures shall be required.
CA	Health and Safety Code § 7050.5	This code states that if human remains are exposed during construction, no further disturbance shall occur until the County Coroner has made the necessary findings as to origin and disposition pursuant to Public Resources Code section 5097.998. The Coroner has 24 hours to notify the Native American Heritage Commission (NAHC) if the remains are determined to be of Native American descent. The NAHC will contact most likely descendants, who may recommend how to proceed.

### 3.3.5.3 Impact Analysis

#### ***a) Would the Project cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?***

**No Impact.** Low energy geophysical surveys will be located offshore, with activities that may extend from just beyond the surf zone to the 3 nm line. Low energy geophysical surveys do not employ any sea bottom-founded equipment. All equipment is either hull-mounted or tethered (e.g., tow fish, remotely operated vehicle [ROV]), and is not expected to impact the seafloor.

Acoustic pulses originating from the equipment will reflect from, or penetrate into, the seafloor. Depending on the type of equipment used, either seafloor imagery or shallow penetration is expected. Acoustic pulses will not damage or adversely affect artifacts or surrounding sediments. Low energy geophysical survey activities will not result in ground disturbing activities that have the potential to impact any paleontological resources that may be located in State waters.

According to the CSLC's Shipwrecks Database, 1,154 known archaeological or historical resources are located within State waters (**Table 3-54**); however, such surveys do not physically disturb the seafloor. Therefore, the potential for low energy geophysical surveys to result in a significant impact to important archaeological or historical resources is remote, and OGPP surveys are considered to have no impact on offshore cultural resources. In the unlikely event that low energy geophysical survey activities encounter a previously unidentified archaeological site, the CSLC will be notified immediately and will subsequently notify applicable tribal and/or agency representatives.

As a beneficial impact, low energy geophysical surveys are often used to identify submerged cultural resources that may be impacted by ground-disturbing projects, and so can contribute to avoidance and protection of these resources.

#### ***b) Would the Project cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?***

**No Impact.** See response to (a) above.

1 **c) Would the Project directly or indirectly destroy a unique paleontological**  
2 **resource or site or unique geologic feature?**

3 **No Impact.** See response to (a) above.

4 **d) Would the Project disturb any human remains, including those interred outside**  
5 **of formal cemeteries?**

6 **No Impact.** Low energy geophysical surveys may occur anywhere along the California  
7 coast. While it remains possible that submerged human remains may occur in a survey  
8 area, survey activities will not physically affect the seafloor. Survey activities are  
9 restricted to the use of acoustic sources (i.e., vessel mounted or towed) and passive  
10 equipment (e.g., magnetometer). Therefore, there will be no impact on human remains.

#### 11 3.3.5.4 Mitigation and Residual Impacts

12 **Mitigation.** The conduct of low energy geophysical surveys under the OGPP would not  
13 result in impacts to historic, cultural, or paleontological resources. Therefore, no  
14 mitigation measures are required.

15 **Residual Impacts.** The completion of low energy geophysical surveys would have no  
16 historic, cultural, or paleontological resources impacts. No mitigation is required, and no  
17 residual impacts would occur.

1 **3.3.6 Geology and Soils**

<b>VI. GEOLOGY AND SOILS:</b> Would the Project:	<b>Potentially Significant Impact</b>	<b>Less Than Significant with Mitigation</b>	<b>Less Than Significant Impact</b>	<b>No Impact</b>
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
ii) Strong seismic ground shaking?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
iii) Seismic-related ground failure, including liquefaction?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
iv) Landslides?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Result in substantial soil erosion or the loss of topsoil?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of waste water?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

2 **3.3.6.1 Environmental Setting**

3 **Regional Marine Geology**

4 The onset of glaciation during the Pleistocene Epoch caused several major oscillations  
5 in the sea level of more than 91 meters (m) (300 feet [ft]) as the polar ice caps formed  
6 and subsequently receded. The last major regression occurred about 17,000 years ago,  
7 and global sea levels dropped approximately 122 m (Fillon et al. 2004). Sediments on  
8 the seafloor of the present-day continental shelf were exposed for several thousand  
9 years. Migrating rivers eroded sizeable channels when sea-level regressions exposed  
10 portions of the present seafloor. Sediments on the inner continental shelf along the  
11 California coast are consistent with recent deposition under turbulent, shallow water

1 conditions. Sediments farther offshore consist of silty clays that settled out of  
2 suspension (CSLC 2012b).

3 On a regional basis, unique geologic features are present, including rocky intertidal  
4 zones, beaches of varying grain sizes (gravel to fine-grained), rocky reefs, and  
5 underwater pinnacles. These features are the result of active tectonic processes,  
6 erosion, and wave and biological action in the surrounding area. These features provide  
7 a substrate for marine life and public viewing enjoyment.

## 8 **California Seafloor Mapping Program**

9 The California Seafloor Mapping Program (CSMP) is a cooperative program designed  
10 to create a comprehensive coastal/marine geologic and habitat base map series for  
11 State waters. The Ocean Protection Council authorized funds to establish the CSMP in  
12 2007, assembling a team of experts from State and Federal agencies, academia, and  
13 private industry to develop the best approach to mapping and classifying estuarine and  
14 marine geologic habitats, while at the same time updating all nautical charts. Initiated in  
15 2008, the CSMP collected bathymetric and backscatter data, the latter of which provide  
16 insight into the geologic composition of the seafloor. CSMP data have been used in the  
17 development of a habitat and geologic base map series.

18 While the CSMP was originally developed to support the design and monitoring of  
19 marine reserves through the Marine Life Protection Act (MLPA) (California Department  
20 of Fish and Game [CDFG] 2007), accurate statewide mapping of the seafloor also  
21 provides valuable data for: (1) improvement of climate change and ocean circulation  
22 models; (2) siting of potential ocean energy facilities; (3) furthering understanding of  
23 ecosystem dynamics; (4) identifying submerged faults and expanding predictive  
24 capabilities regarding tsunami potential; (5) more effective regulation of offshore  
25 development; (6) improving maritime safety; and (7) improving characterization of  
26 sediment transport and sand delivery.

27 CSMP map products are generated in a three-tiered process, with each data tier being  
28 constructed from the previous tier. When finalized, the completed Geographic  
29 Information Systems (GIS)-ready CSMP data layers are made available for public  
30 download from an online data catalog. The three tiers include:

- 31 • Tier 1, Foundation Data Products – consists of basic survey data (e.g., xyz  
32 bathymetry grids, backscatter [substrate] mosaics). Tier 1 data represent the  
33 minimum data sets necessary to support basic habitat classification. Tier 1  
34 products are composed primarily of multibeam bathymetry data.
- 35 • Tier 2, GIS Products – consists of map products derived through semiautomated  
36 GIS processes. GIS product derivatives were created from the bathymetry digital  
37 elevation models and include shaded relief imagery (in grey scale) and colored



by depth, as well as GIS analyses of rugosity, slope, and topographic position index, and substrate (habitat) analyses. These products are also made available to the MLPA Initiative for use in the MPA-designation process. Federal Geographic Data Committee (FGDC)-compliant metadata files are generated for each final product file to document the processing steps.

- Tier 3, Map Folios – consists of fully interpreted, classified, and attributed geologic and habitat maps that integrate the bathymetry, backscatter, and subbottom profile data into a single interpretation for broad areas.

Additional information regarding seafloor mapping products is available at [http://seafloor.otterlabs.org/csmc/csmc\\_datacatalog.html](http://seafloor.otterlabs.org/csmc/csmc_datacatalog.html).

### 3.3.6.2 Regulatory Setting

Federal and State laws and regulations pertaining to this issue and relevant to the Project are identified in **Table 3-56**. No local laws and regulations relevant to this issue are applicable to the Project.

**Table 3-56. Federal and/or State Laws, Regulations, and Policies Potentially Applicable to the Project (Geology and Soils)**

CA	Alquist-Priolo Earthquake Fault Zoning Act (Pub. Resources Code §§ 2621-2630)	This Act requires that "sufficiently active" and "well-defined" earthquake fault zones be delineated by the State Geologist and prohibits locating structures for human occupancy across the trace of an active fault.
	California Seismic Hazards Mapping Act (Pub. Resources Code § 2690 and following as division 2, chapter 7.8)	This Act and the Seismic Hazards Mapping Regulations (Cal. Code Regs., tit. 14, div. 2, ch. 8, art. 10) are designed to protect the public from the effects of strong ground shaking, liquefaction, landslides, other ground failures, or other hazards caused by earthquakes. The Act requires that site-specific geotechnical investigations be conducted identifying the hazard and formulating mitigation measures prior to permitting most developments designed for human occupancy. Special Publication 117, Guidelines for Evaluating and Mitigating Seismic Hazards in California (California Geological Survey 2008), constitutes guidelines for evaluating seismic hazards other than surface fault rupture and for recommending mitigation measures as required by section 2695, subdivision (a).
CA	California Coastal Act Chapter 3 policies	Coastal Act policies applicable to geology and soils are: <ul style="list-style-type: none"> <li>• Section 30253 requires, in part, that: New development shall: (a) Minimize risks to life and property in areas of high geologic, flood, and fire hazard; and (b) Assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs.</li> <li>• Section 30243 states in part: The long-term productivity of soils and timberlands shall be protected.</li> </ul>

### 3.3.6.3 Impact Analysis

**a) Would the Project expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:**

1 ***i) Rupture of a known earthquake fault, as delineated on the most recent***  
2 ***Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for***  
3 ***the area or based on other substantial evidence of a known fault? Refer to***  
4 ***Division of Mines and Geology Special Publication 42.***

5 ***ii) Strong seismic ground shaking?***

6 ***iii) Seismic-related ground failure, including liquefaction?***

7 ***iv) Landslides?***

8 **No Impact.** The low energy geophysical survey activities conducted under the OGPP  
9 would not themselves result in changes to existing geology, nor will low energy  
10 geophysical surveys have any adverse effect on marine geology or soils (sediments).  
11 Survey data may provide additional insight into shallow geology and substrate  
12 characteristics (e.g., amount of sediment overburden; location of shallow faults). The  
13 objectives of low energy geophysical surveys conducted under the OGPP vary,  
14 depending upon the client and survey target. Most low energy geophysical surveys  
15 have been conducted to characterize geological/geophysical characteristics associated  
16 with existing or potential infrastructure. However, the surveys themselves would not  
17 expose people or structures to adverse effects related to faults or seismic activity.

18 ***b) Would the Project result in substantial soil erosion or the loss of topsoil?***

19 **No Impact.** Low energy geophysical surveys conducted under the OGPP would not  
20 result in any ground-disturbing activities within areas surveyed. Consequently, there  
21 would be no soil erosion or loss of topsoil impacts.

22 ***c) Would the Project be located on a geologic unit or soil that is unstable, or that***  
23 ***would become unstable as a result of the Project, and potentially result in on- or***  
24 ***offsite landslide, lateral spreading, subsidence, liquefaction or collapse?***

25 **No Impact.** Low energy geophysical surveys conducted under the OGPP would be  
26 restricted to marine waters of the State. Survey operations may occur above geologic  
27 units or soils that are unstable; however, there is no potential for survey operations to  
28 produce offsite landslides, lateral spreading, subsidence, liquefaction, or collapse.  
29 Survey results may provide insight into the existence of such conditions.

30 ***d) Would the Project be located on expansive soil, as defined in Table 18-1-B of***  
31 ***the Uniform Building Code (1994), creating substantial risks to life or property?***

32 **No Impact.** Low energy geophysical surveys conducted under the OGPP would be  
33 restricted to marine waters of the State. No onshore components would be affected by  
34 survey operations. Therefore, low energy geophysical surveys will not result in any  
35 structural development that could be adversely affected by soil-related hazards such as  
36 landslides, subsidence, liquefaction, or expansive soil.

1 **e) Would the Project have soils incapable of adequately supporting the use of**  
2 **septic tanks or alternative wastewater disposal systems where sewers are not**  
3 **available for the disposal of waste water?**

4 **No Impact.** Low energy geophysical surveys conducted under the OGPP in marine  
5 waters of the State will not result in any development that would increase the generation  
6 of wastewater or require the use of an individual wastewater treatment or disposal  
7 system. All wastewaters generated by survey vessel operations are either treated with  
8 U.S. Coast Guard-approved marine sanitation devices, or stored aboard the survey  
9 vessel and destined to be pumped ashore for processing through existing wastewater  
10 treatment facilities.

11 3.3.6.4 Mitigation and Residual Impact

12 **Mitigation.** The Project would not result in geology or soils impacts, and no mitigation  
13 measures are required.

14 **Residual Impacts.** The Project would have no geology or soils impacts. No mitigation is  
15 required, and no residual impacts would occur.

### 1 3.3.7 Hazards and Hazardous Materials

<b>VII. HAZARDS AND HAZARDOUS MATERIALS:</b> Would the Project:	<b>Potentially Significant Impact</b>	<b>Less Than Significant with Mitigation</b>	<b>Less Than Significant Impact</b>	<b>No Impact</b>
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the Project result in a safety hazard for people residing or working in the project area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f) For a project within the vicinity of a private airstrip, would the Project result in a safety hazard for people residing or working in the project area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
h) Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

#### 2 3.3.7.1 Environmental Setting

3 State marine waters of California are used in a variety of ways, including recreation,  
4 research, fishing, military/defense, and commercial enterprise. Of these water-based  
5 uses, vessels and vessel traffic pose the most likely potential source of hazardous  
6 materials into the marine environment from the Project. Marine traffic includes  
7 recreational vessels, commercial fishing operations, naval and U.S. Coast Guard  
8 (USCG) operations, and commercial trade. Approaches to major California ports  
9 (e.g., San Francisco, Los Angeles-Long Beach) use vessel traffic separation schemes

to promote safe vessel passage. California ports receive approximately 5,000 to 6,000 commercial vessel arrivals each year, arriving primarily from overseas or outside the State (Ashton et al. 2012).

### 3.3.7.2 Regulatory Setting

Federal and State laws and regulations pertaining to this issue and relevant to the Project are identified in **Table 3-57**. No local laws and regulations relevant to this issue are applicable to the Project.

**Table 3-57. Federal and/or State Laws, Regulations, and Policies Potentially Applicable to the Project (Hazards and Hazardous Materials)**

U.S.	Clean Water Act (CWA) (33 U.S.C. § 1251 et seq.)	The CWA is comprehensive legislation (it generally includes reference to the Federal Water Pollution Control Act of 1972, its supplementation by the CWA of 1977, and amendments in 1981, 1987, and 1993) that seeks to protect the nation's water from pollution by setting water quality standards for surface water and by limiting the discharge of effluents into waters of the U.S. (see below and in <b>Section 3.3.8, Hydrology and Water Resources</b> ).
U.S.	California Toxics Rule (40 C.F.R. § 131)	In 2000, the USEPA promulgated numeric water quality criteria for priority toxic pollutants and other water quality standards provisions to be applied to waters in the State of California. USEPA promulgated this rule based on the Administrator's determination that the numeric criteria are necessary in California to protect human health and the environment. Under CWA section 303(c)(2)(B), the USEPA requires states to adopt numeric water quality criteria for priority toxic pollutants for which the USEPA has issued criteria guidance, and the presence or discharge of which could reasonably be expected to interfere with maintaining designated uses. These Federal criteria are legally applicable in California for inland surface waters, enclosed bays, and estuaries.
U.S.	Hazardous Materials Transportation Act (HMTA) (49 U.S.C. § 5901)	The HMTA delegates authority to the U.S. Department of Transportation (DOT) to develop and implement regulations pertaining to the transport of hazardous materials and hazardous wastes by all modes of transportation. Additionally, the USEPA's Hazardous Waste Manifest System is a set of forms, reports, and procedures for tracking hazardous waste from a generator's site to the disposal site. Applicable Federal regulations are contained primarily in C.F.R. titles 40 and 49.
U.S.	National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 C.F.R. § 300)	Authorized under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 U.S.C. § 9605, as amended by the Superfund Amendments and Reauthorization Act of 1986, Pub. L. 99 through 499; and by CWA section 311(d), as amended by the Oil Pollution Act of 1990 (OPA), Pub. L. 101 through 380. The NCP outlines requirements for responding to both oil spills and releases of hazardous substances. It specifies compliance, but does not require the preparation of a written plan. It also provides a comprehensive system for reporting, spill containment, and cleanup. The USCG and USEPA co-chair the National Response Team. In accordance with 40 C.F.R. § 300.175, the USCG has responsibility for oversight of regional response for oil spills in "coastal zones," as described in 40 C.F.R. § 300.120.
U.S.	Oil Pollution Act (OPA) (33 U.S.C. § 2712)	The OPA requires owners and operators of facilities that could cause substantial harm to the environment to prepare and submit plans for responding to worst-case discharges of oil and hazardous substances. The passage of the OPA motivated California to pass a more stringent spill response and recovery regulation and the creation of the Office of Spill Prevention and Response (OSPR) within the California Department of Fish and Wildlife (CDFW) to review and regulate oil spill plans and contracts.

U.S.	Resource Conservation and Recovery Act (RCRA) (42 U.S.C. § 6901 et seq.)	The RCRA authorizes the USEPA to control hazardous waste from “cradle-to-grave,” which encompasses its generation, transportation, treatment, storage, and disposal. RCRA’s Federal Hazardous and Solid Waste Amendments from 1984 include waste minimization and phasing out land disposal of hazardous waste as well as corrective action for releases. The Department of Toxic Substances Control is the lead State agency for corrective action associated with RCRA facility investigations and remediation.
U.S.	Toxic Substances Control Act (TSCA) (15 U.S.C. § 2601–2692)	The TSCA authorizes the USEPA to require reporting, record-keeping, testing requirements, and restrictions related to chemical substances and/or mixtures. It also addresses production, importation, use, and disposal of specific chemicals, such as polychlorinated biphenyls (PCBs), asbestos-containing materials, lead-based paint, and petroleum.
U.S.	Other	<ul style="list-style-type: none"> <li>• Act of 1980 to Prevent Pollution from Ships requires ships in U.S. waters, and U.S. ships wherever located, to comply with International Convention for the Prevention of Pollution from Ships (MARPOL).</li> <li>• Convention on the International Regulations for Preventing Collisions at Sea (COLREGS). These regulations establish “rules of the road” such as rights-of-way, safe speed, actions to avoid collision, and procedures to observe in narrow channels and restricted visibility.</li> <li>• Inspection and Regulation of Vessels (46 USC Subtitle II Part B). Federal regulations for marine vessel shipping are codified in 46 C.F.R. parts 1 through 599 and are implemented by the USCG, Maritime Administration, and Federal Maritime Commission. These regulations provide that all vessels operating offshore, including those under foreign registration, are subject to requirements applicable to vessel construction, condition, and operation. All vessels (including motorboats) operating in commercial service (e.g., passengers for hire, transport of cargoes, hazardous materials, and bulk solids) on specified routes (inland, near coastal, and oceans) are subject to requirements applicable to vessel construction, condition, and operation. These regulations also allow for inspections to verify that vessels comply with applicable international conventions and U.S. laws and regulations.</li> <li>• Navigation and Navigable Waters regulations (33 C.F.R.) include requirements pertaining to prevention and control of releases of materials (including oil spills) from vessels, traffic control, and restricted areas, and general ports and waterways safety.</li> </ul>
CA	California Coastal Act Chapter 3 policies	Section 30232 states: Protection against the spillage of crude oil, gas, petroleum products, or hazardous substances shall be provided in relation to any development or transportation of such materials. Effective containment and cleanup facilities and procedures shall be provided for accidental spills that do occur.
CA	Lempert-Keene-Seastrand Oil Spill Prevention and Response Act (Gov. Code § 8574.1 et seq.; Pub. Resources Code § 8750 et seq.)	This Act and its implementing regulations seek to protect State waters from oil pollution and to plan for the effective and immediate response, removal, abatement, and cleanup in the event of an oil spill. The Act requires vessel and marine facilities to have marine oil spill contingency plans and to demonstrate financial responsibility, and requires immediate cleanup of spills, following the approved contingency plans, and fully mitigating impacts on wildlife. The Act assigns primary authority to OSPR to direct prevention, removal, abatement, response, containment, and cleanup efforts with regard to all aspects of any oil spill in the marine waters of the State. The California State Lands Commission (CSLC) assists OSPR with spill investigations and response.
CA	Other	<ul style="list-style-type: none"> <li>• California Clean Coast Act (SB 771) establishes limitations for shipboard incinerators, and the discharge of hazardous material—including oily bilgewater, graywater, and sewage—into State waters or a marine sanctuary. It also provides direction for submitting information on visiting vessels to the CSLC and reporting of discharges to the State water quality agencies.</li> <li>• California Harbors and Navigation Code specifies a State policy to “promote safety for persons and property in and connected with the use and equipment of vessels,” and includes laws concerning marine navigation that are implemented by local city and county governments. This Code also regulates discharges from</li> </ul>

		<p>vessels within territorial waters of the State of California to prevent adverse impacts on the marine environment. This Code regulates oil discharges and imposes civil penalties and liability for cleanup costs when oil is intentionally or negligently discharged to the State waters.</p> <ul style="list-style-type: none"> <li>• California Seismic Hazards Mapping Act (Pub. Resources Code § 2690) and Seismic Hazards Mapping Regulations (Cal. Code Regs., tit. 14, div. 2, ch. 8, art. 10) (See Section 3.6, Geology and Soils).</li> <li>• Porter-Cologne Water Quality Control Act (Cal. Water Code § 13000 et seq.) (See <b>Section 3.3.8, Hydrology and Water Quality</b>).</li> </ul>
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### 3.3.7.3 Impact Analysis

Environmental hazards and risks were identified that could arise from non-routine activities, including accidents or upsets associated with low energy geophysical surveys. These hazards and risks are limited to the accidental release of hydrocarbons associated with fueling and maintenance of equipment and vessels. For the purposes of this analysis, an accidental release of diesel fuel amounting to 10 to 20 oil barrels (bbl) is associated with either a fuel container breach or valve malfunction.

Although oil spills from tanker accidents receive the most publicity, most spills are not the result of vessel accidents but of oil transfer activities (i.e., routine operations that involve the movement, either intentional or unintentional, of oil cargo and/or fuel oil to and from vessels). Such activities include loading and unloading of oil cargoes, fueling, cleaning tanks, bilge pumping, and ballasting (Talley et al. 2005).

Two factors used to determine the significance of an impact provide the foundation for an environmental risk assessment – impact hazard and impact likelihood. The approach used in this analysis is similar to that employed by CSLC (2012a). Impact hazard reflects an assessment and determination of public risk. Impact hazard classifications include negligible, minor, major, severe, and disastrous. The classification levels are described in **Table 3-58**.

**Table 3-58. Impact Hazard Classification and Descriptions**

Hazard Classification	Description
Negligible	No significant risk to the public, with no minor injuries
Minor	Small level of risk to the public, with at most a few minor injuries
Major	Major level of public risk, with up to 10 severe injuries
Severe	Severe public risk, with up to 100 severe injuries or up to 10 fatalities
Disastrous	Disastrous public risk involving more than 100 severe injuries or more than 10 fatalities

Impact likelihood is rated according to its estimated potential for occurrence or frequency of occurrence. Impact likelihood classifications range from extraordinary to frequent (**Table 3-59**).

**Table 3-59. Impact Likelihood Classifications, Frequency of Occurrence, and Descriptions**

Likelihood Classification	Frequency of Occurrence	Description
Extraordinary	Less than once in 1,000,000 years	Has never occurred but is possible
Rare	Between once in 10,000 years and once in 1,000,000 years	Has occurred on a worldwide basis, but only a few times
Unlikely	Between once in 100 years and once in 10,000 years	Is not expected to occur during the Project lifetime
Likely	Between once in 1 year and once in 100 years	Would probably occur during the Project lifetime
Frequent	Greater than once a year	Would occur once a year on average

Impact severity, represented within a matrix, is a product of impact hazard and impact likelihood. In other words, impact significance is determined based on the relationship between the likelihood of an impact and impact consequence:

$$\text{Impact Consequence} \times \text{Impact Likelihood} \rightarrow \text{Impact Significance}$$

Impact significance is depicted in **Table 3-60**.

**Table 3-60. Matrix of Impact Significance**

Likelihood	Severity of Consequence				
	Negligible	Minor	Major	Severe	Disastrous
Frequent					
Likely					
Unlikely					
Rare					
Extraordinary					

Note: Significant impacts are reflected in the shaded regions of the table. Unshaded areas represent negligible or less than significant impact; shaded areas represent significant impact.

**a) Would the Project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?**

**No Impact.** Low energy geophysical surveys will last one to four days under the “typical” survey scenario, with some exceptions; as occurred during 2008-2012, most surveys are expected to be associated with infrastructure and are expected to occur primarily in Regions I and II. A total of 10 to 12 surveys representing 70 to 80 survey days may be expected although the implementation of longer duration surveys may push the total survey days to 100 or more.

Vessels employed in low energy geophysical surveys vary and are typically in the 30- to 61-meter (m) (100- to 200-foot [ft]) size range, but may be smaller depending on the type of survey being conducted and its location.



1 Hazardous materials routinely carried by a survey vessel include diesel fuel, hydraulic  
2 fluid, lubricants, and small volumes of paint, solvents, and special use chemicals  
3 (e.g., electronic contact cleaner, sealants). During transit to and from each survey  
4 location and during survey operations, hazardous materials will be packaged in  
5 appropriate containers and properly stored. Hazardous materials are routinely  
6 inventoried and are transported with applicable material safety data sheets (MSDS).  
7 Proper handling procedures for hazardous waste are typically detailed either by a  
8 vessel operator or chief scientist. Federal and State laws require all hazardous  
9 materials, including used products and their containers, to be properly disposed of  
10 through an approved onshore disposal facilities.

11 No hazards to the public are expected through the routine transport, handling/use, or  
12 disposal of survey-related hazardous materials.

13 ***b) Would the Project create a significant hazard to the public or the environment***  
14 ***through reasonably foreseeable upset and accident conditions involving the***  
15 ***release of hazardous materials into the environment?***

16 **Less than Significant Impact with Mitigation.** While low energy geophysical surveys  
17 are relatively short in duration, accidents are possible. An accident scenario has been  
18 adopted for this analysis, based on the accidental release of diesel fuel amounting to  
19 10 to 20 bbl, associated with either a fuel container breach or valve malfunction.

20 While considered unlikely, an accidental diesel fuel release into the marine environment  
21 could result in potentially significant impacts to marine biota without the incorporation of  
22 mitigation. A summary of potential impacts, by biological resource category, is provided  
23 below.

#### 24 **Potential Impacts of a Diesel Fuel Release**

25 A small diesel fuel release (e.g., 10 to 20 bbl) will undergo extensive weathering via  
26 evaporation and dispersion. After 8 hours (hr), fate modeling results indicate that  
27 35 percent of the diesel fuel will have evaporated, and 54 percent of the diesel will have  
28 dispersed, leaving only 11 percent of the diesel fuel on the surface of the water.

29 Potential and documented impacts of oil in aquatic environments have been reviewed  
30 by the National Research Council (NRC) (NRC 1985, 2003b) and others (Neff et al.  
31 1976; Neff and Anderson 1981; Engelhardt 1983, 1987; Teal and Howarth 1984;  
32 Capuzzo 1987; Geraci and St. Aubin 1990; Rice et al. 1996; Sloan 1999;  
33 Kingston 2002).

1   **Air Quality**

2   An accidental 10- to 20-bbl diesel fuel release would affect air quality in the vicinity of  
3   the survey vessel by introducing volatile organic compounds (VOCs) into the  
4   atmosphere through evaporation. Emissions would not last long due to rapid  
5   volatilization of hydrocarbons. Evaporation is greatest within the first 24 hrs. The more-  
6   toxic, light aromatic and aliphatic hydrocarbons are lost rapidly by evaporation and  
7   dissolution (NRC 1985; Payne et al. 1987). Evaporated hydrocarbons are degraded  
8   rapidly by sunlight. Biodegradation of diesel fuel on the water surface and in the water  
9   column by marine bacteria and fungi initially removes the n-alkanes and subsequently  
10   the light aromatics. Other components are biodegraded more slowly. Photo-oxidation  
11   attacks mainly the medium- and high-molecular weight polycyclic aromatic  
12   hydrocarbons (PAHs) of a diesel release. The extent and persistence of impacts would  
13   depend on meteorological and oceanographic conditions at the time. Impact  
14   significance to air quality would be dependent upon the location of the spill (e.g.,  
15   offshore a nonattainment area), spill size, and existing meteorological and  
16   oceanographic conditions.

17   **Water Quality and Sediments**

18   A 10- to 20-bbl diesel fuel release would affect marine water quality by increasing  
19   hydrocarbon concentrations due to dissolved components and small oil droplets. Severe  
20   weather and sea conditions can promote the dispersion of spilled diesel fuel into the  
21   water column. Elevated levels of n-alkanes and PAHs are typically encountered in  
22   seawater shortly after a spill (Cripps and Shears 1997). Natural weathering processes  
23   are expected to rapidly remove the diesel fuel from the water column and dilute the  
24   constituents to background levels. Diesel releases are unlikely to affect sediments  
25   unless carried into shallow water. Interaction of the less-volatile components of diesel  
26   fuel with suspended particulates (detritus) and living diatoms in the water column could  
27   provide a mechanism for hydrocarbons to reach benthic sediments. Therefore, impacts  
28   to water quality and sediments are expected to be less than significant due to  
29   weathering and dilution and the relatively small percentage of spilled diesel fuel  
30   reaching the benthos.

31   **Marine Biota**

32   *Plankton and Fish and Fishery Resources*

33   A diesel fuel release could affect phytoplankton and zooplankton because they do not  
34   have the ability to avoid contact. Planktonic communities drift with water currents and  
35   recolonize from adjacent areas. Because of these attributes and their short life cycles,  
36   plankton usually recovers rapidly relative to normal population levels following  
37   disturbances. Diesel is acutely toxic to many zooplankton, bivalve, crustacean, and  
38   ichthyoplankton species; however, several phytoplankton and zooplankton species have

1 the ability to metabolize hydrocarbons. The amount of diesel fuel spilled, and how  
2 quickly it is evaporated or dissolved and dispersed into the water column (and in what  
3 concentrations), will dictate the severity of impact to planktonic organisms.

4 While adult and juvenile fishes may actively avoid a large diesel fuel spill, planktonic fish  
5 eggs and larvae, which lack self-propulsion, would be unable to avoid contact. Most  
6 fishes inhabiting oceanic waters have planktonic eggs and larvae, which will die if  
7 exposed to certain toxic fractions of diesel fuel. However, due to the wide dispersal of  
8 early life history stages of fishes, a diesel release in the volumes expected from a  
9 survey vessel spill would not be expected to have significant impacts at the population  
10 level. Some fishes may be expected to ingest contaminated prey or contaminated  
11 sediments, but no increases in tissue hydrocarbon body burdens are expected.

12 In the event of a large diesel release, fishing activities near the survey could be  
13 temporarily disrupted. The area affected would be relatively small, and the duration  
14 would presumably be only a few days. Therefore, impacts to plankton, fish and fishery  
15 resources are expected to be less than significant.

#### 16 *Intertidal Communities*

17 A diesel fuel release nearshore will undergo weathering and dissolution, but may reach  
18 the intertidal zone depending upon proximity of the survey vessel. Select components of  
19 diesel (n-alkanes, PAHs) are readily dissolved in seawater and may bioaccumulate in  
20 intertidal invertebrates. Depending upon dissolved concentrations, intertidal  
21 invertebrates may realize limited mortality. Elevated tissue levels of these hydrocarbon  
22 components may be expected to occur several months following initial exposure  
23 (Cripps and Shears 1997). Intertidal beaches, particularly along the open coast, may be  
24 expected to be generally cleansed in a few days after oiling, but contamination may  
25 persist for weeks in areas of relatively fine sediments and limited wave action.

#### 26 *Benthic Communities*

27 A diesel fuel release in offshore surface waters would have a less than significant  
28 impact on benthic communities, with the only mechanism available for benthic impacts  
29 being associated with adsorption of nonvolatile diesel fuel components to suspended  
30 particulates followed by sinking. A release occurring nearshore is expected to evaporate  
31 very quickly, with evaporation accelerated under sunny and/or warm water conditions.  
32 Diesel fuel spilled close to shore could reach the benthos if spilled in sufficient  
33 quantities, through dissolution and dispersion in the surf zone and interaction with  
34 suspended particulates. Should a small release occur inside a port or harbor, released  
35 fuel could be contained and cleaned up quickly. Therefore, impacts to benthic  
36 communities are expected to be less than significant.

1    *Marine Mammals, Sea Turtles, and Marine Birds*

2    Diesel fuel may affect marine mammals through various pathways including: direct  
3    contact, inhalation of volatile components, ingestion (directly or indirectly through the  
4    consumption of fouled prey species), and (for mysticetes) impairment of feeding by  
5    fouling of baleen (Geraci and St. Aubin 1987, 1988, 1990; Loughlin et al. 1996).  
6    Cetacean skin is highly impermeable and is not seriously irritated by brief exposure to  
7    diesel fuel; direct contact is not likely to produce a significant impact. Whales and  
8    dolphins apparently can detect slicks on the sea surface but do not always avoid them;  
9    therefore, they may be vulnerable to inhalation of hydrocarbon vapors, particularly those  
10   components of diesel fuel that are readily evaporated. Ingestion of the lighter  
11   hydrocarbon fractions found in diesel fuel can be toxic to marine mammals. Ingested  
12   diesel fuel can remain within the gastrointestinal tract and can be absorbed into the  
13   bloodstream, and irritate and/or destroy epithelial cells in the stomach and intestines.  
14   Certain constituents of diesel fuel (e.g., aromatic hydrocarbons, PAHs) include some  
15   well-known carcinogens. These substances, however, do not show significant  
16   biomagnification in food chains and are readily metabolized by many organisms.  
17   Released diesel fuel may also foul the baleen fibers of mysticete whales, thereby  
18   impairing food-gathering efficiency or result in the ingestion of diesel fuel or diesel  
19   fuel-contaminated prey.

20   Diesel fuel in the marine environment may affect sea turtles through various pathways  
21   including: direct contact, inhalation of diesel fuel and its volatile components, ingestion  
22   of diesel fuel (directly or indirectly through the consumption of fouled prey species), and  
23   ingestion of floating tar (Geraci and St. Aubin 1987). Several aspects of sea turtle  
24   biology and behavior place them at risk, including lack of avoidance behavior,  
25   indiscriminate feeding in convergence zones, and inhalation of large volumes of air  
26   before dives (Milton et al. 2003, 2010). Studies have shown that direct exposure of  
27   sensitive tissues (e.g., eyes, nares, other mucous membranes) to diesel fuel or volatile  
28   hydrocarbons may produce irritation and inflammation. Diesel fuel can also adhere to  
29   turtle skin or shells. Turtles surfacing within or near a diesel release would be expected  
30   to inhale petroleum vapors, and ingested diesel fuel, particularly the lighter fractions,  
31   can be toxic to sea turtles. In addition, hatchling and juvenile turtles feed  
32   opportunistically at or near the surface in oceanic waters and are especially sensitive to  
33   released hydrocarbons (including diesel fuel).

34   Direct contact of marine birds with diesel fuel may result in the fouling or matting of  
35   feathers with subsequent limitation or loss of flight capability, or insulating or  
36   water-repellent capabilities; irritation or inflammation of skin or sensitive tissues, such as  
37   eyes and other mucous membranes; or toxic effects from ingested diesel fuel or the  
38   inhalation of diesel and its volatile components.

Under both the current OGPP and the OGPP Update, permit requirements include the development of an Oil Spill Contingency Plan (OSCP). OSCP's are intended for use by a vessel's crew in the event of an accidental spill, and generally list specific steps to be taken and individuals to contact, as and describe the type and location of spill response equipment onboard. To ensure these OSCP's are both required and adequately detailed to inform safe, rapid and effective spill response, Mitigation Measure (MM) **HAZ-1**, listed in **Section 3.3.7.4** below, clarifies the minimum content each OSCP shall contain. **MM HAZ-2** would further minimize the likelihood of accidental spills by limiting fueling activity to approved docking facilities. Finally, **MM HAZ-3** would require that onboard spill response equipment and supplies are available and sufficient to contain and recover a diesel fuel spill. Taken together, **MMs HAZ-1, HAZ-2, and HAZ-3** will reduce the potential for and consequences of a hazardous material release to a less than significant level for marine mammals, sea turtles, and marine birds.

#### *Sensitive Habitat Areas*

Diesel fuel spills could occur as a result of vessel collision or accident. A diesel spill is expected to dissipate rapidly and would only likely affect organisms in the immediate vicinity. Diesel fuel used for the operation of a survey vessel is light and would float on the water surface. Diesel fuel spilled at the ocean surface will disperse and weather, with volatile components evaporating, water-soluble fractions dissolving, and portions of the spill dispersing in the water column as small droplets (depending upon the degree of wave and surf activity).

The potential for impacts from a diesel fuel spill will depend greatly on the size and location of a spill, the meteorological and oceanographic conditions at the time of the accidental release, proximity to sensitive/protected resources, and the speed with which cleanup equipment could be employed. While it is expected that diesel fuel will disperse rapidly, with volatile and more toxic components quickly evaporating, portions of the spill could reach sensitive coastal habitats due to the location of low energy geophysical survey activity. As stated above for sensitive marine species groups, implementation of **MMs HAZ-1, HAZ-2, and HAZ-3** would reduce the potential for a spill to occur, and would ensure a rapid and effective response and cleanup if a spill did occur, which would avoid or minimize the potential for such a spill to affect sensitive coastal habitats such that the impact, with mitigation, is less than significant.

#### *Fishing and Shipping and Maritime Industry*

A diesel fuel release is not expected to affect socioeconomic or cultural conditions. Natural weathering processes would remove the released hydrocarbons from the water column and dilute the constituents to background levels relatively quickly. The impacts would be limited to waters near the release site and would persist from a few hours to a few days. Except for exclusion from the area, impacts on fishing from a diesel release

1 are unlikely because fishers would be warned away from a release site. Similarly,  
2 impacts on shipping from a diesel release offshore are unlikely.

3 *Recreation and Aesthetics/Tourism*

4 Impacts from a diesel fuel spill will depend on the size and location of a spill, the  
5 meteorological and oceanographic conditions at the time of the accidental release, and  
6 the speed with which cleanup equipment could be employed. The likelihood that a  
7 diesel fuel spill will reach coastal waters where recreation and tourism activities occur  
8 will depend on the survey location and the timing of the spill.

9 Fueling will occur only at approved docking facilities, with no cross vessel fueling, which  
10 will substantially reduce the potential for a survey-related release of diesel fuel or other  
11 hazardous substances. As stated above for sensitive marine species groups,  
12 implementation of **MMs HAZ-1, HAZ-2, and HAZ-3** would reduce the potential for a spill  
13 to occur, and would ensure a rapid and effective response and cleanup if a spill did  
14 occur, which would avoid or minimize the potential for such a spill to affect recreation  
15 and tourism activities such that the impact, with mitigation, is less than significant.

16 ***c) Would the Project emit hazardous emissions or handle hazardous or acutely***  
17 ***hazardous materials, substances, or waste within one-quarter mile of an existing***  
18 ***or proposed school?***

19 **No Impact.** Low energy geophysical surveys under the OGPP would occur in State  
20 waters, and as a result, would not occur within one-quarter mile of a school. Therefore,  
21 no impacts would occur.

22 ***d) Would the Project be located on a site which is included on a list of hazardous***  
23 ***materials sites compiled pursuant to Government Code Section 65962.5 and, as a***  
24 ***result, would it create a significant hazard to the public or the environment?***

25 **No Impact.** Government Code section 65962.5 applies to hazardous wastes sites,  
26 leaking underground storage tank sites and other waste disposal sites that may serve  
27 as a source of hazardous materials and runoff. None of these hazardous materials or  
28 waste sites is at or near any of the potential survey locations, and the surveys would not  
29 result in any ground-disturbance that could release latent pollutants.

30 ***e) For a project located within an airport land use plan or, where such a plan has***  
31 ***not been adopted, within two miles of a public airport or public use airport, would***  
32 ***the Project result in a safety hazard for people residing or working in the Project***  
33 ***area?***

34 **No Impact.** Low energy geophysical surveys under the OGPP would occur in State  
35 waters, and not occur within an area encompassed by an airport land use plan, or within

2 miles of a public airport or public use airport; as a result, survey operations would not present a safety hazard to personnel residing or working in such areas.

***f) For a project within the vicinity of a private airstrip, would the Project result in a safety hazard for people residing or working in the project area?***

**No Impact.** Low energy geophysical surveys under the OGPP would occur in State waters, and as a result, will have no effect on public or private airport or airstrip operations.

***g) Would the Project impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?***

**Less than Significant Impact.** Onshore mobilization and demobilization activities are the only element of low energy geophysical surveys that could physically interfere with an adopted emergency response plan or emergency evacuation plan; these activities would be limited to the movement of personnel and equipment. Mobilization and demobilization would occur over a short period of time (i.e., several days) and would not generate a substantial increase in vehicular traffic. This minor, temporary increase in traffic would not substantially interfere with emergency response or evacuation.

***h) Would the Project expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?***

**No Impact.** Low energy geophysical surveys under the OGPP would occur in offshore State waters. Onshore support activities, including mobilization and demobilization of personnel, equipment, and supplies, would occur within existing port facilities. Neither survey operations nor survey support operations would occur within or in close proximity to areas with substantial vegetation that would contribute to potential wildfire hazard impacts.

#### 3.3.7.4 Mitigation and Residual Impacts

**Mitigation.** Implementation of existing permit requirements regarding the development and adherence to an OSCP and the implementation of the MMs below would reduce the potential for an accidental release of diesel fuel other hazardous material products to a less than significant level.

**MM HAZ-1: Oil Spill Contingency Plan (OSCP).** Permittees shall develop and submit to CSLC staff for review and approval an OSCP that addresses accidental releases of petroleum and/or non-petroleum products during survey operations. Permittees' OSCP's shall include the following information for each vessel to be involved with the survey:

- 1                   • Specific steps to be taken in the event of a spill, including notification  
2                   names, phone numbers, and locations of: (1) nearby emergency  
3                   medical facilities, and (2) wildlife rescue/response organizations  
4                   (e.g., Oiled Wildlife Care Network);
- 5                   • Description of crew training and equipment testing procedures; and
- 6                   • Description, quantities and location of spill response equipment  
7                   onboard the vessel.
- 8   **MM HAZ-2:** Vessel fueling shall only occur at an approved docking facility. No cross  
9                   vessel fueling shall be allowed.
- 10 **MM HAZ-3:** Onboard spill response equipment and supplies shall be sufficient to  
11                   contain and recover the worst-case scenario spill of petroleum products as  
12                   outlined in the OSCP.
- 13 **Residual Impacts.** With implementation of **MMs HAZ-1, HAZ-2, and HAZ-3**, the Project  
14                   would have less than significant impacts related to the potential for an accidental  
15                   release of hazardous materials, and no impact related to airport operations, wildfire risk,  
16                   evacuation planning, or other hazardous material-related impacts. Therefore, no  
17                   significant residual impacts would occur.



## 1 3.3.8 Hydrology and Water Quality

VIII. HYDROLOGY AND WATER QUALITY: Would the Project:	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
a) Violate any water quality standards or waste discharge requirements?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of preexisting nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or offsite?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or offsite?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f) Otherwise substantially degrade water quality?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
h) Place within a 100-year flood hazard area structures that would impede or redirect flood flows?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
i) Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
j) Be subject to inundation by seiche, tsunami, or mudflow?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

3.3.8.1 Environmental Setting

Nearshore marine water quality off California is influenced by many factors, including local currents, the presence and characteristics of discharges from ocean outfalls, stormwater discharges, other point and nonpoint sources, and freshwater inflow. Natural hydrocarbon seeps, river runoff, municipal wastewater and minor industrial outfalls, commercial vessel traffic, port infrastructure and petroleum development activities contribute to increased levels of nutrients, trace metals, and/or synthetic organic contaminants in offshore waters. The following summary of hydrology and water quality has been derived from the environmental baseline descriptions prepared under the State Marine Life Protection Act (MLPA) Initiative and environmental impact analyses developed from these efforts.

**Coastal Watersheds and Land Use**

Land uses present along the California coast include urban and rural developments, agriculture, timberlands, and commercial and industrial development. Impacts of land use on water quality may include, but are not limited to, nutrient loading and associated eutrophication, runoff, siltation, habitat loss, and decreases in fish populations. Other land uses, such as open space, can serve as a buffer and reduce terrestrial impacts on nearby water bodies.

The South Coast and North Coast regions (generally describing Regions I and IV) each contain a total of 19 hydrologic units or major watersheds that drain into its coastal waters. Numerous watersheds are also present along the Central Coast and North Central Coast regions (generally describing Regions II and III).

**Point Sources**

Point sources include municipal wastewater treatment and disposal systems and industrial sites, including desalination plants, power plants, aquaculture/mariculture sites, and research marine laboratories.

*Region I*

Region I contains 12 municipal wastewater treatment plants, two desalination plants, 10 “once-through” cooling power plants, and multiple other permitted discharge sites that include aquaculture wastewater, marine laboratory waste seawater, refinery wastewater, and treated sanitary waste from oil platforms. Los Angeles, San Gabriel, Santa Ana, Santa Margarita, San Luis Rey, San Dieguito, San Diego, Sweetwater, Otay and Tijuana Rivers; and San Juan, San Mateo and Escondido Creeks all discharge into Region I’s coastal waters.

1    *Region II*

2    Within Region II, there are ten permitted municipal wastewater discharges, some of  
3    which discharge wastewater from other municipalities and unincorporated areas. There  
4    are also various discharges of seawater from university marine laboratories and the  
5    Monterey Bay Aquarium, brine discharge from the Gaviota desalination plant,  
6    aquaculture wastewater, as well as cooling water from the Morro Bay Power Plant, the  
7    Ormond Beach Generating Station and Mandalay Bay Generation Station. In addition to  
8    these discharges, freshwater flows from the Santa Maria, Santa Ynez, Ventura and  
9    Santa Clara Rivers; Arroyo Burro; and Mission, Carpinteria and Rincon Creeks also flow  
10   into the region's coastal waters.

11   *Region III*

12   Region III contains ten permitted wastewater discharges, some of which discharge  
13   wastewater from other municipalities and unincorporated areas. These discharges  
14   include seawater discharges from Bodega Marine Laboratory, the Monterey Bay  
15   Aquarium, other marine laboratories, the Moss Landing Power Plant and an abalone  
16   growing operation in Bodega Bay. In addition to these discharges, the Gualala, Russian,  
17   San Lorenzo, Pajaro, Salinas, Carmel and Big Sur Rivers discharge freshwater into  
18   coastal waters. The Sacramento and San Joaquin Rivers also discharge an average of  
19   19,600 million gallons per day (MGD) to San Francisco Bay, which contains  
20   contaminants with agricultural, industrial, and urban/municipal origins. This river  
21   discharge mixes with runoff from urbanized areas around San Francisco Bay and is  
22   carried tidally out the Golden Gate.

23   *Region IV*

24   Region IV contains several municipal wastewater treatment plants, one power plant,  
25   and three other permitted pollution discharge sites. Effluents from these facilities include  
26   treated sanitary wastewater, marine laboratory waste seawater, sawmill wastewater,  
27   and fish offal from a fish cleaning station. Additional wastewater and power plant  
28   discharge sites are located inland, along rivers that drain into coastal waters of Region  
29   IV. Major wastewater dischargers in the North Coast region include City of Crescent,  
30   City of Arcata, City of Eureka, Shelter Cove, Fort Bragg, and Mendocino City. Cooling  
31   water is discharged from the Humboldt Bay power plant. Other industrial dischargers  
32   include the marine laboratory at California State University, Humboldt; industrial  
33   wastewater from the Sierra Pacific Industries Arcata sawmill; and fish offal from the  
34   Humboldt Bay Recreation District fish cleaning station.

## **Stormwater Discharge**

Stormwater discharges occur throughout California. Stormwater outfalls may contain a variety of pollutants that can affect local water quality, including bacteria, trash, petroleum hydrocarbons, and heavy metals.

## **Nonpoint Sources**

Nonpoint source pollution represents a combination of flows from diverse and diffuse sources. Rainfall runoff can acquire pollutants, including sediment, pesticides, fertilizers, trash, salt, oils, heavy metals, grease, bacteria, and nutrients. Major categories of nonpoint pollution sources include agriculture, forestry operations, urban development, hydrologic modification, and marina and recreational activities. Major elements for each of these categories include:

- Agriculture: nursery plants, milk and milk products, livestock, fruits, nuts, and vegetables. Primary nonpoint source pollutants: nutrients, animal waste, sediments, and pesticides. Water quality factors: eutrophication, turbidity, temperature increases, toxicity, and decreased oxygen.
- Forestry operations, predominantly in Regions III and IV: commercial logging, timberland use conversions. Primary nonpoint source pollutants: sediment from erosion. Water quality factors: increased sediment load, increasing water temperatures, decreased oxygen, and increased organic and inorganic chemicals.
- Urban development: buildings, roads, parking lots, and other paved surfaces (residential, industrial, and commercial development). Primary nonpoint source pollutants: runoff and associated constituents, including sediment, nutrients, plastics, viruses, pathogenic bacteria from sewer overflows and failing domestic wastewater systems, heavy metals from leaking automobiles and metal pipes, pesticides, and petroleum hydrocarbons from leaking automobiles, minor spills, and roads. Water quality factors: accelerated runoff, stream channel erosion, flooding, water contamination, sedimentation, and degradation of aquatic habitat.
- Hydrologic modification: designed to control water flow, allowing for settling of suspended solids and filtration of water-borne contaminants; modifications include alteration of stream and river channels, installation of dams and water impoundments, and dredging. Primary nonpoint source pollutants: increased water temperature, and sediment load. Water quality factors: increased sediment load, and increasing water temperatures.
- Ports, harbors, marinas, and associated vessels: protective shorelines, channel entrances, and berthing facilities for commercial and recreational vessels. Primary nonpoint source pollutants: antifouling paint, sewage, fuel spills,

wastewater, and trash. Water quality factors: adverse effects on aquatic species (impediments to growth, reproduction, spawning), eutrophication, decreased oxygen, and pollutant contamination.

The State Water Resources Control Board (SWRCB), in concert with the State's nine Regional Water Quality Control Boards (RWQCB or Regional Board), is responsible for the assessment of water quality monitoring data for California's surface waters, including both fresh and marine waters. The SWRCB and RWQCBs review water quality data and produce a summary report every two years to determine if pollutants are occurring at levels that exceed protective water quality standards, as required under section 303(d) and 305(b) of the Federal Clean Water Act (CWA). Generally, those water bodies and pollutants that exceed protective water quality standards are placed on the State's 303(d) List. This determination is governed in California by the SWRCB's 303(d) Listing Policy. Ultimately, the U.S. Environmental Protection Agency (USEPA) must approve the 303(d) List before it is considered final. Placement of a water body and its offending pollutant on the 303(d) List initiates the development of a Total Maximum Daily Load (TMDL) plan. TMDLs may establish "daily load" limits of the pollutant, or in some cases require other regulatory measures, with the ultimate goal of reducing the amount of the pollutant entering the water body to meet water quality standards. TMDLs are normally developed by RWQCBs then approved by the SWRCB and State Office of Administrative Law before being submitted for USEPA approval.

The current 303(d) List of California's impaired water bodies contains 3,489 entries in nine regions. Of this total, the vast majority are rivers and streams, or lakes and reservoirs. Only five management regions are applicable to the OGPP study area – North Coast Region (Regions III and IV), San Francisco Bay Region (Region III), Central Coast Region (Regions II and III), Los Angeles Region (Regions I and II), Santa Ana Region (Region I), and San Diego Region (Region I). Descriptions of the coastal regions, as represented by the five coastal Regional Boards and summarized in SWRCB (2012, 2013), and descriptions of representative impaired water bodies for each of these regions are provided in **Table 3-61**.

In general, the water quality of Region's III and IV, and the northern portion of Region II, is good. A limited number of large urban centers and various agricultural watersheds in these areas suggest that water quality degradation from treated wastewater discharges is limited, with agricultural watersheds contributing pesticides and nutrients to nearshore waters. Water quality along these portions of the California coast reflects the mix of land uses and discharges in the region. Data on coastal water quality in the region typically come from studies or monitoring programs whose efforts are concentrated in the more urbanized areas or that target suspected problem areas. Consequently, there are relatively few data for water quality along the more pristine sections of coastline where water quality is expected to be high.

1 **Table 3-61. Description of California's Coastal Regions and Representative Listing of Impaired Water Bodies**  
 2 **(adapted from SWRCB 2012, 2013)**

Region and Impaired Water Body Characteristics	
<b>North Coast Region (Regional Board 1)</b>	
<p><u>Regional Overview:</u> The North Coast Region comprises all regional basins, including Lower Klamath Lake and Lost River Basins, draining into the Pacific Ocean from the California-Oregon state line southerly to the southerly boundary of the watershed of the Estero de San Antonio and Stemple Creek in Marin and Sonoma Counties. Two natural drainage basins, the Klamath River Basin and the North Coastal Basin, divide the Region. The Region covers all of Del Norte, Humboldt, Trinity, and Mendocino Counties, major portions of Siskiyou and Sonoma Counties, and small portions of Glenn, Lake, and Marin Counties. It encompasses a total area of approximately 19,390 square miles (mi<sup>2</sup>), including 340 miles (mi) of coastline and remote wilderness areas, as well as urbanized and agricultural areas. Beginning at the Smith River in northern Del Norte County and heading south to the Estero de San Antonio in northern Marin County, the Region encompasses a large number of major river estuaries, including the Klamath River, Redwood Creek, Little River, Mad River, Eel River, Noyo River, Navarro River, Elk Creek, Gualala River, Russian River, and Salmon Creek. Northern Humboldt County coastal lagoons include Big Lagoon and Stone Lagoon. The two largest enclosed bays in the Region are Humboldt Bay and Arcata Bay in Humboldt County. Another enclosed bay, Bodega Bay, is located in Sonoma County near the Region's southern border.</p>	
<p><u>Eel River:</u> Fourteen impaired bodies of water are associated with the Eel River Hydrologic Unit, including the Middle Fork, South Fork, and North Fork Hydrologic Areas and associated tributaries. The Eel River watershed provides habitat for fish and wildlife, including threatened or endangered salmonids. People use the watershed for municipal, agricultural, and recreational purposes. The Eel River has a TMDL listing for temperature and sedimentation/siltation. The temperature impairment stems from channelization, removal of riparian vegetation, habitat modification, and unspecified nonpoint sources. A number of factors contribute to the sedimentation and siltation impairment, including construction, land development, range grazing of riparian and upland habitats, silviculture, logging road construction and maintenance, and unspecified nonpoint sources.</p>	
<p><u>Redwood Creek:</u> Listed as a total maximum daily load (TMDL) site for temperature and sedimentation/siltation. Timber harvesting, road building, grazing, and the construction of levees in the lower 3.5 mi of the creek are contributing factors to the temperature impairment. Redwood Creek supports an anadromous fishery, and the estuary is important for juvenile salmonid rearing. Declines in salmonid populations in Redwood Creek have been attributed to the elevated water temperatures. A number of factors contribute to the sedimentation/siltation impairment, including land development, range grazing of riparian habitats, silviculture, logging road construction and maintenance, and the removal of riparian vegetation.</p>	
<p><u>Klamath River:</u> Fourteen impaired bodies of water are associated with the Klamath River Hydrologic Unit, including portions of the Lower and Middle Hydrologic Areas. The Klamath River is the second largest river by volume in California and is listed as a TMDL site primarily for nutrients, organic enrichment, and temperature. The nutrients and organic enrichment impairments are attributed to agricultural, municipal and industrial land uses, and a number of other point and nonpoint sources. The temperature impairment stems from habitat modification, including upstream impoundment and the removal of riparian vegetation, and unspecified nonpoint sources.</p>	

### Region and Impaired Water Body Characteristics

#### ***San Francisco Bay Region (Regional Board 2)***

Regional Overview: The San Francisco Bay Region comprises San Francisco Bay, Suisun Bay, from Sacramento River and San Joaquin River westerly from a line which passes between Collinsville and Montezuma Island and follows thence the boundary common to Sacramento and Solano Counties and that common to Sacramento and Contra Costa Counties to the westerly boundary of the watershed of Markley Canyon in Contra Costa County, all basins draining into the bays and rivers westerly from this line, and all basins draining into the Pacific Ocean between the southerly boundary of the North Coast region and the southerly boundary of the watershed of Pescadero Creek in San Mateo and Santa Cruz Counties. The Region comprises most of the San Francisco Estuary to the mouth of the Sacramento-San Joaquin Delta. The San Francisco Estuary conveys the waters of the Sacramento and San Joaquin Rivers to the Pacific Ocean. The Bay is located on the north Central Coast of California and functions as the only drainage outlet for waters of the Central Valley. It also marks a natural topographic separation between the northern and southern coastal mountain ranges. The Region's waterways, wetlands, and bays form the centerpiece of the fourth largest metropolitan area in the U.S., including all or major portions of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma Counties. The San Francisco Bay Regional Water Board has jurisdiction over the part of the San Francisco Estuary that includes all of the San Francisco Bay segments extending east to the Delta (Winter Island near Pittsburg). The San Francisco Estuary sustains a highly dynamic and complex environment. The Sacramento and San Joaquin Rivers enter the Bay system through the Delta at the eastern end of Suisun Bay and contribute almost all of the fresh water inflow into the Bay. Many smaller rivers and streams also convey fresh water to the Bay system. The rate and timing of these fresh water flows are among the most important factors influencing physical, chemical, and biological conditions in the Estuary. Flows in the Region are highly seasonal, with more than 90 percent of the annual runoff occurring during the winter rainy season between November and April.

The vast majority of Regional Board 2 impaired water bodies are associated with major rivers in the Delta, as well as lower and upper bay locations, all of which are located outside OGPP Project area. Impaired waters of the San Francisco Bay may exit the bay through the Golden Gate, affecting adjacent waters of the Pacific Ocean. Pacific Ocean sites identified in the 2008–2010 303(d) List include Baker Beach, Bolinas Beach, Fitzgerald Marine Reserve, Muir Beach, Pacifica State/Linda Mar Beach, Pillar Point, Pillar Point Beach, Rockaway Beach, Venice Beach, and Tomales Bay.

#### ***Central Coast Region (Regional Board 3)***

Regional Overview: The Central Coast Region comprises all basins draining into the Pacific Ocean from the southerly boundary of the watershed of Pescadero Creek in San Mateo and Santa Cruz Counties to the southeasterly boundary, located in the westerly part of Ventura County, of the watershed of Rincon Creek. The Region extends over a 300 mi (483 kilometers [km]) long by 40 mi (64 km) wide section of the State's Central Coast. Its geographic area encompasses all of Santa Cruz, San Benito, Monterey, San Luis Obispo, and Santa Barbara Counties as well as the southern one-third of Santa Clara County, and small portions of San Mateo, Kern, and Ventura Counties. Included in the Region are urban areas such as the Monterey Peninsula and the Santa Barbara coastal plain; prime agricultural lands such as the Salinas, Santa Maria, and Lompoc Valleys; National Forest lands; extremely wet areas such as the Santa Cruz Mountains; and arid areas such as the Carrizo Plain. Water bodies in the Central Coast Region are varied. Enclosed bays and harbors in the region include Morro Bay, Elkhorn Slough, Tembladero Slough, Santa Cruz Harbor, Moss Landing Harbor, Monterey Harbor, Port San Luis, and Santa Barbara Harbor. Several small estuaries also characterize the region, including the Santa Maria River Estuary, San Lorenzo River Estuary, Big Sur River Estuary, and many others. Major rivers, streams, and lakes include San Lorenzo River, San Benito River, Pajaro River, Salinas River, Santa Maria River, Cuyama River, Estrella River and Santa Ynez River, San Antonio Reservoir, Nacimiento Reservoir, Twitchel Reservoir, and Cuchuma Reservoir.

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As of 2006, only two areas along the central California coast had been designated as impaired: 12 mi along the south coastline of Monterey Bay because of metals and pesticides; and 3.3 mi of coastline at Jalama Beach, approximately 5 mi north of Point Conception, because of fecal coliform bacteria. With issuance of the 2008–2010 303(d) List, additional sites were included: Morro Bay, Moss Landing Harbor, Arroyo Burro Beach, Avila Beach, Capitola Beach, Carpinteria State Beach, Cayucos, East Beach/Mission and Sycamore Creek, Goleta Beach, Hammonds Beach, Haskell's Beach, Hope Ranch Beach, Leadbetter Beach, Ocean Beach, Olde Port Beach, Pismo State Beach, Point Rincon, Refugio Beach, and Stillwater Cove Beach.

**Los Angeles Region (Regional Board 4)**

Regional Overview: The Los Angeles Region comprises all basins draining into the Pacific Ocean between the southeasterly boundary, located in the westerly part of Ventura County, of the watershed of Rincon Creek and a line which coincides with the southeasterly boundary of Los Angeles County from the ocean to San Antonio Peak and follows thence the divide between San Gabriel River and Lytle Creek drainages to the divide between Sheep Creek and San Gabriel River drainages. The Region encompasses all coastal drainages flowing into the Pacific Ocean between Rincon Point (on the coast of western Ventura County) and the eastern Los Angeles County line, as well as the drainages of five coastal islands (Anacapa, San Nicolas, Santa Barbara, Santa Catalina, and San Clemente). In addition, the Region includes all coastal waters within 3 mi of the continental and island coastlines. Two large deep-water harbors (Los Angeles and Long Beach Harbors) and one smaller deep-water harbor (Port Hueneme) are contained in the Region. There are small craft marinas within the harbors, as well as tank farms, naval facilities, fish processing plants, boatyards, and container terminals. Several small-craft marinas also exist along the coast (Marina del Ray, King Harbor, Ventura Harbor); these contain boatyards, other small businesses, and dense residential development. Large, primarily concrete-lined rivers (Los Angeles River, San Gabriel River) lead to unlined tidal prisms that are influenced by marine waters. Salinity may be greatly reduced following rains since these rivers drain large urban areas composed of mostly impermeable surfaces. Some of these tidal prisms receive a considerable amount of freshwater throughout the year from publicly-owned treatment works that discharge tertiary-treated effluent and industrial effluent. Santa Monica Bay, which includes the Palos Verdes Shelf, dominates a large portion of the open coastal water bodies in the Region. The Region's coastal water bodies also include the areas along the Ventura County shoreline and the waters surrounding the five offshore islands.

Most of the impaired water bodies of the Los Angeles region are rivers and streams, or lakes and reservoirs. Applicable coastal and bay shoreline water bodies within the OGPP Project area include Abalone Cove Beach, Avalon Beach, Big Rock Beach, Bluff Cove Beach, Cabrillo Beach (outer), Carbon Beach, Castle Rock Beach, Dockweiler Beach, Escondido Beach, Flat Rock Point Beach Area, Hermosa Beach, Inspiration Point Beach, La Costa Beach, Las Flores Beach, Las Tunas Beach, Leo Carillo Beach (south of County Line), Long Beach City Beach, Long Point Beach, Malaga Cove Beach, Malibu Beach, Malibu Lagoon Beach (Surfrider), McGrath Beach, Nicholas Canyon Beach, Ormond Beach, Palo Verde Shoreline Park Beach, Paradise Cove Beach, Peninsula Beach, Point Dume Beach, Point Vicente Beach, Portuguese Bend Beach, Puerco Beach, Redondo Beach, Resort Point Beach, Rincon Beach, Robert H. Meyer Memorial Beach, Royal Palms Beach, San Buenaventura Beach, Santa Monica Bay Offshore/Nearshore, Santa Monica Beach, Sea Level Beach, Surfers Point at Seaside, Topanga Beach, Torrance Beach, Trancas Beach (Broad Beach), Venice Beach, Ventura Marina Jetties, Whites Point Beach, Will Rogers Beach, and Zuma Beach.

**Santa Ana Region (Regional Board 8)**

Regional Overview: The Santa Ana Region comprises all basins draining into the Pacific Ocean between the southeasterly boundary of the Los Angeles region and a line which follows the drainage divide between Muddy and Moro Canyons from the ocean to the summit of San Joaquin Hills; thence along the divide between lands draining into Newport Bay and into Laguna Canyon to Niguel Road; thence along Niguel Road and Los Aliso Avenue to the divide between Newport Bay and Aliso Creek drainages; thence along that divide and the southeasterly boundary of the Santa Ana River drainage to the divide between Baldwin Lake and Mojave Desert drainages; thence along that divide to the divide between Pacific



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Ocean and Mojave Desert drainages. The Santa Ana Region is the smallest of the nine Regions in the State (2,800 mi<sup>2</sup>) and is located in Southern California, roughly between Los Angeles and San Diego. Although small geographically, the Region's is one of the most densely populated areas in California. The climate of the Santa Ana Region is classified as Mediterranean: generally dry in the summer with mild, wet winters. The average annual rainfall in the Region is about fifteen inches, most of it occurring between November and March. The enclosed bays in the Region include Newport Bay, Bolsa Bay (including Bolsa Chica Marsh), and Anaheim Bay. Principal rivers include Santa Ana, San Jacinto and San Diego. Lakes and reservoirs include Big Bear Lake, Hemet Lake, Lake Mathews, Canyon Lake, Lake Elsinore, Santiago Reservoir, and Perris Reservoir.

Most of the impaired water bodies of the Santa Ana region are rivers and streams, or lakes and reservoirs. Applicable coastal and bay shoreline water bodies within the OGPP Project area include Balboa Beach, Bolsa Chica State Beach, Huntington Beach State Park, and Seal Beach.

***San Diego Region (Regional Board 9)***

Regional Overview: The San Diego Region comprises all basins draining into the Pacific Ocean between the southern boundary of the Santa Ana Region and the California-Mexico boundary. The San Diego Region is located along the coast of the Pacific Ocean from the Mexican border to north of Laguna Beach. The Region is rectangular in shape and extends approximately 80 mi along the coastline and 40 mi east to the crest of the mountains. The Region includes portions of San Diego, Orange, and Riverside Counties. The Region's population is concentrated along the coastal strip. Two harbors, Mission Bay and San Diego Bay, support major recreational and commercial boat traffic. Coastal lagoons are found along the San Diego County coast at the mouths of creeks and rivers.

Most of the impaired water bodies of the San Diego region are rivers and streams, or lakes and reservoirs. Applicable coastal and bay shoreline water bodies within the OGPP Project area include Mission Bay shoreline (multiple locations), Aliso Beach, Aliso Creek, Moonlight State Beach, Silver Strand, Imperial Beach Pier, Main Beach, Loma Alta creek mouth, North Beach Creek, North Doheny State Park, San Juan Creek, South Doheny State Park, Los Penasquitos River mouth, Camp Surf Jetty, Point Loma, Poche Beach, San Clemente City Beach, South Capistrano County Beach, San Diego River outlet/Dog Beach, San Dieguito Lagoon Mouth/San Dieguito River Beach, Cardiff State Beach/San Elijo Lagoon, San Luis Rey River mouth, San Mateo Creek outlet, La Jolla Shores Beach, Children's Pool (Scripps), La Jolla Cove, Pacific Beach, Ravina, La Jolla Shores Beach, and Tijuana River mouth/north (multiple locations).

While the water quality of Region III and the northern portion of Region II is generally good, freshwater runoff in these regions has been implicated in infectious diseases affecting southern sea otters (*Enhydra lutris nereis*). Numerous fatal brain infections by the protozoan parasite *Toxoplasma gondii* have been recognized in southern sea otters from California (Thomas and Cole 1996; Miller et al. 2004). Researchers found that otters sampled near areas of maximal freshwater runoff were approximately three times more likely to be seropositive to *T. gondii* than otters sampled in areas of low flow. No association was found between seropositivity to *T. gondii* and human population density or exposure to sewage (ICF Jones & Stokes 2009a,b).

In Region I and the southern portion of Region II, water quality has improved in the last two decades because of enacted discharge regulations. Water quality in these regions is affected by a wide range of both land-based and water-based sources. Land use landward of these regions varies considerably, from highly urbanized in Los Angeles County to more agricultural and open space in Ventura County, although there is an increasing trend toward urban residential and commercial land use.

Los Angeles County continues to receive the poorest water quality reports for the State, with the Los Angeles River outlet having very poor water quality in 2008 (Heal the Bay 2008). In addition, a majority of the highest water pollution in the State is located landward of Region I, with many nonpoint sources in Los Angeles County.

Approximately 71 National Pollutant Discharge Elimination System (NPDES) permits have been issued along the California coast. SWRCB (2012, 2013) identifies 29 discharges that release more than 10 MGD, with an additional 36 dischargers that release less than 10 MGD. Significant discharges by flow and coastal region are summarized in **Table 3-62**. The SWRCB notes that most of the wastewater discharges of less than 10 MGD discharge occur within 1 nautical mile (nm) from shore, and many of those discharges are actually discharging at the shoreline.

**Table 3-62. Summary of Significant Wastewater Discharges Along the California Coast (From: SWRCB 2012, 2013)**

RWQCB Region	Number of Discharges >100 MGD	Number of Discharges >10 and <100 MGD	Number of Discharges <10 MGD
North Coast	0	0	9
San Francisco	0	1	2
Central Coast	3	7	17
Los Angeles	7	1	6
Santa Ana	2	0	2
San Diego	3	5	1

1 3.3.8.2 Regulatory Setting

2 Federal and State laws and regulations pertaining to this issue and relevant to the  
3 Project are identified in **Table 3-63**. No local laws and regulations relevant to this issue  
4 are applicable to the Project.

5 **Table 3-63. Federal and/or State Laws, Regulations, and Policies Potentially**  
6 **Applicable to the Project (Hydrology and Water Quality)**

U.S.	Clean Water Act (CWA) (33 U.S.C. § 1251 et seq.)	<p>The CWA is comprehensive legislation (it generally includes reference to the Federal Water Pollution Control Act of 1972, its supplementation by the CWA of 1977, and amendments in 1981, 1987, and 1993) that seeks to protect the nation's water from pollution by setting water quality standards for surface water and by limiting the discharge of effluents into waters of the U.S. These water quality standards are promulgated by the USEPA and enforced in California by the SWRCB and nine RWQCBs. CWA sections include:</p> <ul style="list-style-type: none"> <li>• Section 401 (33 U.S.C. § 1341) requires certification from the State or interstate water control agencies that a proposed water resources project is in compliance with established effluent limitations and water quality standards. ACOE projects, as well as applicants for Federal permits or licenses are required to obtain this certification.</li> <li>• Section 402 (33 U.S.C. § 1342) establishes conditions and permitting for discharges of pollutants under the NPDES.</li> <li>• Section 403 (33 U.S.C. § 1343) addresses criteria and permits for discharges into the territorial seas, the contiguous zone, and the ocean.</li> <li>• Section 404 (33 U.S.C. § 1344) authorizes a separate permit program for disposal of dredged or fill material in U.S. waters.</li> </ul>
U.S.	Oil Pollution Act (OPA) (33 U.S.C. § 2712)	The OPA requires owners and operators of facilities that could cause substantial harm to the environment to prepare and submit plans for responding to worst-case discharges of oil and hazardous substances. The passage of the OPA motivated California to pass a more stringent spill response and recovery regulation and the creation of the Office of Spill Prevention and Response (OSPR) within the California Department of Fish and Wildlife to review and regulate oil spill plans and contracts.
U.S.	Rivers and Harbors Act (33 U.S.C. § 401)	This Act governs specified activities (e.g., construction of structures and discharge of fill) in "navigable waters" of the U.S. (waters subject to the ebb and flow of the tide or that are presently used, have been used in the past, or may be susceptible for use to transport interstate or foreign commerce). Under section 10, excavation or fill within navigable waters requires approval from the ACOE, and the building of any wharf, pier, jetty, or other structure is prohibited without Congressional approval.
CA	Porter-Cologne Water Quality Control Act (Cal. Water Code § 13000 et seq.) (Porter-Cologne)	Porter-Cologne is the principal law governing water quality in California. The Act established the SWRCB and nine RWQCBs who have primary responsibility for protecting State water quality and the beneficial uses of State waters. Porter-Cologne also implements many provisions of the Federal CWA, such as the NPDES permitting program. Pursuant to the CWA § 401, applicants for a Federal license or permit for activities that may result in any discharge to waters of the U. S. must seek a Water Quality Certification (Certification) from the State in which the discharge originates. Such Certification is based on a finding that the discharge will meet water quality standards and other appropriate requirements of State law. In California, RWQCBs issue or deny certification for discharges within their jurisdiction. The SWRCB has this responsibility where projects or activities affect waters in more than one RWQCB's jurisdiction. If the SWRCB or a RWQCB imposes a condition on its Certification, those conditions must be included in the Federal permit or license.

		<p>Statewide Water Quality Control Plans include: individual RWQCB Basin Plans; the California Ocean Plan; the San Francisco Bay/Sacramento-San Joaquin Delta Estuary Water Quality Control Plan (Bay-Delta Plan); the Water Quality Control Plan for Enclosed Bays and Estuaries of California; and the Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California (Thermal Plan). These Plans contain enforceable standards for the various waters they address. For example:</p> <ul style="list-style-type: none"> <li>• <u>Basin Plan</u>. Porter-Cologne (§ 13240) requires each RWQCB to formulate and adopt a Basin Plan for all areas within the Region. Each RWQCB establishes water quality objectives to ensure the reasonable protection of beneficial uses and a program of implementation for achieving water quality objectives within the basin plans. 40 C.F.R. § 131 requires each State to adopt water quality standards by designating water uses to be protected and adopting water quality criteria that protect the designated uses. In California, the beneficial uses and water quality objectives are the State's water quality standards.</li> <li>• The <u>California Ocean Plan</u> establishes water quality objectives for California's ocean waters and provides the basis for regulation of wastes discharged into the State's ocean and coastal waters. For example, the Ocean Plan incorporates the State water quality standards that apply to all NPDES permits for discharges to ocean waters.</li> </ul>
CA	California Coastal Act Chapter 3 policies	<p>Coastal Act policies applicable to water quality are:</p> <ul style="list-style-type: none"> <li>• Section 30231 states The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored through, among other means, minimizing adverse effects of waste water discharges and entrainment, controlling runoff, preventing depletion of ground water supplies and substantial interference with surface water flow, encouraging waste water reclamation, maintaining natural vegetation buffer areas that protect riparian habitats, and minimizing alteration of natural streams.</li> <li>• See also: Section 30233 (Diking, filling or dredging; continued movement of sediment and nutrients); and Section 30235 (Construction altering natural shoreline), which states in part ...Existing marine structures causing water stagnation contributing to pollution problems and fish kills should be phased out or upgraded where feasible.</li> </ul>

### 1 3.3.8.3 Impact Analysis

#### 2 **a) Would the Project violate any water quality standards or waste discharge** 3 **requirements?**

4 **Less than Significant Impact.** Under the “typical” survey scenario, the majority of low  
5 energy geophysical surveys are expected to last one to four days; most surveys will  
6 continue to be associated with infrastructure and are expected to occur primarily in  
7 Regions I and II. A total of 10 to 12 surveys representing 70 to 80 survey days may be  
8 expected although the implementation of longer duration surveys may push the total  
9 survey days to 100 or more.

10 Vessels employed in low energy geophysical surveys vary and are typically in the 30- to  
11 61-meter (m) (100- to 200-foot [ft]) size range, but may be smaller depending on the  
12 type of survey being conducted and its location. During transit to and from each survey

1 location and during survey operations, the vessel will generate various discharges that  
2 may affect water quality. Vessel discharges may include sanitary and domestic wastes,  
3 cooling water, brine/reverse osmosis (RO) water, and organic wastes.

4 Sanitary wastes (e.g., black water or sewage) consist of human body wastes from  
5 toilets and urinals. Sanitary waste will be either treated on board the vessel using an  
6 approved marine sanitation device (MSD) or stored aboard to be pumped later onshore,  
7 depending upon vessel size and specifications. The U.S. Coast Guard (USCG)  
8 classifies and approves MSDs as follows:

- 9 • Type I MSD: Flow-through treatment devices that commonly use maceration and  
10 disinfection for the treatment of sewage for vessels equal to or less than 65 ft in  
11 length; must produce an effluent with no visible floating solids and a fecal  
12 coliform bacterial count not greater than 1,000 per 100 milliliters (mL).
- 13 • Type II MSD: Flow-through treatment devices that may employ biological  
14 treatment and disinfection; some Type II MSDs may use maceration and  
15 disinfection; may be installed on vessels of any length; must produce an effluent  
16 with a fecal coliform bacterial count not greater than 200 per 100 mL and no  
17 more than 150 milligram (mg) of total suspended solids per liter.
- 18 • Type III MSD: Typically a holding tank in which sewage is stored until it can be  
19 disposed of shoreside or at sea (beyond 3 nm from shore); may be installed on  
20 vessels of any length; no performance standard, but pursuant to USCG  
21 regulations, a Type III MSD must “be designed to prevent the overboard  
22 discharge of treated or untreated sewage or any waste derived from sewage”  
23 (33 C.F.R. § 159.53(c)).

24 Boats 65 ft or less in length may be equipped with a Type I, II, or III device. Vessels  
25 longer than 65 ft must have a Type II or III MSD installed.

26 Domestic waste, or “gray water,” includes water from showers, sinks, laundries, galleys,  
27 safety showers, and eye wash stations. Aside from screening to remove solids,  
28 domestic waste does not require treatment before discharge.

29 Cooling water is used to maintain proper engine temperatures for main engines and, as  
30 applicable, generators. Used on a “once through” basis, seawater effluent used in  
31 cooling is not treated. Cooling water effluent is discharged from the vessel at a slightly  
32 higher temperature than ambient seawater. Cooling water volumes are sufficient to  
33 produce only a very localized increase in water temperature around the exit port(s).

34 The discharge of wastewater and cooling water will not result in water quality  
35 degradation or an increase in contaminants that exceeds the California Ocean Plan.  
36 Since these materials are nontoxic, no significant adverse effects on marine organisms  
37 or water quality would occur beyond the immediate area of physical disruption.

1 Therefore, the Project would not result in short- or long-term violations of a water quality  
2 standards or waste discharge requirements, and impacts would be less than significant.

3 ***b) Would the Project substantially deplete groundwater supplies or interfere***  
4 ***substantially with groundwater recharge such that there would be a net deficit in***  
5 ***aquifer volume or a lowering of the local groundwater table level (e.g., the***  
6 ***production rate of preexisting nearby wells would drop to a level which would not***  
7 ***support existing land uses or planned uses for which permits have been***  
8 ***granted)?***

9 **No Impact.** Offshore low energy geophysical surveys will not physically affect  
10 underlying aquifers. Survey vessels will either load water from existing port facilities or  
11 generate potable water using vessel-equipped RO units. Therefore, groundwater  
12 supplies will not be substantially depleted and low energy geophysical surveys will have  
13 no impact related to existing groundwater levels or recharge.

14 ***c) Would the Project substantially alter the existing drainage pattern of the site or***  
15 ***area, including through the alteration of the course of a stream or river, in a***  
16 ***manner which would result in substantial erosion or siltation on- or offsite?***

17 **No Impact.** Low energy geophysical surveys will occur within State marine waters and  
18 will have no effect on existing drainage patterns or river or stream courses, and will not  
19 affect erosion or siltation.

20 ***d) Would the Project substantially alter the existing drainage pattern of the site or***  
21 ***area, including through the alteration of the course of a stream or river, or***  
22 ***substantially increase the rate or amount of surface runoff in a manner that would***  
23 ***result in flooding on- or offsite?***

24 **No Impact.** Low energy geophysical surveys will occur within State marine waters and  
25 will have no effect on existing drainage patterns or river or stream courses. Surveys will  
26 not affect the rate or amount of surface runoff in any manner and will not influence  
27 flooding.

28 ***e) Would the Project create or contribute runoff water that would exceed the***  
29 ***capacity of existing or planned stormwater drainage systems or provide***  
30 ***substantial additional sources of polluted runoff?***

31 **No Impact.** Low energy geophysical surveys will not create or contribute runoff water  
32 and will not adversely affect the quality of runoff water. Therefore, low energy  
33 geophysical surveys will have no impact on land-based runoff.

34 ***f) Would the Project otherwise substantially degrade water quality?***

35 **Less than Significant Impact with Mitigation.** Minor and localized impacts to ocean  
36 water quality may occur during low energy geophysical survey operations, particularly

as they relate to routine vessel discharges (e.g., treated sanitary wastes, cooling water). Impacts to water quality may also occur as a result of the accidental release of petroleum products or other similar substances (e.g., diesel fuel spill, hydraulic fluid spill).

Survey vessels will comply with current USCG and RWQCB regulations pertinent to routine discharges. Allowable discharges within State waters will comply with applicable coliform or coliform/suspended solids limits.

Geophysical operators conducting surveys under the current OGPP and OGPP Update are required to prepare an Oil Spill Contingency Plan (OSCP). Water quality impacts from an accidental release can be reduced to a less than significant level through adherence to the OSCP, coupled with proper training and timely spill response. An OSCP describes spill response equipment and supplies maintained on the vessel, and outlines response actions that will be taken in the event of an accidental spill. Development of a survey-specific OSCP and adherence to equipment requirements and response protocols will guarantee some level of spill preparation and response and will reduce accident-related impacts; furthermore, implementation of mitigation measures (MMs) **HAZ-1**, **HAZ-2**, and **HAZ-3** will minimize the potential for a spill during fueling, and will ensure that sufficient spill response equipment is on board to adequately implement the OSCP. With these MMs, the Project's impact on water quality degradation would be reduced to a less than significant level.

***g) Would the Project place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?***

**No Impact.** Low energy geophysical surveys will occur within State marine waters and will have no effect on 100-year flood hazard areas. Therefore, low energy geophysical surveys will have no impact on construction of housing in flood hazard areas.

***h) Would the project place within a 100-year flood hazard area structures that would impede or redirect flood flows?***

**No Impact.** Low energy geophysical surveys will occur within State marine waters. No structures will be placed, and no effects to 100-year flood hazard areas are expected.

***i) Would the Project expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?***

**No Impact.** Low energy geophysical surveys will not result in the development of any housing or result in the development of any structures that would redirect flood flows.

1 **j) Would the Project be subject to inundation by seiche, tsunami, or mudflow?**

2 **Less than Significant Impact.** Mudflow will not affect marine survey operations.  
3 Ground displacement beneath the ocean has the potential to cause the formation of a  
4 tsunami wave. If a survey vessel were entering or leaving port, it is possible that a  
5 seiche could affect an enclosed harbor. The Pacific Tsunami Warning Center is  
6 operated by the National Oceanic and Atmospheric Administration (NOAA) and would  
7 likely be able to provide advance notice of an oncoming wave. If a tsunami were to  
8 occur during a low energy geophysical survey, advance warning via a NOAA  
9 announcement would enable the survey vessel to move off shore into deeper water.  
10 Impacts to survey operations from a tsunami or seiche would be less than significant.

11 **3.3.8.4 Mitigation and Residual Impacts**

12 **Mitigation.** Compliance with existing regulations and adherence to OGPP requirements  
13 for development and implementation of an OSCP would reduce the potential for water  
14 quality-related impacts from survey operations. Combined with implementation of  
15 **MMs HAZ-1, HAZ-2, and HAZ-3** (see **Section 3.3.7.4**), any potentially significant  
16 impacts from possible spills of oil or other contaminants would be reduced to less than  
17 significant. Low energy geophysical survey activity would not result in any other water  
18 quality- or hydrology-related impacts.

19 **Residual Impacts.** With implementation of **MMs HAZ-1, HAZ-2, and HAZ-3**, low  
20 energy geophysical surveys would have less than significant hydrology and water  
21 quality impacts. Residual impacts would be less than significant.



### 1 3.3.9 Land Use and Planning

<b>IX. LAND USE AND PLANNING:</b> Would the Project:	<b>Potentially Significant Impact</b>	<b>Less Than Significant with Mitigation</b>	<b>Less Than Significant Impact</b>	<b>No Impact</b>
a) Physically divide an established community?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

#### 2 3.3.9.1 Environmental Setting

3 The Offshore Geophysical Permit Program (OGPP or Project) area is located in the  
4 Pacific Ocean offshore of the California coastline, and has multiple uses and associated  
5 Federal and State jurisdictions and policies. Uses of the marine waters along the  
6 California coast include boating, kayaking, fishing and other water sports, as well as  
7 significant commercial and recreational fishing. Commercial and tourist vessels also  
8 transit many areas, especially between major West Coast ports such as San Francisco  
9 and Los Angeles. Many marine waters along the coast where OGPP activities are  
10 expected to occur also provide opportunities for whale watching. The seafloor in Project  
11 area waters is under the land use jurisdiction of the California State Lands Commission  
12 (CSLC). The CSLC has land use authority over “sovereign lands” of the State, which, in  
13 the coastal environment, are those between the mean high tide line (MHTL) to  
14 3 nautical miles (nm) offshore.

15 The California Coastal Commission (CCC), pursuant to the California Coastal Act, also  
16 retains review authority over proposed project actions that are within or could impact the  
17 coastal zone. A number of local agencies also manage areas of the coastal zone  
18 pursuant to the Coastal Act through Local Coastal Programs (LCP); however, LCP  
19 jurisdiction is limited to the coastal zone upland of the MHTL.

20 The National Oceanic and Atmospheric Administration (NOAA) administers the National  
21 Marine Sanctuaries Program, which designates and manages activities in California’s  
22 four national marine sanctuaries (NMS): Monterey Bay, Gulf of the Farallones, Channel  
23 Islands, and Cordell Bank.<sup>14</sup> These sites were selected because they possess  
24 conservational, recreational, ecological, historical, research, educational,  
25 archaeological, cultural, or aesthetic qualities that give them special national, and  
26 sometimes international, significance.

<sup>14</sup> Cordell Bank NMS is located outside of State waters and would not be impacted by the OGPP.

The California Fish and Game Commission (FGC) and California Department of Fish and Wildlife (CDFW) also have jurisdiction over a number of Marine Protected Areas (MPA) located within State waters across all four permit regions. The MPAs were created in response to California Marine Life Protection Act (MLPA) requirements and are intended primarily to protect or conserve marine life and habitat. Locations and policies associated with MPAs, as well as maps and additional information on the environmental and regulatory setting concerning land use in the four coastal regions, can be found in the following documents, as well as at [www.dfg.ca.gov/marine/mpa/](http://www.dfg.ca.gov/marine/mpa/).

- **Region I:** South Coast Marine Protected Areas Project draft and final Environmental Impact Reports (EIRs) (URS 2010a,b).
- **Region II:** South Coast Marine Protected Areas Project draft and final EIRs (URS 2010a,b) and draft and final EIRs: California Marine Life Protection Act Initiative Central Coast Marine Protected Areas Project (Jones & Stokes 2006, 2007).
- **Region III:** Draft and final environmental impact reports: California Marine Life Protection Act Initiative Central Coast Marine Protected Areas Project (Jones & Stokes 2006, 2007) and draft and final EIRs: California Marine Life Protection Act Initiative North Central Coast Marine Protection Areas Project (ICF Jones & Stokes 2009a,b).
- **Region IV:** Marine Life Protection Act – North Coast Study Region draft and final EIRs (Horizon Water and Environment LLC 2012a,b).

### 3.3.9.2 Regulatory Setting

Federal and State laws and regulations pertaining to this issue and relevant to the Project are presented in **Table 3-64**. No local laws and regulations relevant to this issue are applicable to the Project.

**Table 3-64. Federal and/or State Laws, Regulations, and Policies Potentially Applicable to the Project (Land Use and Planning)**

CA	California Coastal Act (Coastal Act) of 1976 (Pub. Resources Code §§ 30000 et seq.)	Pursuant to the Coastal Act, the CCC, in partnership with coastal cities and counties, plans and regulates the use of land and water in the coastal zone. The Coastal Act includes specific policies (see Chapter 3) that address issues such as shoreline public access and recreation, lower cost visitor accommodations, terrestrial and marine habitat protection, visual resources, landform alteration, agricultural lands, commercial fisheries, industrial uses, water quality, offshore oil and gas development, transportation, development design, power plants, ports, and public works. The CCC retains jurisdiction over the immediate shoreline areas below the mean high tide line and offshore areas to the 3 nautical mile State water limit. Following certification of county- and municipality-developed LCPs, the CCC has delegated permit authority to many local governments for the portions of their jurisdictions within the coastal zone.
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3.3.9.3 Impact Analysis

**a) Would the Project physically divide an established community?**

**No Impact.** No onshore developments or structures are proposed as part of activities that would be permitted under the OGPP. As a result, survey activities permitted under the OGPP would not divide an established community.

**b) Would the Project conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the Project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?**

**Less than Significant Impact with Mitigation.** The OGPP would not alter land use along the California coastline because permitted survey activities would originate from existing port facilities and then be conducted in marine waters; no alterations to ports to accommodate survey vessels are anticipated or planned. The jurisdictions of LCPs, administered by local agencies under the Coastal Act, would not extend past the MHTL, and so would not be impacted by offshore surveys.

Surveys permitted under the OGPP could result in the deployment and operation of survey equipment that within the boundaries of MPAs established along the coastline of all four coastal regions. The CSLC analyzed potential conflicts with MPAs as part of this checklist question because the MLPA is intended, at least in part, to avoid and mitigate ongoing adverse effects on living marine resources from a variety of sources. Transit through MPAs as well as much of the survey operations would not conflict with the controlling regulations; however, certain survey operations in the absence of mitigation have the potential to result in the “take”<sup>15</sup> of living marine organisms, which is generally prohibited in State Marine Reserves (SMRs) and prohibited but for exceptions specified by regulation in State Marine Conservation Areas (SMCAs), as described below. Organisms within MPA boundaries that could be potentially affected by low energy geophysical surveys include marine mammals, sea turtles, fishes, and invertebrates. The following impacts are predicted in association with low energy geophysical survey operations:

- Marine mammals and sea turtles: no injury or mortality from acoustic sources will occur when complying with OGPP permit requirements and **MM BIO-1** through **MM BIO-9** below. Minor behavioral modification may be associated with select equipment.

<sup>15</sup> “Take is defined in section 86 of the Fish and Game Code as “hunt, pursue, catch, capture, or kill” or attempt to do the same.

- 1 • Fishes: no injury or mortality from acoustic sources is expected. Minor behavioral  
2 modification may be associated with select equipment, including startle reactions  
3 and possible short-term displacement from habitat.
- 4 • Invertebrates: limited, localized startle reactions are expected.
- 5 • Algae and macrophytes (e.g., kelp): no impacts from acoustic sources are  
6 expected.

7 Allowable activities within MPAs are dictated by MPA type. In a state marine reserve, it  
8 is unlawful to injure, damage, take, or possess any living, geological, or cultural marine  
9 resource, except under a permit or specific authorization from the CDFW for research,  
10 restoration, or monitoring purposes.

11 In a state marine park, it is unlawful to injure, damage, take, or possess any living or  
12 nonliving marine resource for commercial exploitation purposes. Any human use that  
13 would compromise protection of the species of interest, natural community or habitat, or  
14 geological, cultural, or recreational features, may be restricted by the designating entity  
15 or managing agency. All other uses are allowed, including scientific collection with a  
16 permit, research, monitoring, and public recreation, including recreational harvest,  
17 unless otherwise restricted.

18 In a SMCA, it is unlawful to injure, damage, take, or possess any living, geological, or  
19 cultural marine resource for commercial or recreational purposes, or a combination of  
20 commercial and recreational purposes, which the designating entity or managing  
21 agency determines would compromise the protection of the species of interest, natural  
22 community, habitat, or geological features. The designating entity or managing agency  
23 may permit research, education, and recreational activities, and certain commercial and  
24 recreational harvest of marine resources.

25 In a state marine recreational management area, it is unlawful to perform any activity  
26 that, as determined by the designating entity or managing agency, would compromise  
27 the recreational values for which the area may be designated. Recreational  
28 opportunities may be protected, enhanced, or restricted, while preserving basic  
29 resource values of the area. No other use is restricted.

30 A special closure is a geographically specific area that prohibits human entry. Special  
31 closures are smaller in size than MPAs and are designed to protect breeding seabird  
32 and marine mammal populations from human disturbance.

33 Under Public Resources Code section 36710, subdivisions (a) and (c), take can be  
34 authorized for research, education, restoration, and other limited purposes, and so the  
35 use of low energy geophysical equipment may be allowed in select MPAs (e.g., when  
36 infrastructure inspection constitutes “monitoring”). Consistency with MPA “take”  
37 regulations would be achieved by either limiting/avoiding MPAs, where necessary, or by

obtaining and complying with the requirements of a Scientific Collecting Permit (SCP) issued by the CDFW (see **MM BIO-9** in **Section 3.3.4.4**). Permittees under both the current OGPP and the OGPP Update are required to comply with all other federal, State, and local laws, including compliance with MPA regulations. With implementation of this permit requirement and **MM BIO-9**, survey activities permitted under the OGPP would not be expected to conflict with the regulations governing activities within potentially affected MPAs.

**c) Would the Project conflict with any applicable habitat conservation plan or natural community conservation plan?**

**No Impact.** OGPP surveys would occur in waters offshore of the coast of California and would not include any onshore activities or equipment. There are no applicable habitat conservation plans or natural community conservation plans in the Project area, and therefore, no impact is expected.

**3.3.9.4 Mitigation and Residual Impact**

**Mitigation.** The OGPP would not result in impacts related to dividing an established community or inconsistency with applicable state and local land use policies; however, survey activities permitted under the OGPP do have the potential to result in the “take” of marine organisms within the boundaries of MPAs situated within the Project area. This potential conflict with the requirements of MPAs would be resolved through implementation of **MM BIO-9**, which requires the acquisition of and compliance with an SCP for surveys that would result in take of living marine organisms within a MPA.

**Residual Impacts.** With the incorporation of the recommended mitigation measure, there will be no residual impacts to land use and planning.

### 1 3.3.10 Mineral Resources

<b>X. MINERAL RESOURCES:</b> Would the Project:	<b>Potentially Significant Impact</b>	<b>Less Than Significant with Mitigation</b>	<b>Less Than Significant Impact</b>	<b>No Impact</b>
a) Would the project result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Would the project result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

#### 2 3.3.10.1 Environmental Setting

3 Mineral resources within State tidelands offshore California include oil and natural gas  
4 deposits (i.e., for energy uses), sand and gravel resources (i.e., for beach nourishment  
5 and construction needs), and salts (i.e., used for food and industrial purposes). State  
6 tideland oil and gas development is concentrated in the South Coast region  
7 (Pt. Conception south). The first State offshore oil well was drilled in 1896 off  
8 Summerland, in Santa Barbara County. Early offshore development occurred from  
9 wooden piers, typically in the vicinity of extending onshore oil fields. In 1915, the  
10 California legislature created the Division of Oil and Gas (now Division of Oil, Gas, and  
11 Geothermal Resources) to encourage efficient recovery and end wasteful extraction  
12 processes. Extraction of crude oil and natural gas from underground reservoirs  
13 continues today within offshore lease areas in southern and southern central California.

14 There are currently 27 operating oil and gas platforms in State tidelands and on the  
15 Federal Outer Continental Shelf (OCS) off California (Bernstein et al. 2010). Oil and  
16 natural gas produced from offshore platforms located on both State and Federal OCS  
17 leases are transported to shore via pipeline. Marine tankers and barges are also used to  
18 transport crude oil to the terminals from non-platform sources. The California State  
19 Lands Commission (CSLC) has identified 43 marine oil terminals in the Southern  
20 California area located near Santa Barbara (decommissioned Cojo Bay and Gaviota,  
21 Santa Barbara, and Ellwood terminals), Ventura County (Port Hueneme and Mandalay  
22 Bay terminals), Los Angeles/Long Beach Harbor (El Segundo, Cenco, and 24 other  
23 terminals in the harbors), and San Diego County (Carlsbad and eight other terminals in  
24 San Diego Harbor) (URS 2010a,b).

25 In general, the crude oil transported to onshore terminals is processed into gasoline and  
26 other petroleum products by local southern California refineries, and the natural gas is  
27 used to power local electricity-generating plants (Perry 2009). **Table 3-65** identifies  
28 current oil and gas-related platforms and artificial islands off California.

1 **Table 3-65. California Offshore Oil and Gas Platforms and Artificial Islands**

Platform	Water Depth (ft)	Installation Date	Operator
<b>Federal OCS Platforms</b>			
A	188	1968	Dos Cuadras Offshore LLC
B	190	1968	Dos Cuadras Offshore LLC
C	192	1969	Dos Cuadras Offshore LLC
Edith	161	1983	Dos Cuadras Offshore LLC
Ellen	265	1980	Rise Energy LLC/SP Beta Properties LLC
Elly	255	1980	Rise Energy LLC/SP Beta Properties LLC
Eureka	700	1984	Rise Energy LLC/SP Beta Properties LLC
Gail	739	1987	Venoco
Gilda	205	1981	Dos Cuadras Offshore LLC
Gina	95	1980	Dos Cuadras Offshore LLC
Grace	318	1979	Venoco
Habitat	290	1981	Dos Cuadras Offshore LLC
Harmony	1198	1989	Exxon Mobil Corp.
Harvest	675	1985	Plains Exploration and Production Company
Henry	173	1979	Dos Cuadras Offshore LLC
Heritage	1075	1989	Exxon Mobil Corp.
Hermosa	603	1985	Plains Exploration and Production Company
Hidalgo	430	1986	Plains Exploration and Production Company
Hillhouse	190	1969	Dos Cuadras Offshore LLC
Hogan	154	1967	Pacific Operators Offshore, Ltd.
Hondo	842	1976	Exxon Mobil Corp.
Houchin	163	1968	Pacific Operators Offshore, Ltd.
Irene	242	1985	Plains Exploration and Production Company
<b>State Water Platforms</b>			
Emmy	45	1963	Aera Energy
Eva	58	1964	Dos Cuadras Offshore LLC
Esther	30	1990	Dos Cuadras Offshore LLC
Holly	211	1966	Venoco
<b>State Water Artificial Islands (Oil and Gas Production)</b>			
Rincon Island	55	1957	Greka Energy
Grissom	20-45	1965	THUMS Long Beach/Occidental Long Beach
White	20-45	1965	THUMS Long Beach/Occidental Long Beach
Chaffee	20-45	1965	THUMS Long Beach/Occidental Long Beach
Freeman	20-45	1965	THUMS Long Beach/Occidental Long Beach

2 The California Department of Conservation (2010) reported that offshore crude oil  
3 production (i.e., State and Federal OCS) in 2009 totaled 35.6 million barrels (bbl), with  
4 13.3 million bbl from State tidelands and 22.3 million bbl from Federal OCS wells. Total  
5 natural gas production in California in 2009 was 33.7 billion cubic feet (bcf), with

1 contributions from State tidelands at 5.8 bcf and Federal OCS contributions at 31.5 bcf.  
2 State offshore oil production levels in 2009 decreased 5.1 percent compared to 2008  
3 production figures. Total gas production levels, including both onshore and offshore  
4 sources, dropped 7.4 percent in 2009 compared to 2008.

5 Sand and gravel reach the ocean via streams and from the erosion of coastal cliffs,  
6 headlands, and wave cut platforms. Coarse sediment is distributed by wave and  
7 longshore currents forming beaches and large waves and rip currents carrying sediment  
8 offshore. Accumulation of coarse sediment varies from a few feet thick on some  
9 beaches to thousands of feet thick near the marine shelf edge. Based on available  
10 public information, no active sand and gravel mining operations are identified within the  
11 South Coast region (Perry 2009).

12 Higgins et al. (2004) have developed a concise summary of beach erosion and  
13 accretion along the California coast. In winter, California's beaches are subjected to  
14 pounding by tall, high-energy short wavelength storm waves generated by local storms.  
15 Beaches respond by reducing their overall slope through erosion of the beach face and  
16 berm and the transport and redeposition of the sand in an offshore bar. This shifts the  
17 breaker zone farther offshore and produces a winter beach profile. At this point, the surf  
18 zone is at its widest and the breaker heights greatest. In summer, low, long-wavelength  
19 swell waves, generated by distant storms, reverse this process by eroding and  
20 redelivering the sand stored in the offshore bar to the beach face and berm (summer  
21 profile). Decreasing wave energy also causes beaches to narrow and steepen. The  
22 critical wave conditions that govern the shift between summer and winter profiles are  
23 largely a function of critical wave steepness (ratio of wave height to wavelength). Storm  
24 waves have high steepness values, while long swell waves have low steepness values.

25 Beach nourishment began in the early 1900s in California, with dozens of beaches  
26 along the coast having realized beach nourishment activity. Most beach nourishment  
27 projects have been in southern California, from Santa Barbara County south.

28 Technical reports and data sets identified by Higgins et al. (2004) indicate the presence  
29 of potential sand source areas off California, as well as other factors including geologic  
30 structure, variations in transportation dynamics, energy conditions and geomorphology  
31 of the depositional areas, and variations of all of these factors with time. Deposits of  
32 sand are common in nearshore regions, including State waters, where rivers have  
33 discharged material at their mouths (Welday and Williams 1975). Mud belts are  
34 concentrated farther away from the shoreline or in nearshore areas where the energy of  
35 waves and currents is reduced due to the presence of protective coastal settings  
36 (e.g., Monterey Bay). Bedrock areas are often nearshore extensions of onshore  
37 features or where either relief is positive or current patterns do not favor deposition of  
38 sediment. Many sand deposits farther offshore are thought to represent paleo-beaches,  
39 which originated when the shoreline was much farther west than today; since the last



1 ice age the shoreline has migrated eastward from these locations as sea level has  
2 risen.

3 Salts form naturally in protected lagoons and estuaries where ocean water circulation is  
4 limited or lacks an open, constant connection to the ocean. Non-circulating water warms  
5 in these shallow areas and evaporates, leaving salt deposits. The main salt-producing  
6 regions within southern and northern California are located in San Diego Bay (Western  
7 Salt Works) and southern San Francisco Bay (e.g., Cargill Salt); waters of San  
8 Francisco Bay and San Diego Bay are outside of the OGPP study area.

9 3.3.10.2 Regulatory Setting

10 No Federal, State, or local laws and regulations relevant to this issue are applicable to  
11 the Project.

12 3.3.10.3 Impact Discussion

13 Mineral resources, such as oil deposits, are located in various offshore locations along  
14 the California coastline included within the study area. Under the OGPP, surveys could  
15 be permitted in areas underlain by mineral resources. In some cases, mineral resources  
16 may be located within existing MPAs that preclude any mineral development or other  
17 similar activities without prior authorization from the California Fish and Game  
18 Commission.

19 ***a) Result in the loss of availability of a known mineral resource that would be of***  
20 ***value to the region and the residents of the State?***

21 **No Impact.** Geophysical surveys permitted by the OGPP would not entail mineral  
22 extraction. Additionally, surveys would have no bearing on prospective future mineral  
23 extraction because surveys would not disturb offshore mineral resources and would be  
24 short-term and temporary in nature. Therefore, no impact would occur.

25 ***b) Result in the loss of availability of a known mineral resource that would be of***  
26 ***value to the region and the residents of the State?***

27 See response for Category (a) above. No impact on mineral resources would occur.

28 3.3.10.4 Mitigation and Residual Impacts

29 **Mitigation.** The OGPP would have no impact on mineral resources, and no mitigation is  
30 required.

31 **Residual Impacts.** The OGPP would have no impact on mineral resources, no  
32 mitigation is required, and no residual impacts would occur.

### 3.3.11 Noise

<b>XI. NOISE:</b> Would the Project result in:	<b>Potentially Significant Impact</b>	<b>Less Than Significant with Mitigation</b>	<b>Less Than Significant Impact</b>	<b>No Impact</b>
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) A substantial permanent increase in ambient noise levels in the Project vicinity above levels existing without the Project?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) A substantial temporary or periodic increase in ambient noise levels in the Project vicinity above levels existing without the Project?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f) For a Project within the vicinity of a private airstrip, would the Project expose people residing or working in the Project area to excessive noise levels?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

#### 3.3.11.1 Environmental Setting

The following noise analysis considers airborne noise issues. A discussion of ambient noise levels underwater, as well as other sources of anthropogenic noise in the marine environment, is provided in **Section 3.3.4, Biological Resources**.

Sound waves are characterized by parameters such as amplitude, intensity, wavelength, frequency, and velocity:

- *Amplitude*. The amount of energy contained in a sound pressure wave, a measure of the strength of the sound wave, is referred to as its amplitude.
- *Intensity*. The amount of energy passing through a unit area per unit of time is the sound wave's intensity. The units of sound intensity are watts per square meter (energy per unit of time per unit of area).
- *Wavelength*. The length of one cycle of a sound wave.

- **Frequency.** The number of pressure waves that pass by a reference point per unit time and is measured in Hertz (Hz) or cycles per second.
- **Velocity.** The linear speed of an object in a specified direction.

Amplitude and intensity are directly and linearly related. Higher amplitude sounds are perceived to be louder than lower amplitude sounds. Sound pressures are usually represented in microPascals (μPa).

The ambient sound level of a region is defined by the total noise generated from both natural and anthropogenic sources. In the Project area, the magnitude and frequency of environmental noise may vary considerably because of changing weather and sea conditions. Wind and wave activity in the nearshore zone are primary sources of natural sound, while transportation activities (e.g., recreational and commercial vessels; shoreline vehicular and truck traffic) and waterfront operations represent potentially significant anthropogenic noises sources along the coast.

Low energy geophysical surveys conducted under permit would occur in nearshore and offshore waters, potentially within any of the four regions along the California coast. Low energy geophysical survey vessels may operate from just beyond the surf zone to 3 nautical miles (nm) offshore. Nearest sensitive receptors would be dependent upon survey location and proximal public beaches and coastal development, and the intensity of any impacts would be influenced by ambient sound sources.

### 3.3.11.2 Regulatory Setting

Federal and State laws and regulations pertaining to this issue and relevant to the Project are identified in **Table 3-66**.

**Table 3-66. Federal and/or State Laws, Regulations, and Policies Potentially Applicable to the Project (Noise)**

<b>U.S.</b>	Noise Control Act (42 U.S.C. § 4910)	The <b>Noise Control Act</b> required the USEPA to establish noise emission criteria, as well as noise testing methods (40 C.F.R. Chapter 1, Subpart Q). These criteria generally apply to interstate rail carriers and to some types of construction and transportation equipment. The USEPA published a guideline (USEPA 1974) containing recommendations for acceptable noise level limits affecting residential land use of 55 dBA $L_{dn}$ for outdoors and 45 dBA $L_{dn}$ for indoors.
<b>U.S.</b>	Department of Housing and Urban Development Environmental Standards (24 C.F.R. Part 51)	These standards set forth the following exterior noise standards for new home construction (for interior noise levels, a goal of 45 dBA is set forth and attenuation requirements are geared to achieve that goal): <ul style="list-style-type: none"> <li>• 65 <math>L_{dn}</math> or less – Acceptable</li> <li>• 65 <math>L_{dn}</math> and &lt; 75 <math>L_{dn}</math> – Normally unacceptable, appropriate sound attenuation measures must be provided</li> <li>• &gt; 75 <math>L_{dn}</math> – Unacceptable</li> </ul>
<b>U.S.</b>	Federal Highway Administration	FHA Noise Abatement Procedures are procedures for noise studies and noise abatement measures to help protect the public health and welfare, to supply noise abatement criteria, and to establish requirements for information to be given to

	(FHA) Noise Abatement Procedures (23 C.F.R. Part 772)	local officials for use in the planning and design of highways. It establishes five categories of noise sensitive receptors and prescribes the use of the Hourly $L_{eq}$ as the criterion metric for evaluating traffic noise impacts.
U.S.	Federal Energy Regulatory Commission (FERC) Guidelines (18 C.F.R. § 157.206(d)(5))	FERC Guidelines On Noise Emissions From Compressor Stations, Substations, And Transmission Lines require that “the noise attributable to any new compressor stations, compression added to an existing station, or any modification, upgrade or update of an existing station, must not exceed a $L_{dn}$ of 55 dBA at any pre-existing noise sensitive area (such as schools, hospitals, or residences).”
U.S.	USEPA Levels Document	<b>NTIS 550\9-74-004, 1974</b> (“Information on Levels of Environmental Noise Requisite to Protect Health and Welfare with an Adequate Margin of Safety”). In response to a Federal mandate, the USEPA provided guidance in this document, commonly referenced as the, “Levels Document,” that establishes an $L_{dn}$ of 55 dBA as the requisite level, with an adequate margin of safety, for areas of outdoor uses including residences and recreation areas. The USEPA recommendations contain a factor of safety and do not consider technical or economic feasibility (i.e., the document identifies safe levels of environmental noise exposure without consideration for achieving these levels or other potentially relevant considerations), and therefore should not be construed as standards or regulations.
CA	California Department of Transportation Policies	State regulations for limiting population exposure to physically and/or psychologically significant noise levels include established guidelines and ordinances for roadway and aviation noise under California Department of Transportation as well as the now defunct California Office of Noise Control. The California Office of Noise Control land use compatibility guidelines provided the following: <ul style="list-style-type: none"> <li>• An exterior noise level of 60 to 65 dBA Community Noise Equivalent Level (CNEL) is considered "normally acceptable" for residences.</li> <li>• A noise level of 70 dBA CNEL is considered to be "conditionally acceptable" (i.e., the upper limit of "normally acceptable" noise levels for sensitive uses such as schools, libraries, hospitals, nursing homes, churches, parks, offices, and commercial/professional businesses).</li> <li>• A noise level of greater than 75 dBA CNEL is considered "clearly unacceptable" for residences.</li> </ul>

Low energy geophysical surveys may occur off any of 15 California coastal counties. Local plans or noise elements establish standards for the protection of individuals from excessive noise levels and specify which projects are subject to those standards, and which would be exempt from such regulation. A summary of noise thresholds for California coastal counties is provided in **Table 3-67**.

**Table 3-67. Exterior Noise Thresholds for Select California Coastal Counties**

Exterior Noise Level Standards	Maximum Noise Level (dBA) and Applicable Parameter(s)
<b>Monterey County</b>	
Open Space (Water Recreation)	45–65 (normally acceptable); 65–75 (conditionally acceptable); 75–80 (normally unacceptable)
<b>San Luis Obispo County</b>	
Hourly Equivalent (Leq, dBA)	50 (daytime); 45 (nighttime)
Maximum Level (dBA)	70 (daytime); 65 (nighttime)
<b>San Diego County</b>	
CNEL (dBA)	60 or an increase of +10 dB over preexisting noise
Project-generated Noise	45–75, depending upon zone; hourly restrictions may apply
Impulsive Noise	82 (residential); 85 (agricultural)
<b>Orange County</b>	
Residential	60 (daytime); 50 (nighttime)
Commercial	65 (daytime); 55 (nighttime)
Industrial	70 (daytime); 60 (nighttime)
<b>Los Angeles County</b>	
Residential	50 (daytime); 45 (nighttime)
Commercial	60 (daytime); 55 (nighttime)
Industrial	70 (anytime)
<b>Ventura County</b>	
Construction, Maximum 1 hr Leq (dBA)	55, or ambient noise level +3 dBA (daytime); 45–50, or ambient noise level +3 dBA (nighttime);
<b>Del Norte County</b>	
Residential and Commercial	62 (daytime); 57 (nighttime)
Other Sensitive Land Uses	52 (daytime); 47 (nighttime)
Industrial and Heavy Commercial Uses	67 (daytime); 62 (nighttime)
<b>Mendocino County</b>	
CNEL (dBA)	60–70 (coastal zone)
<b>Santa Cruz County</b>	
Residential	60 (average, daytime/nighttime)

Abbreviations: Leq = equivalent continuous sound level; dB = decibels; dBA = decibels, A-weighted; CNEL = community noise equivalent level.

### 1 3.3.11.3 Impact Analysis

2 Human response to noise varies among individuals and is dependent upon the ambient  
3 environment in which the noise is perceived. In general, guidelines for impacts for  
4 varying noise exposure levels include sleep disturbance, speech interference, and  
5 workplace hearing loss. Sleep disturbance begins to occur when the indoor sound  
6 exposure level rises above 35 dBA (decibels, A-weighted) (Federal Interagency  
7 Committee on Aviation Noise [FICAN] 1997). Interference with human speech begins to  
8 occur when the equivalent continuous sound level (Leq) rises above 60 dBA  
9 (U.S. Environmental Protection Agency [USEPA] 1974). Hearing loss can result from  
10 prolonged exposure (e.g., workplace exposure) to a time-averaged noise level of

1 90 dBA for 8 hours (hr) or more (Occupational Safety and Health Administration  
2 [OSHA]).

3 Ambient background noise in metropolitan, urbanized areas typically varies from  
4 60 to 70 dB and can be as high as 80 dB or greater; quiet suburban neighborhoods  
5 experience ambient noise levels of approximately 45 to 50 dB (USEPA 1978).

6 ***a) Would the Project expose people to or generate noise levels in excess of***  
7 ***standards established in the local general plan or noise ordinance, or applicable***  
8 ***standards of other agencies?***

9 **Less than Significant Impact.** Individual counties identify their local standards for  
10 acceptable exterior noise levels (see **Table 3-4**). These standards are intended to  
11 protect persons from excessive noise levels that are detrimental to public health,  
12 welfare, and safety. Excessive noise levels can interfere with sleep, communication,  
13 and relaxation. They may also contribute to hearing impairment and a wide range of  
14 adverse physiological stress conditions, and adversely affect the value of real property.  
15 For noise thresholds to protect wildlife from excessive noise levels, please refer to  
16 **Section 3.3.4, Biological Resources.**

17 Regulatory noise standards employed by local jurisdictions generally fall into two  
18 categories: (1) noise control ordinances; and (2) noise/land use compatibility guidelines.  
19 Excepting transportation-related sources, noise is usually regulated using ordinances  
20 that limit the amount of noise such sources may produce as measured at the nearest  
21 sensitive receptor or at property lines. Standards in local noise ordinances may be in  
22 the form of quantitative noise performance levels, or they may simply be in the form of a  
23 qualitative prohibition against creating a nuisance. Many ordinances employ both  
24 approaches (URS 2003).

25 A significant impact would occur if noise levels exceeded existing standards. Given the  
26 variability of how individual county standards are established (e.g., definitive decibel  
27 levels, or allowable increases above ambient levels; limits based on residential,  
28 commercial, or industrial location), the significance of an impact could vary by survey  
29 location.

30 Low energy geophysical surveys are conducted using survey vessels of variable size  
31 and engine complement. Vessels are typically in the 30- to 61-meters [m] (100- to  
32 200-feet [ft]) size range, but may be smaller depending on the type of survey being  
33 conducted and its location. For example, smaller, more maneuverable vessels are used  
34 in areas of restricted movement, such as bays or navigation channels. For purposes of  
35 the air quality analysis, survey vessels were assumed to operate for 12 hrs on a survey  
36 day, including transit to and from a local port. Surveys may occur anywhere along the  
37 California coast; although the vast majority of surveys have occurred in Regions I and II,  
38 including most of Central and Southern California. Survey activities may or may not

occur near public access areas and sensitive onshore receptors. It is also possible that survey operations could occur in the vicinity of other commercial or recreational vessels.

Vessel equipment on board representative survey vessels may include one or two main vessel engines and generators. Engine and exhaust noise are the largest contributors to exterior vessel noise, with sound levels usually highest directly behind a vessel. Low energy geophysical survey vessel operations will produce only minor contributions to existing noise levels within the offshore survey area. Based on noise analyses conducted on research vessels of similar size and engine complement, the maximum topside (i.e., open deck) noise levels may be expected to range between 70 and 75 dBA (National Science Foundation [NSF] 2008). Low energy geophysical equipment, given its periodic, short pulse, and narrow beam nature, is barely audible to crew members aboard the survey vessel and will not contribute to ambient airborne noise levels.

Survey vessels at their closest point to shore (i.e., just beyond the surf zone) may be within several hundred meters of the beach. Levels of sound pressure and levels of sound intensity decrease equally with the distance from the sound source, at a rate of -6 dB per distance doubling.

At source levels of 70 or 75 dBA originating aboard the survey vessel, received levels at 100 m would be 30 or 35 dBA, respectively (**Table 3-68**). Vessel sound levels, while contributing to ambient noise levels in the survey area, will have less than a significant impact on onshore sensitive receptors, as evaluated under all of the counties' local standards.

**Table 3-68. Estimated Attenuation of Vessel-Based Sound with Distance**

Source Level	Distance (m)	Received Level (dBA)
70 dBA	25	42
	50	36
	100	30
	200	24
75 dBA	25	47
	50	41
	100	35
	200	29

Recreational or commercial vessels may also be present during low energy geophysical surveys, although non-project vessel noise may preclude certain low energy geophysical survey measurements due to noise interference. Noise generated by survey vessels and onboard equipment operations would not be substantial and would not adversely affect individuals aboard nearby boats. Therefore, this short-term noise impact is less than significant.

**b) Would the Project expose people to or generate excessive groundborne vibration or groundborne noise levels?**

**No Impact.** Low energy geophysical surveys activities, including survey vessel and equipment use, will not produce groundborne vibration or noise.

**c) Would the Project result in a substantial permanent increase in ambient noise levels in the Project vicinity above levels existing without the Project?**

**No Impact.** Low energy geophysical surveys are short-term activities, usually only lasting one to four days, and will not produce a substantial nor permanent increase in ambient noise levels. Moreover, because the survey vessel would be in motion during the survey, ambient noise levels in any one part of the survey's area would only be affected by the vessel intermittently over the course of the survey. Multiple, co-occurring surveys in the same location are unlikely due to equipment noise interference. Due to the short-term nature of low energy geophysical survey activities, no long-term or permanent changes in the existing noise environment would result.

**d) Would the Project result in a substantial temporary or periodic increase in ambient noise levels in the Project vicinity above levels existing without the Project?**

**Less than Significant Impact.** Low energy geophysical survey operations will not result in significant or substantial increases in ambient noise levels. Surveys will, however, produce relative low, temporary noise increases in close proximity to the survey vessel. Impacts to sensitive onshore receptors are not expected given the relatively low source levels from the survey vessel and onboard equipment, and natural attenuation of these airborne sounds with distance. Therefore, temporary noise impacts from low energy geophysical surveys are less than significant and no mitigation is required.

**e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?**

**No Impact.** Offshore surveys will not be located within a jurisdictional boundary of an airport land use plan. However, given that surveys may occur anywhere along the California coast, it is possible that a survey could occur within 2 miles (mi) of public or public use airports that have not yet adopted airport land use plans. Source levels from low energy geophysical surveys are relatively low and reach ambient noise levels within 50 to 100 m of the survey vessel. Residents or workers associated with a public or public use airport would not be affected by survey vessel noise.



1 ***f) For a Project within the vicinity of a private airstrip, would the Project expose***  
2 ***people residing or working in the Project area to excessive noise levels?***

3 **No Impact.** Low energy geophysical surveys will not be located near any private airport  
4 or airstrip.

5 3.3.11.4 Mitigation and Residual Impacts

6 **Mitigation.** Low energy geophysical surveys will not result in significant short- or  
7 long-term noise impacts. Therefore, no mitigation measures are required.

8 **Residual Impacts.** Low energy geophysical surveys will not result in significant noise  
9 impacts. No mitigation is required and no residual impacts would occur.

### 1 3.3.12 Population and Housing

<b>XII. POPULATION AND HOUSING:</b> Would the Project:	<b>Potentially Significant Impact</b>	<b>Less Than Significant with Mitigation</b>	<b>Less Than Significant Impact</b>	<b>No Impact</b>
a) Would the Project induce substantial population growth in an area, either directly (e.g., by proposing new homes and businesses) or indirectly (e.g., through extension of roads or other infrastructure)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Would the Project displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Would the Project displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

#### 2 3.3.12.1 Environmental Setting

3 The Offshore Geophysical Permit Program (OGPP or Project) area is located in the  
 4 Pacific Ocean offshore of the California coastline. By 2060, California will have 13  
 5 counties, including seven coastal counties, with a population of one million or more, with  
 6 eight of those counties having two million or more residents. Southern California will  
 7 lead the State's growth between 2012 and 2060, growing by 8 million to a total  
 8 population of 31 million (California Department of Finance 2013a,b,c). While coastal  
 9 counties may expect to realize growth, inland counties of California will experience the  
 10 highest growth levels.

11 Summaries of the four coastal regions provided below, are based on Marine Protected  
 12 Area (MPA) analyses and summaries, as cited. These discussions highlight the  
 13 population characteristics and trends on a smaller scale, and provide further insight into  
 14 similarities and differences evident between the regions.

15 The three coastal counties of the North Coast region (Del Norte, Humboldt, and  
 16 Mendocino) are sparsely populated when compared with other California coastal  
 17 counties. The predominantly rural North Coast region contains many small communities  
 18 with few larger towns, most of which are inland. Reservations and rancherias are also  
 19 located throughout this region, providing home to more than 20 federally and non-  
 20 federally recognized tribes and tribal communities that maintain strong cultural  
 21 connections to the marine environment. Eureka, in Humboldt County, is the largest  
 22 coastal city of the North Coast region, with a population of approximately 25,400;  
 23 Humboldt County has a total population of 134,623 (U.S. Census Bureau 2011). Other  
 24 population centers in the North Coast region include Arcata and McKinleyville  
 25 (Humboldt County), Crescent City (Del Norte County), and Fort Bragg (Mendocino  
 26 County).

1 Population-growth projection trends in these coastal counties indicate that Del Norte  
2 County, with the lowest population of the three coastal counties in the North Coast  
3 region, is expected to have the highest change in population growth over the next  
4 40 years. Mendocino County population is expected to increase by greater than  
5 50 percent, while Humboldt County's population is expected to increase by 13 percent  
6 over that same period (Horizon Water and Environment LLC 2012a,b).

7 In the North Central Coast region, San Francisco and San Mateo counties had the  
8 greatest population density in 2000. Population projections for the region are mixed,  
9 with coastal counties in the region expected to grow, while other counties are projected  
10 to decline. San Francisco and San Mateo counties, with mixed growth between  
11 2000 and 2010, are expected to decrease by 9.4 percent and 9.6 percent, respectively  
12 by 2050. In this region, rapid growth is occurring in counties where the average  
13 population density is currently the lowest. Sonoma and San Mateo counties are  
14 expected to increase their population by 72.7 percent and 16.3 percent, respectively,  
15 between 2000 and 2050 (ICF Jones & Stokes 2009a,b).

16 In the Central Coast region, major population centers include the largely urbanized  
17 cities of Salinas, Santa Cruz, the Monterey Peninsula, San Luis Obispo, and Santa  
18 Maria. Populations of all coastal counties are expected to grow over the next several  
19 decades, though at markedly different rates. Based on census data, populations in all  
20 coastal counties grew during the period between 1990 and 2000. Based on population  
21 projections to 2050, Monterey County is expected to realize a population increase  
22 greater than 50 percent. San Luis Obispo County population is expected to increase  
23 approximately 40 percent. Rapid growth is occurring in the counties where the average  
24 population density is currently the lowest (Jones & Stokes 2006, 2007).

25 The five coastal counties in the South Coast region – Santa Barbara, Ventura, Los  
26 Angeles, Orange, and San Diego – are mostly highly urbanized, with population centers  
27 located close to the coast. As of 2000, Orange and Los Angeles counties had the  
28 greatest population densities, exceeding 3,607 and 2,344 people per square mile,  
29 respectively. Major coastal cities of the region, with their respective populations in  
30 parentheses, include Los Angeles (3.7 million), San Diego (1.3 million), Long Beach  
31 (0.5 million), Chula Vista (0.2 million), Huntington Beach (0.2 million), and Oxnard (0.2  
32 million), based on census data presented in URS (2010a,b).

33 Population growth projections in the South Coast region indicate that Ventura County is  
34 expected to have the highest change in population growth over the next 50 years,  
35 followed closely by San Diego County. Los Angeles, Orange, and Santa Barbara  
36 counties are expected to have similar growth patterns, which include a population  
37 growth slightly greater than half that of Ventura and San Diego counties. Santa Barbara  
38 County, which has the smallest population and the lowest density, is expected to  
39 experience the least growth and population change between 2000 and 2050. Aside from

1 Santa Barbara County, rapid growth is occurring in the counties where the average  
2 population density is currently the lowest (URS 2010a,b).

3 In terms of housing, Milken Institute (2012) noted that, as of December 2012, signs of a  
4 healing housing market are accumulating. Nationwide, construction spending, fueled by  
5 accelerated housing building, increased 9.6 percent from a year ago, hitting its highest  
6 annual rate in more than three years. Rising property values and increasing home  
7 construction, together with broad-based residential real estate market gains, including  
8 improved sales, shrinking numbers of foreclosures, reduced excess inventory, and  
9 declining vacancy, show the momentum of a rebound in housing. In California, data  
10 from the California Association of Realtors indicate that, as of September 2012, the  
11 median price of existing detached homes increased more than 20 percent from  
12 September 2011, with sales growing by 5.6 percent year-to-date, bringing down  
13 inventory. The unsold inventory index declined to 3.7 months, nearly half of the long-run  
14 average of 7. As of December 2012, California's single family housing market faced a  
15 supply shortage.

#### 16 3.3.12.2 Regulatory Setting

17 No Federal, State, or local laws and regulations relevant to this issue are applicable to  
18 the Project.

#### 19 3.3.12.3 Impact Discussion

20 Geophysical surveys permitted by the OGPP would be conducted by vessels based in  
21 port communities along the California coast, with most surveys expected to originate  
22 from communities in Regions I and II. Port areas within these regions include relatively  
23 large surrounding communities, such as Long Beach and San Diego in Region I, and  
24 relatively small surrounding communities, such as Morro Bay in Region II.

25 ***a) Would the Project induce substantial population growth in an area, either***  
26 ***directly (e.g., by proposing new homes and businesses) or indirectly***  
27 ***(e.g., through extension of roads or other infrastructure)?***

28 **No Impact.** Surveys permitted by the OGPP would not be expected to create short- or  
29 long-term jobs that would, in turn, generate an increase in population. The surveys are  
30 anticipated to be performed by vessels owned by existing companies using existing  
31 employees, many already residing in local port communities or nearby areas. Any  
32 out-of-area personnel would probably use facilities available on the vessel or nearby  
33 hotels during survey periods, most of which are anticipated to be less than five days in  
34 duration. Should survey activity spur an increase in vessels and staff, the employment  
35 opportunities would be limited and spread over several port communities, generating  
36 little, if any, population growth in individual communities. Additionally, activities  
37 permitted under the OGPP would not result in the extension of an infrastructure system

1 (e.g., roads, water, or sewer service) that would have growth-inducing effects, nor would  
2 it induce growth through construction of new housing.

3 ***b) Would the Project displace substantial numbers of existing housing,***  
4 ***necessitating the construction of replacement housing elsewhere?***

5 **No Impact.** Surveys permitted under the OGPP would not be expected to have any  
6 effect on existing housing.

7 ***c) Would the Project displace substantial numbers of people, necessitating the***  
8 ***construction of replacement housing elsewhere?***

9 **No Impact.** The OGPP would have no population displacement effect.

10 3.3.12.4 Mitigation and Residual Impacts

11 **Mitigation.** The OGPP would not result in impacts related to existing population or  
12 housing, and no mitigation is required.

13 **Residual Impacts.** The OGPP would have no impact on existing population levels or  
14 housing stock. No mitigation is required, and no residual impacts would occur.

### 1 3.3.13 Public Services

<b>XIII. PUBLIC SERVICES:</b> Would the Project:	<b>Potentially Significant Impact</b>	<b>Less Than Significant with Mitigation</b>	<b>Less Than Significant Impact</b>	<b>No Impact</b>
a) Would the Project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities or the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Fire protection?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Police protection?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Schools?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Parks?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Other public facilities?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

#### 2 3.3.13.1 Environmental Setting

3 The following environmental setting summary was derived from several source,  
 4 including the South Coast region and North Central Coast region environmental  
 5 analyses (URS 2010a,b; ICF Jones & Stokes 2009a,b). The discussion focuses on  
 6 protective services, including Federal, State, and local police or enforcement services  
 7 and fire protection. Schools, parks, and other public facilities are detailed in the State  
 8 Marine Protected Area (MPA) Initiative and the characterizations and data syntheses  
 9 that have been developed from these efforts.

10 No single Federal, State, or local agency has complete jurisdiction over the coastal and  
 11 marine environment. Coordination between various enforcement programs of multiple  
 12 entities is necessary on matters of mutual enforcement interest, including the California  
 13 Department of Fish and Wildlife (CDFW), U.S. Fish and Wildlife Service (USFWS), U.S.  
 14 Department of the Interior, National Oceanic and Atmospheric Administration's National  
 15 Marine Fisheries Service (NOAA Fisheries or NMFS), U.S. Coast Guard (USCG),  
 16 California Department of Parks and Recreation (State Parks), and National Park Service  
 17 (NPS). Though these programs often provide financial or logistical support, they do not  
 18 provide significant staff resources statewide, especially for offshore patrols.

#### 19 California Department of Fish and Wildlife

20 The CDFW has management authority over living marine resources within State waters.  
 21 CDFW's Law Enforcement Division wardens are charged with enforcing marine  
 22 resource management laws and regulations over an area encompassing approximately

1 1,100 miles (mi) of coastline and out to the seaward boundary of the Exclusive  
2 Economic Zone (EEZ) located 200 nautical miles (nm) offshore. Enforcement duties  
3 include all commercial and sport fishing statutes and regulations contained in the Fish  
4 and Game Code and Title 14, California Code of Regulations, marine water pollution  
5 incidents, homeland security, and general public safety. CDFW also has jurisdiction  
6 over any vessels that deliver catch to California ports, and all California-registered  
7 fishing vessels operating in Federal waters.

8 A Federal Cooperative Enforcement Agreement with the NOAA deputizes the CDFW to  
9 enforce the Magnuson-Stevens Fishery Conservation and Management Act  
10 (Magnuson-Stevens Act), the Endangered Species Act, the Marine Mammal Protection  
11 Act (MMPA), the National Marine Sanctuaries Act, and the Lacey Act. CDFW  
12 enforcement patrols regularly extend into Federal and EEZ waters beyond 3 nm, where  
13 a significant portion of commercial and recreational fishing efforts, as well as  
14 enforcement effort, occurs.

15 Based on a 2010 summary, CDFW maintains a fleet of seven large patrol boats in the  
16 54- to 65-foot (ft) class stationed at major ports throughout the State. CDFW also has  
17 eight patrol boats in the 24- to 30-ft range, and 15 patrol skiffs stationed at ports and  
18 harbors throughout the State. Overall, as of 2010, CDFW had 230 wardens in the field,  
19 responsible for a combination of both inland and marine patrol. Some of these wardens  
20 have a marine emphasis, focusing primarily on ocean enforcement, in addition to  
21 enforcing inland regulations. CDFW wardens are peace officers whose authority  
22 extends to any place in the State (Fish & Game Code, § 856; Penal Code, § 830.1).

23 CDFW has existing collaborative enforcement efforts with several other agencies,  
24 including NOAA Fisheries, USCG, State Department of Weights and Measures, the  
25 State Parks, NPS, Harbor Patrols, and local police and sheriffs.

## 26 **U.S. Fish and Wildlife Service**

27 The USFWS conserves, protects, and enhances populations of fish, other wildlife, and  
28 plants. It also manages the National Wildlife Refuge (NWR) system, including the  
29 following coastal refuges in California: Castle Rock, Humboldt Bay, San Pablo Bay,  
30 Marin Islands, Farallon, Don Edwards San Francisco Bay, Salinas River,  
31 Guadalupe-Nipomo Dunes, Seal Beach, San Diego Bay, San Diego, and the Tijuana  
32 Slough.

## 33 **NOAA Fisheries (National Marine Fisheries Service)**

34 NOAA Fisheries provides funding to the State to enforce Federal regulations in State  
35 waters; Federal offshore waters; and in bays, estuaries, rivers and streams. NOAA  
36 Fisheries has regulatory authority for marine finfish, invertebrates, sea turtles, and  
37 marine mammals other than sea otters in waters 3 to 200 nm from shore. NOAA

1 Fisheries derives its authority from the Magnuson-Stevens Act of 1976, the MMPA, and  
2 the Federal Endangered Species Act. Under the Magnuson-Stevens Act, NOAA  
3 Fisheries manages any fishery that is the subject of a fishery management plan  
4 developed by regional fishery management councils as well as some non-fishery  
5 management plan species.

## 6 **U.S. Coast Guard**

7 The mission of the USCG is to protect the public, the environment, and U.S. economic  
8 interests in the nation's ports and waterways, along the coast, on international waters,  
9 or in any maritime region as required to support national security. The USCG is part of  
10 the U.S. Department of Homeland Security. The mission of the USCG covers both  
11 non-homeland security and homeland security functions in five roles:

- 12 • Marine Safety: Eliminate deaths, injuries, and property damage associated with  
13 maritime transportation, fishing, and recreational boating.
- 14 • Maritime Security: Protect America's maritime borders from all intrusions by:  
15 (a) halting the flow of illegal drugs, aliens, and contraband into the U.S. through  
16 maritime routes; (b) preventing illegal fishing; and (c) suppressing violations of  
17 Federal law in the maritime arena.
- 18 • Maritime Mobility: Facilitate maritime commerce and eliminate interruptions and  
19 impediments to the efficient and economical movement of goods and people,  
20 while maximizing recreational access to and enjoyment of the water
- 21 • National Defense: Defend the nation as one of the five U.S. armed services.  
22 Enhance regional stability in support of the National Security Strategy, utilizing  
23 the USCG's unique and relevant maritime capabilities.
- 24 • Protection of Natural Resources: Eliminate environmental damage and the  
25 degradation of natural resources associated with maritime transportation, fishing,  
26 and recreational boating.

27 The USCG also takes an active role in maritime incident response. Pollution responses  
28 can involve a large number of organizations due to the potential for widespread and  
29 diverse impacts. Government agencies at several levels may have jurisdiction over  
30 different aspects of a pollution response.

31 To ensure effective coordination, lead agencies have been designated within the  
32 National Response System to coordinate or direct pollution response efforts. While  
33 many pollution incidents are small and are cleaned up by the responsible party under  
34 the supervision of local authorities, the National Response System ensures that State  
35 and Federal resources are available to ensure adequate cleanup on larger or more  
36 complex spills. Within the National Response System, the USCG has been designated



1 as a lead agency for oil and hazardous substance pollution incidents occurring within  
2 the coastal zone of the U.S. As the co-chair of the Regional Response Team (RRT), the  
3 USCG coordinates the regional RRT decisions and actions necessary to support an  
4 incident-specific discharge or release of an oil or hazardous substance within the  
5 coastal zone.

6 California marine and inshore waters fall within the USCG's 11<sup>th</sup> District, with 12 active  
7 facilities/stations (i.e., Bodega Bay, Channel Islands Harbor, Golden Gate, Humboldt  
8 Bay, Lake Tahoe (inland), Los Angeles/Long Beach, Monterey, Morro Bay, Noyo River,  
9 Rio Vista, San Diego, San Francisco).

## 10 **California Department of Parks and Recreation**

11 State Parks manages approximately one-third of the California coastline and manages  
12 coastal wetlands, estuaries, beaches, and dune systems within State Park system units.  
13 Through CSLC leases, the California Department of Parks and Recreation has the  
14 management authority over 15 underwater areas, though it does not have the authority  
15 to restrict the take of living marine resources. The California State Parks and Recreation  
16 Commission has the authority to establish, modify, or delete state marine reserves,  
17 state marine parks, and state marine conservation areas, but must have the  
18 concurrence of the California Fish and Game Commission (Commission) on any  
19 proposed restrictions related to the extraction of living marine resources (Pub.  
20 Resources Code, § 6725).

## 21 **National Park Service**

22 The NPS has several park lands located along the California coast, including the  
23 Channel Islands National Park and the Cabrillo National Monument in southern  
24 California, both of which are underwater parks. The seaward boundary of Channel  
25 Islands National Park is one nautical mile around each of the five park islands –  
26 Anacapa, Santa Cruz, Santa Rosa, San Miguel, and Santa Barbara. The seaward  
27 boundary of the Cabrillo National Monument is 300 yards seaward of mean low water.

28 The NPS regulates landing and camping on the Channel Islands, access to cultural and  
29 archeological sites, and use of personal watercraft. Channel Islands National Park  
30 works closely with the Channel Islands National Marine Sanctuary and NOAA's  
31 Sanctuary Office. Additional details regarding the Channel Islands National Marine  
32 Sanctuary is presented in **Section 3.3.4**.

## 33 **U.S. Park Police**

34 The U.S. Park Police is a distinct Federal agency that is empowered to enforce  
35 applicable regulations, including those of the CDFW. Park Police provide 24-hour (hr)  
36 coverage, and work closely with NPS to enforce regulations within national parks.

## 1 Local Entities

2 Law enforcement services provided by sheriffs are on the county level. The Sheriff's  
3 Department of each coastal county often work in collaboration with other agencies such  
4 as the NPS Law Enforcement Division, the State Park Police, and the USCG. Local port  
5 police and harbor patrol are present at most California ports. Port police and harbor  
6 patrol staff typically work closely with local and Federal government agencies, sharing  
7 information for the detection and prevention of suspected acts of terrorism.

## 8 Emergency Response Services

9 The USCG currently provides emergency response along the California coast. Search  
10 and Rescue is one of the USCG's oldest missions involving multi-mission stations,  
11 cutters, aircraft, and boats. Emergency response services include distress monitoring,  
12 communications, provision of medical advice, initial medical assistance, and/or medical  
13 evacuation. The USCG develops, establishes, maintains, and operates rescue facilities  
14 for the promotion of safety on, under, and over international waters and waters subject  
15 to U.S. jurisdiction; conducts safety inspections of most merchant vessels; and  
16 investigates marine casualties.

### 17 3.3.13.2 Regulatory Setting

18 Federal and State laws and regulations pertaining to this issue area and relevant to the  
19 Project are identified in **Table 3-69**.

20 **Table 3-69. Federal and/or State Laws, Regulations, and Policies Potentially**  
21 **Applicable to the Project (Public Services)**

U.S.	Code of Federal Regulations	<ul style="list-style-type: none"> <li>• Under <b>29 C.F.R. § 1910.38</b>, whenever an Occupational Safety and Health Administration (OSHA) standard requires one, an employer must have an Emergency Action Plan that must be in writing, kept in the workplace, and available to employees for review. An employer with 10 or fewer employees may communicate the plan orally to employees. Minimum elements of an emergency action plan are: <ul style="list-style-type: none"> <li>• Procedures for reporting a fire or other emergency;</li> <li>• Procedures for emergency evacuation, including type of evacuation and exit route assignments;</li> <li>• Procedures to be followed by employees who remain to operate critical plant operations before they evacuate;</li> <li>• Procedures to account for all employees after evacuation;</li> <li>• Procedures to be followed by employees performing rescue or medical duties; and <ul style="list-style-type: none"> <li>○ The name or job title of every employee who may be contacted by employees who need more information about the plan or an explanation of their duties under the plan.</li> </ul> </li> </ul> </li> <li>• Under <b>29 C.F.R. § 1910.39</b>, an employer must have a Fire Prevention Plan (FPP). A FPP must be in writing, be kept in the workplace, and be made available to employees for review; an employer with 10 or fewer employees may communicate the plan orally to employees. Minimum elements of a FPP</li> </ul>
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		<p>are:</p> <ul style="list-style-type: none"> <li>• A list of all major fire hazards, proper hazardous material handling and storage procedures, potential ignition sources and their control, and the type of fire protection equipment necessary to control each major hazard;</li> <li>• Procedures to control accumulations of flammable and combustible waste materials;</li> <li>• Procedures for regular maintenance of safeguards installed on heat-producing equipment to prevent the accidental ignition of combustible materials;</li> <li>• The name or job title of employees responsible for maintaining equipment to prevent or control sources of ignition or fires; and</li> <li>• The name or job title of employees responsible for the control of fuel source hazards.</li> <li>• An employer must inform employees upon initial assignment to a job of the fire hazards to which they are exposed and must also review with each employee those parts of the FPP necessary for self-protection.</li> <li>• Under <b>29 C.F.R. § 1910.155, Subpart L, Fire Protection</b>, employers are required to place and keep in proper working order fire safety equipment within facilities.</li> </ul>
CA	California Code of Regulations	Under <b>Title 19, Public Safety</b> , the California State Fire Marshal (CSFM) develops regulations relating to fire and life safety. These regulations have been prepared and adopted to establish minimum standards for the prevention of fire and for protection of life and property against fire, explosion, and panic. The CSFM also adopts and administers regulations and standards necessary under the California Health and Safety Code to protect life and property.

1 No local laws and regulations relevant to this issue are applicable to the Project.

### 2 3.3.13.3 Impact Discussion

3 ***a) Would the Project result in substantial adverse physical impacts associated***  
4 ***with the provision of new or physically altered governmental facilities or the need***  
5 ***for new or physically altered governmental facilities, the construction of which***  
6 ***could cause significant environmental impacts in order to maintain acceptable***  
7 ***service ratios, response times, or other performance objectives for any of the***  
8 ***public services?***

9 The OGPP would facilitate permits for short-term offshore surveys, resulting in the  
10 operation of survey equipment from vessels along the California coastline (primarily in  
11 Regions I and II). At affected ports, low energy geophysical survey activities would  
12 represent a very small proportion of overall vessel activity, and these activities would  
13 not be expected to introduce a need for long-term changes to fire or police protection  
14 services, nor would they generate a substantial short-term demand for additional fire,  
15 emergency, or law enforcement services.

16 Survey activities are unlikely to require fire services because the majority of the  
17 activities involve in-water activities. Additionally, vessels would be equipped with  
18 fire-suppression materials to handle small fires on-board. In the unlikely event of a  
19 larger fire, fire suppression services could be required; however, this potential

1 short-term impact would not require new or physically altered government facilities, nor  
2 would it result in a significant impact to local fire suppression services.

3 Vessel operations and survey activities could require emergency services (“Other Public  
4 Facilities”) if a worker injury occurs; however, such an event would not result in a  
5 significant impact to existing medical facilities. As determined above, short-term  
6 offshore operations would not be expected to increase project area populations;  
7 therefore, the OGPP would have no impact related to school and park services.

#### 8 3.3.13.4 Mitigation and Residual Impacts

9 **Mitigation.** The OGPP would not result in significant impacts to public services, and no  
10 mitigation is required.

11 **Residual Impacts.** The OGPP would have less than significant impacts on public  
12 services, no mitigation is required, and no residual impacts would occur.

1 **3.3.14 Recreation**

2 This section evaluates potential Project impacts to recreational facilities and recreational  
3 diving. Recreational and commercial fisheries are discussed in **Section 4.1**

<b>XIV. RECREATION:</b>	<b>Potentially Significant Impact</b>	<b>Less Than Significant with Mitigation</b>	<b>Less Than Significant Impact</b>	<b>No Impact</b>
a) Would the Project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Does the Project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Would the Project substantially interfere with recreational diving activities or have a substantial adverse effect on divers?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4 **3.3.14.1 Environmental Setting**

5 California ranks second only to Florida in the number of participants in coastal  
6 recreation, with nearly 18 million participants, most of whom take part in beach visits,  
7 swimming, surfing, scuba diving, wildlife viewing, photography, and various forms of  
8 boating (California Department of Fish and Game [CDFG] 2009). Scuba diving, in  
9 particular, may occur coincident with OGPP survey operations. Scuba diving is a  
10 popular activity along the California coast and offshore islands, especially in the  
11 Channel Islands off southern California. About 20 percent of California's 1.5 million  
12 certified divers are "active," meaning they have dived within the past year and plan to  
13 dive within the next year. California contributes an estimated 12 percent to the total  
14 national revenue generated by recreational scuba diving, generating approximately  
15 \$180 million annually in revenue from diving; equipment sales produce an additional  
16 \$60 million. Growth in the sector was estimated at 10–20 percent per year in the 1980s  
17 and 5–7 percent in the 1990s (Horizon Water and Environment LLC 2012a,b).

18 **Region I**

19 Region I (California/Mexico border northward to the Los Angeles/Ventura County line)  
20 contains numerous coastal parks and beaches, which attract visitors from all over the  
21 world who enjoy such activities as swimming, surfing, scuba diving, bird watching,  
22 whale watching, tidepooling, and hiking in scenic coastal environments. Southern  
23 California has seven of the State's 10 most-visited state parks, five of which are  
24 adjacent to the coast, including Huntington, Bolsa Chica, and Doheny State Beaches in  
25 Orange County, and San Onofre and Cardiff State Beaches in San Diego County.

1 Region I is also home to a large number of county and city beaches. Beach attendance  
2 estimates for Southern California range from 100 million to more than 150 million beach  
3 visits annually (CDFG 2009).

4 Recreational boating is also a popular and economically important activity in Region I.  
5 The nearshore ocean waters in Region I are fairly protected because of the geographic  
6 orientation of the Southern California Bight, with its east-west orientation protecting the  
7 regions from large oceanic events. The Channel Islands also provide protection on the  
8 leeward side (south-east side) of each island. There are also numerous bays, estuaries,  
9 and harbors in Region I, which provide protected waters conducive to boating. Major  
10 public boat launch facilities within Region I include the Marina Del Rey launch ramp,  
11 King Harbor boat hoist and small craft launch ramp, Cabrillo Beach launch ramp, South  
12 Shore launch ramp, and Davey's launch ramp in Los Angeles County; Sunset Aquatic  
13 launch ramp and Newport Dunes launch ramp in Orange County; and the Oceanside  
14 Harbor launch ramp, Dana Basin launch ramp, and Shelter Island launch ramp in San  
15 Diego County. Public launch facilities are located throughout Mission Bay and San  
16 Diego Bay, in addition to other locations throughout Region I (CDFG 2009).

17 According to a report published by the California Department of Boating and Waterways  
18 (2002) and updated during development of the Marine Life Protection Act (MLPA)  
19 regional profile for the South Coast study region (CDFG 2009), the most-used marine  
20 waterways in Region I (besides the marine waterways of the Pacific Ocean along all  
21 three Region I counties) include Channel Islands Harbor, Marina Del Rey, Mission Bay,  
22 Newport Harbor, Los Angeles-Long Beach Harbor, Dana Harbor, Santa Barbara  
23 Channel, San Pedro Bay, Santa Catalina Island, Alamitos Bay, San Diego Bay, Mission  
24 Bay, and Oceanside Harbor. The Pacific Ocean was the most used waterway off Los  
25 Angeles and Ventura counties, while San Diego Bay was most frequently used off San  
26 Diego County.

27 Scuba diving is a popular ocean-based recreational activity in Region I, with more than  
28 50 mainland locations identified as popular dive sites (**Table 3-70**), in addition to  
29 offshore islands (e.g., Channel Islands) within the region (e.g., Catalina). Scuba access  
30 points along the mainland coastline are numerous, are often easily accessible, and are  
31 also recognized for their scenic value (URS 2010a,b).

**Table 3-70. Popular Mainland Dive Locations Along the Southern California Coast, by County (Adapted from: URS 2010a,b)**

County	Popular Dive Locations
Los Angeles	Leo Carrillo (Beach, Lil Cove, and North Lot), Nicholas Canyon, La Piedra, El Pescador, El Matador, Paradise Cove, Escondido Creek, Latigo Beach, Latigo Canyon, Point Dume, Corral Beach, Big Rock, Topaz Jetty, Malaga Cove, Marineland, White Point, Gladstone's, Vet's Park, Cardiac Hill
Orange	Corona del Mar, Little Corona, Reef Point, North Crescent Bay, South Crescent Bay, Shaw's Cove, Fisherman's Cove, Heisler Park, Diver's Cove, Main Beach, Cleo Street Barge, Cress/Mountain Street, Wood's Cove, Montage Resort, Dana Point Harbor, Moss Point, Treasure Island, Aliso Beach
San Diego	La Jolla Canyon, Scripps Canyon, Goldfish Point, La Jolla Cove, Hospital Point, The Wreck of the Ruby E, Marine Room, Boomer Beach, Quast Hole, Sunset Cliffs, Osprey Point, Rockslide, Point Loma Kelp Beds, Swami's

## Region II

The coastline of Region II (Los Angeles/Ventura County line northward to the San Luis Obispo/Monterey County line) provides a wide array of recreational opportunities supported by the region's natural and aesthetic resources. The region's beaches, from narrow cove beaches flanked by granite cliffs to long strips of sand, support non-consumptive recreational activities such as swimming, surfing, sunbathing, boating, diving, sightseeing, hiking, kayaking, canoeing, whale watching, and tidepooling. Popular state parks and beaches include El Capitan State Beach (203,850 visitors in 2009) and Refugio State Beach (155,092 visitors in 2009) in Santa Barbara County, McGrath State Beach (160,543 visitors in 2009) in Ventura County, and Morro Bay State Park (1,515,506 visitors in 2003; 1,726,466 visitors in 2009), Pismo State Beach (1,177,518 visitors in 2003; 482,427 visitors in 2009), and Montaña De Oro State Park (776,651 visitors in 2003; 760,061 visitors in 2009) in San Luis Obispo County (CDFG 2005; California State Parks 2010). Other state beaches providing coastline access to recreationists include:

- Near Oxnard and Ventura, Ventura County—Oxnard, Mandalay, San Buenaventura, and Emma Wood State Beaches;
- Between Carpinteria and Gaviota, Santa Barbara County—Carpinteria and Gaviota State Beaches; and
- Between Pismo Beach and San Simeon, San Luis Obispo County—Avila, Morro Strand, Cayucos, and William Randolph Hearst Memorial State Beaches.

In addition, city and county beaches, such as Arroyo Burro and Isla Vista county beaches near Santa Barbara, provide recreation opportunities for thousands of visitors each year.

Sailing and boating are popular activities in Region II. Recreational boating with motor-powered, sail-powered, and hand-powered vessels (e.g., kayaks) occurs throughout the region, with the highest density around major harbors, including the Channel Islands Harbor launch ramp and Ventura Harbor launch ramp in Ventura County; the Gaviota Pier boat hoist, Goleta Pier boat hoist, and Santa Barbara Harbor launch ramp in Santa Barbara County; and harbors and ports in the Morro Bay region of San Luis Obispo County (Morro Bay, Avila, and Port San Luis). These locations provide jumping-off points for single or multiple-day boating trips. Many vessels, in particular sailboats, are moored in the region's marinas and buoyed areas.

According to Department of Boating and Waterways (2002), the most-used waterways in Region II (besides the marine waterways of the Pacific Ocean along the three counties) include Channel Islands Harbor, Santa Barbara Channel, and Morro Bay.

Scuba diving is also a popular recreational activity in Region II, with nearly 20 mainland locations identified as popular dive sites (**Table 3-71**). One of the most popular dive destinations in Region II is the northern Channel Islands, with dive boat operations providing access from Santa Barbara and Ventura harbors (Jones & Stokes 2006, 2007).

**Table 3-71. Popular Mainland Dive Locations Along the Central California Coast, by County (Adapted from: Jones & Stokes 2006, 2007)**

County	Popular Dive Locations
Santa Barbara	Naples Reef, Carpinteria Reef, Gaviota State Beach, Tajiguas, Refugio State Park, Ellwood, Isla Vista, Arroyo Burro Park, Leadbetter, Mesa Lane, Hammonds
Ventura	Rincon Reef, La Jennelle, Long Walk, North Deer Creek, Deer Creek Road, Staircase, Neptune's Net

### Region III

The coastal counties within Region III (Monterey, Santa Cruz, San Mateo, San Francisco, Marin, and Sonoma counties) have some of the most popular coastal attractions and destinations in the State, including Monterey Bay Aquarium, Santa Cruz Beach and Boardwalk, Golden Gate Bridge, Point Reyes National Seashore, scenic lighthouses, miles of spectacular beaches, and many scenic coastal towns such as Carmel, Monterey, Half Moon Bay, Point Reyes, and Bodega Bay. With its numerous coastal parks and beaches, the region attracts visitors to swim, surf, dive, bird watch, whale watch, observe tide pools, and hike the magnificent coastal environments. Popular state beaches in the region include Monterey State Beach in Monterey County; Seacliff and New Brighton State Beaches in the Santa Cruz area; Ocean Beach in San Francisco; Stinson Beach in Marin County; and several other beaches in the Golden Gate Recreation Area and the Point Reyes National Seashore. Region III also includes several ports and public and private boat launching facilities for embarking on single- or



multiday trips to places such as Monterey, Moss Landing, Santa Cruz, San Francisco, and Bodega Bay.

Scuba diving is a popular recreational activity in Region III, with nearly 50 mainland locations identified as popular dive sites (**Table 3-72**).

**Table 3-72. Popular Mainland Dive Locations Along the North Central California Coast, by County (Adapted from: ICF Jones & Stokes 2009a,b)**

County	Popular Dive Locations
Sonoma	Richardson, Horseshoe Cove, Fisk Mill Cove, Stump Beach, Gerstle Cove, Gerstle Pinnacle, Ocean Cove, Stillwater Cove, Cemetary Reef, Timber Cove, Windmere Point/Lomer Gulch, Fort Ross Cove, Fort Ross Reef, Red Barn/Pedotti's Ranch/Sheep Ranch, Russian Gulch
Marin	Tomales Point, Abalone Point/Double Point, San Agustin
San Francisco	Noonday Rock, Isle of St. James, Middle Farallon, Henry Bergh
Santa Cruz	Boardwalk, Seacliff Beach, Capitola Pier
Monterey	Monterey Bay, Monterey Breakwater/San Carlos Beach, Lover's Point, Carmel Bay, Del Monte Beach, MacAbee Beach, Lovers Cove, Otter Cove, Coral Street Cove, Point Pinos, Stillwater Cove, Butterfly House, Stewart's Point, Monastery Beach, Point Lobos, Big Sur Coast, Jade Cove, Julia Pfeiffer Burns State Park, Garrapata Park, Point Estero

The majority of scuba diving sites are found in Sonoma and Mendocino counties, although the southern portion of the region is also very popular among recreational divers. For example, Monterey and Carmel Bays are primary dive destinations for non-consumptive recreational scuba divers seeking shoreline access, while less accessible destinations are visited by dive vessels. Divers travel by boat southward beyond Carmel Bay to visit the north Big Sur coast, between Point Lobos and Point Sur (Jones & Stokes 2009a,b).

#### Region IV

In Region IV (Sonoma/Mendocino County line northward to California-Oregon border), beaches and accessible shores provide opportunities to participate in a variety of activities along a rugged coastline with spectacular scenic vistas. Land-based recreation activities along the Mendocino, Humboldt, and Del Norte County coastlines support coastal tourism, facilitated by vista points along State Route (SR) 1, beach use, and wildlife viewing from shore and land points. Non-consumptive water-based activities include swimming, surfing, scuba diving, tidepooling, whale watching, boating, kayaking, and boating from public ports and public and private marinas. In particular, historic Mendocino and the Mendocino Headlands are a popular tourist destination, with nearby Fort Bragg providing opportunities for recreational boating and whale watching. Boating also originates from facilities in Eureka and Crescent City. Popular coastal state parks

1 include Van Damme and Mackerricher State Parks in Mendocino County, and Patrick's  
2 Point and Prairie Creek Redwoods State Parks in Humboldt County.

3 Scuba diving is a popular recreational activity in Region IV, particularly along the  
4 Mendocino coast. Region IV has more than 40 mainland locations identified as popular  
5 dive sites (**Table 3-73**).

6 **Table 3-73. Popular Mainland Dive Locations Along the North California Coast, by**  
7 **County (Adapted from: Horizon Water and Environment LLC 2012a,b)**

County	Popular Dive Locations
Del Norte	St. George's Reef, High Bluff Beach, Wilson Creek Beach, Enderts Beach, Crescent Beach, Crescent City Harbor, Crescent City Beaches, Battery Point Lighthouse
Humboldt	King Range National Conservation Area, Mottole River/Mattole River Beach, Mattole Road beaches, Reading Rock, Cape Mendocino, Samoa Dunes Recreation Area/North Spit/North Jetty/South Jetty, Trinidad State Beach, Patrick's Point State Park, Redwood National Park
Mendocino	Nowhere Reef, Navarro River Beach, Bull Rock, Albion River Flats, Colby Reef, Van Damme State Park, Blow Hole, Jack Peters Gulch, Russian Gulch State Park, The Pipeline, The Bathrooms, Caspar Bay, Jug Handle State Reserve, Glass Beach, MacKerricher Beach State Park, Usal Beach, Mendocino Highlands, Arena Rock, Arena Cove, Arena Bay, Collins Landing

### 8 3.3.14.2 Regulatory Setting

9 Federal and State laws and regulations pertaining to this issue area and relevant to the  
10 Project are identified in **Table 3-74**.

11 **Table 3-74. Federal and/or State Laws, Regulations, and Policies Potentially**  
12 **Applicable to the Project (Recreation)**

CA	California Coastal Act Chapter 3 policies	<p>Coastal Act Chapter 3 policies applicable to recreation are:</p> <ul style="list-style-type: none"> <li>• <b>Section 30220.</b> Coastal areas suited for water-oriented recreational activities that cannot readily be provided at inland water areas shall be protected for such uses.</li> <li>• <b>Section 30221.</b> Oceanfront land suitable for recreational use shall be protected for recreational use and development unless present and foreseeable future demand for public or commercial recreational activities that could be accommodated on the property is already adequately provided for in the area.</li> <li>• <b>Section 30222.</b> The use of private lands suitable for visitor-serving commercial recreational facilities designed to enhance public opportunities for coastal recreation shall have priority over private residential, general industrial, or general commercial development, but not over agriculture or coastal-dependent industry.</li> <li>• <b>Section 30223.</b> Upland areas necessary to support coastal recreational uses shall be reserved for such uses, where feasible.</li> <li>• <b>Section 30224.</b> Increased recreational boating use of coastal waters shall be encouraged, in accordance with this division, by developing dry storage areas, increasing public launching facilities, providing additional berthing space in existing harbors, limiting non-water-dependent land uses that congest access corridors and preclude boating support facilities, providing harbors of refuge, and by providing for new boating facilities in natural harbors, new protected water areas, and in areas dredged from dry land.</li> </ul>
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Additional information on the regulatory framework for recreational resources in the California marine and coastal environment can be found in the following documents:

- **Region I:** South Coast Marine Protected Areas Project Environmental Impact Report (EIR) (United Research Services [URS] 2010a,b);
- **Region II:** South Coast Marine Protected Areas Project EIR (URS 2010a,b) and California Marine Life Protection Act Initiative Central Coast Marine Protected Areas Project EIR (Jones & Stokes 2006, 2007);
- **Region III:** California Marine Life Protection Act Initiative Central Coast Marine Protected Areas Project EIR (Jones & Stokes 2006, 2007) and California Marine Life Protection Act Initiative North Central Coast Marine Protection Areas Project EIR (ICF Jones & Stokes 2009a,b); and
- **Region IV:** Marine Life Protection Act – North Coast Study Region EIR (Horizon Water and Environment LLC 2012a,b).

#### 3.3.14.3 Impact Analysis

This section addresses potential impacts on recreational facilities. It should be noted that the two Checklist questions do not address potential effects on recreational fishing or other recreational activities, such as the potential of the OGPP to diminish the quality of visual resources that support onshore recreational activities, including beach activity. Potential impacts on onshore recreational activities are discussed in **Section 3.3.1, Aesthetics**; potential impacts on recreational fishing are discussed in **Section 4.1, Commercial and Recreational Fishing**; and potential conflicts with recreational boat traffic are discussed in **Section 3.3.15, Transportation/Traffic**.

***a) Would the Project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?***

**No Impact.** Geophysical survey vessels would use existing harbors and would have no effect on neighborhood or regional parks. Vessel and crew use of harbor facilities would not result in the substantial physical deterioration of these facilities.

***b) Does the Project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?***

**No Impact.** Geophysical survey vessels would be expected to mobilize, overnight, and berth at the available port closest to survey locations. As a result, onshore activities related to surveys would mostly occur on board vessels and in ports while vessels are moored at established berths. Although most of the future survey activity under the

OGPP is anticipated to occur in Regions I and II, the berthing locations of the 10 to 12 surveys expected each year would be spread across several ports and harbors, and no additional facilities would be needed to accommodate survey vessels. Similarly, survey activities would not result in an increase in local area populations or generate a demand for onshore recreation facilities. Therefore, the OGPP would not result in the deterioration of existing recreation facilities or require the construction of new facilities.

Coastal Act policies that pertain to recreation facilities require the protection of facilities that serve the boating (recreational and commercial) industries. The OGPP would be consistent with these requirements in regard to onshore facilities because permitted geophysical surveys would not result in impacts to existing recreation facilities or require the development of new facilities. Also, as described in **Section 4.1, Commercial and Recreational Fisheries**, the OGPP would not result in significant impacts to recreational fishing.

***c) Would the Project substantially interfere with recreational diving activities or have a substantial adverse effect on divers?***

**Less than Significant with Mitigation.** Survey equipment noise has the potential to adversely affect recreational divers if they are present near the survey vessel or towed equipment. The current acoustic exposure threshold for recreational scuba divers is 145 decibels (dB) referenced to (re) 1 microPascal ( $\mu$ Pa) root mean square (rms) (Parvin et al. 2002; Parvin 2005). OGPP equipment source levels range between approximately 200 and 234 dB re 1  $\mu$ Pa rms, however, beam widths are quite variable, ranging between 1° and 40°. Narrow beam widths, when coupled with these source levels, indicate that the greatest potential for acoustic impact to divers from low energy geophysical surveys would occur immediately below the vessel and/or equipment. Using maximum horizontal distances (see Appendix G) and discounting the narrow beam width characteristic of many sources, the attenuation of source levels to the 145 dB isopleth is expected to occur within 1 to 2 kilometers (km) for the boomer and side-scan sonar, and significantly less for remaining low energy geophysical survey equipment sources.

OGPP surveys are typically short term, lasting several days and within relatively small survey areas. Impacts to recreational diving activities would be less than significant due to the limited duration and areal extent of OGPP survey operations in a particular survey area. However, impacts to recreational divers individually could be higher than the 145 dB threshold absent compliance with existing maritime rules and additional mitigation identified below.

OGPP survey vessel operators conduct operations in compliance with USCG navigation rules. Pursuant to California's Harbors and Navigation Code, both divers and vessels are required to utilize and recognize a dive flag (i.e., a red flag with a white diagonal

running from the upper left-hand corner to the lower right-hand corner). A dive flag is required to be displayed on the water, indicating the presence of a person or persons engaged in diving in the water in the immediate area. When a dive flag is flown and observed, OGPP vessel operators will exercise precaution commensurate with conditions indicated. OGPP survey vessel operators will be aware of dive vessels flying the dive flag, and will avoid coming into close proximity to dive operations. When dive flags are properly used, impacts to recreational divers will be less than significant.

Divers entering the water from shore may or may not employ a surface float and attendant dive flag, although it is considered prudent to do so. In the event a diver is not using a dive flag, it would be difficult for a vessel operator to readily identify a diver while underwater in the vicinity. Under these circumstances, it is possible that a diver might be exposed to equipment noise from survey operations, particularly if the survey vessel passes overhead.

#### 3.3.14.4 Mitigation and Residual Impacts

**Mitigation.** The OGPP would not result in significant recreation impacts, with the exception of potential impacts to recreational divers. Impacts to recreational divers will be limited to those situations where divers are not flying the dive flag and OGPP survey vessel operators are unable to recognize divers in the vicinity of survey operations. Implementation of mitigation measure (MM) **REC-1** will minimize the potential for acoustic-related impacts to recreational divers, such that the impact would be less than significant.

**MM REC-1: U.S. Coast Guard (USCG), Harbormaster, and Dive Shop Operator Notification.** Permittees shall provide the USCG with survey details, including information on vessel types, survey locations, times, contact information, and other details of activities that may pose a hazard to divers so that USCG can include the information in the Local Notice to Mariners, advising vessels to avoid potential hazards near survey areas. Furthermore, Permittees shall post such notices in the harbormasters' offices of regional harbors at least 15 days in advance of in-water activities and notify local dive shop operators of proposed survey operations at least 15 days in advance of in-water activities.

**Residual Impacts.** For all recreation impacts except for recreational diving, the OGPP would not result in impacts related to recreation facilities and no mitigation is required. Implementation of notification procedures outlined in **MM REC-1** will reduce the potential for impact because it would provide adequate notice on the time and location of survey activities to allow divers to avoid the area of effect; residual impacts would be less than significant.

### 1 3.3.15 Transportation/Traffic

<b>XVI. TRANSPORTATION/TRAFFIC:</b> Would the Project:	<b>Potentially Significant Impact</b>	<b>Less Than Significant with Mitigation</b>	<b>Less Than Significant Impact</b>	<b>No Impact</b>
a) Conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Result in inadequate emergency access?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities or otherwise decrease the performance or safety of such facilities?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

2 The following section discusses existing marine vessel transportation routes and vessel  
3 activity within the Offshore Geophysical Permit Program (OGPP or Project) area.

#### 4 3.3.15.1 Environmental Setting

### 5 Region I

6 Two of the busiest port complexes in the United States are located in Region I, including  
7 the Los Angeles port complex (Los Angeles and Orange Counties) and the San Diego  
8 port complex (San Diego County). Each port complex contains major ports (Tier 1 ports)  
9 and minor ports (Tier 2 ports). Tier one ports are large, heavily used ports that support  
10 various uses.

1    *Port of Los Angeles (Los Angeles County)*

2    The Port of Los Angeles is the busiest port in the United States by container volume,  
3    and the 16th-busiest container port internationally (URS 2010a,b). The Port of Los  
4    Angeles handles high levels of vessel traffic that mainly support the transportation of oil  
5    and petroleum products. The port is also home to the World Cruise Center, serving  
6    approximately 11 cruise lines. In addition, a public boat launch facility, and chartered  
7    sportfishing and whale watching businesses are located within the port.

8    *Port of Long Beach (Los Angeles County)*

9    The Port of Long Beach is the second-busiest seaport in the United States, and the  
10   17th-busiest container port internationally. The port is also home to Carnival Cruise  
11   Line's Long Beach Cruise Terminal, plus a variety of private docks, as well as several  
12   public boat launch facilities, marinas, and chartered sportfishing and whale watching  
13   services within the port.

14   *Port of San Diego (San Diego County)*

15   The Port of San Diego is located in San Diego Bay and is one of the three busiest port  
16   complexes in the country, with high amounts of vessel traffic that support the  
17   transportation of oil and petroleum products (California Department of Fish and Game  
18   [CDFG] 2009). The port also has a large volume of military vessel traffic. The port hosts  
19   two maritime cargo terminals, a cruise ship terminal, 17 public parks, multiple public  
20   boat launch facilities, and the largest charter sportfishing fleet in the State. The port's B  
21   Street Cruise Ship Terminal hosts approximately 190 cruise ships and receives  
22   approximately 200 annual cruise ship calls.

23   Several Tier 2 ports are located in the region. Tier 2 ports typically consist of marinas,  
24   boat slips, and boat launching facilities, and primarily support sportfishing and  
25   recreational boating, including charters and rentals, and boat clubs. Tier two ports in  
26   Los Angeles County include Marina Del Rey (City of Marina Del Rey), Avalon Harbor  
27   (Santa Catalina Island), and King Harbor (Santa Monica Bay). Orange County offers  
28   Tier 2 ports at Dana Point Harbor (City of Dana Point), Newport Harbor (City of Newport  
29   Beach), and Huntington Harbor (City of Huntington Beach). Areas around Newport  
30   Harbor and Huntington Harbor also have a large variety of private dock locations. In  
31   San Diego County, Tier 2 ports include Mission Bay (City of Mission Bay) and  
32   Oceanside Harbor (City of Oceanside).

33   Marine waters off of Southern California are a heavily traveled vessel transportation  
34   corridor. The most congested vessel areas are considered to be at the entrances to  
35   major ports in the region. Harbor Safety Committees established by state law at the  
36   major ports, improved Vessel Traffic Service, and other safety measures have served to  
37   improve navigation safety and response in these areas (CDFG 2009).

1 Designated coastwise shipping lanes traverse the Southern California coast from near  
2 Region II's Point Arguello, in western Santa Barbara County, through the Santa Barbara  
3 Channel, continuing southeast to the Ports of Los Angeles and Long Beach, then south  
4 to the Port of San Diego. The shipping lanes consist of both a Northbound and  
5 Southbound Coastwise Traffic Lane with a Separation Zone in between. Most coastwise  
6 vessel traffic passes through the Santa Barbara Channel en route to major ports on the  
7 U.S. west coast. Exceptions are super tankers, which for safety reasons generally avoid  
8 the channel by traveling south of the Channel Islands. Vessel transportation in the south  
9 coast (Region I) includes tankers, container ships, bulk carriers, military vessels,  
10 research vessels, cruise ships, tugs and tows, commercial and recreational fishing  
11 boats, and other commercial and recreational vessels (URS 2010a,b).

12 The coastwise shipping lanes operate in accordance with a Traffic Separation Scheme  
13 (TSS). A TSS is an internationally recognized vessel routing designation that separates  
14 opposing flows of vessel traffic into lanes approximately 1 nautical mile (nm) wide (such  
15 as the Northbound Coastwise Traffic Lane), with a zone between lanes approximately  
16 2 nm wide (Separation Zone) where traffic is to be avoided. Vessels are not required to  
17 use any designated TSS, but failure to use one, if available, would be a major factor in  
18 determining liability in case of a collision (URS 2010a,b).

19 In addition to a TSS, vessel operations in Region I are restricted in military use areas  
20 and near coastal power plants. Refer to South Coast Marine Protected Areas Project  
21 Draft Environmental Impact Report (EIR) (URS 2010a,b) for more information.

## 22 **Region II**

23 Several ports are located in Region II, with the largest located in the City of Port  
24 Hueneme. Important ports in the region include the following:

### 25 *Port Hueneme (Ventura County)*

26 Port Hueneme serves as California's only deep-water port between Los Angeles and  
27 San Francisco. The port contains six wharves that are used for cargo transfer, tanker  
28 lightering, servicing offshore oil supply vessels, and to a lesser extent, commercial  
29 fishing and sportfishing. The Port of Hueneme handles a variety of commodities in  
30 addition to offshore oil and gas supplies (CDFG 2009). Recently, the number of annual  
31 vessel calls was 270, but is expected to increase to almost 500 by 2020 due to wharf  
32 infrastructure investment projects (URS 2010a,b).

### 33 *Ventura Harbor (Ventura County)*

34 Ventura Harbor contains both a marina and a boat launch and supports recreational  
35 boating, swim beaches, and commercially operated recreation operations such as  
36 sportfishing charters, tours, scuba diving, and sailing (URS 2010a,b).



1 *Channel Islands Harbor (Ventura County)*

2 Channel Islands Harbor is located in the city of Oxnard. Similar to Ventura Harbor,  
3 Channel Islands Harbor contains both a marina and boat launch that support  
4 recreational boating, swim beaches, and commercially operated businesses such as  
5 sportfishing, tours, scuba diving, and sailing (URS 2010a,b).

6 *Santa Barbara Harbor (Santa Barbara County)*

7 Located in Santa Barbara, the harbor holds 1,054 slips, side and end ties, 16 open  
8 water moorings, and 24 fishermen float spaces. The harbor contains four marinas and a  
9 boat launch that support recreational boating and commercial operations such as  
10 sportfishing, wildlife tours, yacht cruises, and sailing (URS 2010a,b).

11 *Morro Bay Port (San Luis Obispo County)*

12 Located at Morro Bay, the port is a commercial harbor that features commercial fishing  
13 vessels, Commercial Passenger Fishing Vessels (CPFVs), and private recreational  
14 boating facilities.

15 *Port San Luis (San Luis Obispo County)*

16 Located at Avila Beach, Port San Luis is a small craft harbor that features commercial  
17 fishing vessels, CPFVs, and private recreational boating facilities.

18 In San Luis Obispo County, minor harbors or launches are located at Cambria and San  
19 Simeon. Both provide landing facilities for private recreational vessels.

20 Vessel transportation in Region II includes many types of vessels, including tankers,  
21 container ships, bulk carriers, military vessels, commercial and recreational fishing  
22 boats, and other recreational boats. Commercial fishing vessels operating in the region  
23 can generally be categorized as follows:

- 24 • **Purse Seine vessels.** Purse seiners catch salmon, herring and squid by  
25 encircling them with a long net and drawing (pursing) the bottom closed to  
26 capture the fish. Purse seiners are sleek, cabin-forward vessels.
- 27 • **Trap vessels.** Trap vessels target Dungeness crab, rock crab, spot prawn,  
28 nearshore finfish, or sablefish using twine or wire-meshed, steel or plastic pots  
29 (traps), either attached in strings or fished separately. Trap vessels come in a  
30 variety of sizes and configurations, up to 50 feet (ft) or more in length.
- 31 • **Troll vessels.** Trollers catch salmon by “trolling” bait or lures through feeding  
32 concentrations of fish. Trollers come in a variety of sizes and configurations, up  
33 to 50 ft or more in length.

- 1       • **Trawl vessels.** Trawlers typically catch large quantities of mid-water species and  
2       bottomfish by towing a large cone-shaped net. Trawlers are generally large  
3       vessels, up to 600 ft in length. Trawlers generally transit the nearshore region to  
4       offshore fishing grounds.
- 5       • **Longline vessels.** Longliners catch bottomfish (primarily halibut, black cod,  
6       lingcod, and rockfish) via a long line that is laid on the bottom, with attached  
7       leaders and baited hooks. Longliners are typically 50 to 100 ft in length.
- 8       • **Gill net vessels.** Gill net vessels catch salmon by setting curtain-like nets  
9       perpendicular to the direction in which the fish are traveling as they migrate along  
10      the coast toward their natal streams. Gill net vessels are usually 30 to 40 ft in  
11      length. While not permitted to fish within the study region, gillnetters may transit  
12      the region to fish in other areas.
- 13      • **Other hook-and-line vessels.** These vessels use fewer hooks on shorter lines  
14      or “stick” gear to catch primarily nearshore and shelf finfishes. Most  
15      hook-and-line vessels are less than 50 ft in length.

16   As discussed previously for Region I, designated shipping lanes traverse the coastline  
17   from Point Arguello, in western Santa Barbara County, through the Santa Barbara  
18   Channel, continuing on to ports in Los Angeles and San Diego counties. The shipping  
19   lanes consist of both a Northbound and Southbound Coastwise Traffic Lane and a  
20   Separation Zone in between. Most coastwise vessel traffic passes through the Santa  
21   Barbara Channel en route to major ports on the U.S. west coast. Exceptions are super  
22   tankers, which for safety reasons generally avoid the channel by traveling south of the  
23   Channel Islands. As is the case in other coastal regions, vessel traffic is governed by  
24   regulations for Regulated Navigation Areas, with vessels operating according to  
25   International Navigation Rules, as described in the draft and final EIRs: California  
26   Marine Life Protection Act Initiative Central Coast Marine Protected Areas Project  
27   (Jones & Stokes 2006, 2007).

28   As identified for Region I, vessel operations in Region II are restricted in military use  
29   areas and near coastal power plants. Refer to South Coast Marine Protected Areas  
30   Project draft and final EIRs (URS 2010a,b) and draft and final EIRs: California Marine  
31   Life Protection Act Initiative Central Coast Marine Protected Areas Project (Jones &  
32   Stokes 2006, 2007) for additional information.

### 33   **Region III**

34   Region III contains some of the busiest shipping lanes in the  
35   State. Over 6,000 commercial vessels (excluding domestic fishing vessels) enter and  
36   exit San Francisco Bay each year, of which less than 25 percent are of intermediate  
37   size (draft less than 50 ft) and about 5 percent are large vessels (draft greater than 50  
38   ft); remaining vessels are small vessels with limited draft (CDFG 2007). Elsewhere in

1 Region III, nearshore vessel traffic consists primarily of commercial fishing vessels,  
2 CPFVs, and private recreational vessels.

3 Important ports in the southern part of Region III include Monterey Harbor and the port  
4 at Moss Landing in Monterey County, and Santa Cruz Harbor in Santa Cruz County. In  
5 the central part of the region, ports associated with the San Francisco Bay port complex  
6 includes ports such as San Francisco, Princeton/Half Moon Bay, Sausalito, Richmond,  
7 Oakland and Berkeley. North of San Francisco, ports are located at Dillon Beach,  
8 Timber Cove, Marshall, Bodega Bay, Inverness, Point Reyes, Marconi Cove, Bolinas  
9 and Tomales Bay.

10 Vessel navigation in Region III is governed by navigational rules described in the draft  
11 and final EIRs: California Marine Life Protection Act Initiative Central Coast Marine  
12 Protected Areas Project (Jones & Stokes 2006, 2007) and draft and final EIRs:  
13 California Marine Life Protection Act Initiative North Central Coast Marine Protection  
14 Areas Project (ICF Jones & Stokes 2009a,b).

#### 15 **Region IV**

16 Nearshore vessel traffic in Region IV primarily consists of commercial fishing vessels,  
17 CPFVs, and private recreational vessels. No deep-water ports accommodating cargo  
18 ships or tankers are located in the region. Although the ports in Region IV are relatively  
19 small compared to ports in other regions, the ports support regionally important  
20 commercial and recreational fishing industries, as well as the tourist industry.

21 Ports in Region IV are grouped into the Fort Bragg Port Complex and the Eureka Port  
22 Complex. The Fort Bragg Port Complex includes ports at Albion, Point Arena, Anchor  
23 Bay, and Noyo-Fort Bragg in Mendocino County. In the Eureka Port Complex, ports are  
24 located at Shelter Cove, Fields Landing, King Salmon, Eureka, and Trinidad in  
25 Humboldt County, and at Crescent City in Del Norte County. Smaller ports and harbors  
26 are located elsewhere in the region.

27 Vessel navigation in Region IV is governed by navigational rules described in the  
28 Marine Life Protection Act – North Coast Study Region draft and final EIRs (Horizon  
29 Water and Environment LLC 2012a,b).

#### 30 **3.3.15.2 Regulatory Setting**

31 Federal and State laws and regulations pertaining to this issue area and relevant to the  
32 Project are identified in **Table 3-75**.

**Table 3-75. Federal and/or State Laws, Regulations, and Policies Potentially Applicable to the Project (Transportation/Traffic)**

U.S.	Ports and Waterways Safety Act	This Act provides the authority for the USCG's program to increase vessel safety and protect the marine environment in ports, harbors, waterfront areas, and navigable waters, including by authorizing the Vessel Traffic Service, controlling vessel movement, and establishing requirements for vessel operation.
CA	California Vehicle Code	Chapter 2, Article 3 of the Vehicle Code defines the powers and duties of the California Highway Patrol, which has enforcement responsibilities for the vehicle operation and highway use in the State.
CA	Other	The California Department of Transportation is responsible for the design, construction, maintenance, and operation of the California State Highway System and the portion of the Interstate Highway System in California.

Additional information on the regulatory framework for vessel transportation and traffic in the California marine and coastal environment can be found in the following documents:

- **Region I:** South Coast Marine Protected Areas Project EIR (United Research Services [URS] 2010a,b);
- **Region II:** South Coast Marine Protected Areas Project EIR (URS 2010a,b) and California Marine Life Protection Act Initiative Central Coast Marine Protected Areas Project EIR (Jones & Stokes 2006, 2007);
- **Region III:** California Marine Life Protection Act Initiative Central Coast Marine Protected Areas Project EIR (Jones & Stokes 2006, 2007) and California Marine Life Protection Act Initiative North Central Coast Marine Protection Areas Project EIR (ICF Jones & Stokes 2009a,b); and
- **Region IV:** Marine Life Protection Act – North Coast Study Region EIR (Horizon Water and Environment LLC 2012a,b).

### 3.3.15.3 Impact Analysis

**Significance Criteria.** The Transportation/Traffic guidance questions listed in the checklist above are worded in a way conducive to assessing onshore traffic issues, but do not explicitly consider the particular vessel traffic-related issues that offshore projects can generate. Accordingly, the CSLC often uses additional significance criteria for projects involving vessel traffic (for example, see CSLC 2012a). Consistent with these past documents and an adaptation of the above questions, a significant transportation impact would be considered to result if the Project:

- Reduces the existing level of safety for vessels transiting the Project area; or
- Substantially increases the potential for vessel collisions.

1 These criteria have been integrated into the impact discussions below.

2 ***a) Conflict with an applicable plan, ordinance, or policy establishing measures of***  
3 ***effectiveness for the performance of the circulation system, taking into account***  
4 ***all modes of transportation including mass transit and non-motorized travel and***  
5 ***relevant components of the circulation system, including but not limited to***  
6 ***intersections, streets, highways and freeways, pedestrian and bicycle paths, and***  
7 ***mass transit?***

8 **No Impact.** With the exception of creating potential vessel hazards, as discussed below  
9 under **(d)**, survey activities permitted under the OGPP would not conflict with applicable  
10 plan, ordinance, or policy establishing measures of effectiveness for the performance of  
11 transportation circulation systems.

12 ***b) Conflict with an applicable congestion management program, including but not***  
13 ***limited to level of service standards and travel demand measures, or other***  
14 ***standards established by the county congestion management agency for***  
15 ***designated roads or highways?***

16 **Less than Significant Impact.** Surveys permitted by the OGPP would generate a small  
17 amount of temporary traffic on local roads as vessel crews and suppliers travel to  
18 harbors where survey vessels are berthed. Considering the small number of surveys  
19 anticipated each year (10 to 12 surveys), the distribution of surveys across several  
20 harbors, and the relatively small size of survey crews (i.e., six to ten crew, including  
21 geophysical survey team), minimal new traffic would be generated on local roads by  
22 survey activities. The addition of boat crew-related commute trips to roadways that  
23 provide access to harbors would be a temporary impact, but would not be expected to  
24 result in significant impacts to existing circulation system conditions or conflict with local  
25 or regional standards for roadway operations. Additionally, temporary increases in  
26 vehicle traffic to harbors would not conflict with a traffic-related policy or Congestion  
27 Management Plan.

28 The OGPP would lead to a small increase in vessel traffic that would likely be  
29 indistinguishable from normal daily use patterns, and is therefore less than significant.

30 ***c) Result in a change in air traffic patterns, including either an increase in traffic***  
31 ***levels or a change in location that results in substantial safety risks?***

32 **No Impact.** Surveys permitted under the OGPP would not include any activities that  
33 would require the use or modification of existing air space. As such, no impacts to air  
34 traffic patterns or air traffic levels would result from the OGPP.

35 ***d) Substantially increase hazards due to a design feature (e.g., sharp curves or***  
36 ***dangerous intersections) or incompatible uses (e.g., farm equipment)?***

1 **Less than Significant Impact with Mitigation.** Under the OGPP, permitted  
2 geophysical surveys could reduce the existing level of safety for vessels transiting the  
3 Project area, or increase the potential for vessel collisions by adding vessel traffic to  
4 marine waters or by deploying equipment hazardous to marine transportation.

5 Surveys would increase vessel traffic in State waters (within 3 nm of the shoreline) as  
6 survey vessels transit between ports and survey locations, and conduct survey  
7 activities. As described in **Section 2, Project Description**, vessels used for specific low  
8 energy geophysical surveys are selected based on their cost and capabilities, including  
9 their ability to navigate, to deploy and retrieve various pieces of equipment, and their  
10 maximum draft in shallow areas. Vessels selected for surveys are variable, but are  
11 typically in the 100- to 200-ft size range, but may be smaller depending on the type of  
12 survey being conducted and its location. For example, smaller, more maneuverable  
13 vessels are employed in areas of restricted movement, such as within bays or  
14 navigation channels.

15 Within State waters, permitted surveys could occur anywhere between the edge of the  
16 surf zone and 3 nm offshore. For example, infrastructure surveys could take vessels  
17 close to the surf line. Alternatively, surveys could be conducted further offshore,  
18 including in designated shipping lanes. The timing of surveys is also broad, although  
19 most survey activities would occur during daytime hours. If a particular survey window is  
20 broad, geophysical contractors will take into consideration local conditions and, on  
21 occasion, long-range weather forecasts. Vessel operations are easier for crew members  
22 and the geophysical team aboard when conditions are good. On occasion, the work  
23 window is very narrow, and vessels must operate within that window, regardless of  
24 conditions.

25 Most geophysical surveys permitted under the OGPP are expected to occur in Regions  
26 I and II. As discussed in **Section 3.3.15.1** above, vessel traffic, including cargo ships,  
27 tankers, commercial and recreational fishing boats, and other types of commercial and  
28 recreational vessels, is heavy near ports in these regions. Additionally, designated  
29 shipping lanes traverse the coastline from Point Arguello, in western Santa Barbara  
30 County, through the Santa Barbara Channel, continuing on to ports in Los Angeles and  
31 San Diego counties.

32 Under the OGPP, vessel traffic attributable to surveys is not anticipated to be  
33 substantial, annually contributing about 80 vessel days of traffic, primarily during  
34 daylight hours, that would be distributed throughout the study region, but mostly within  
35 Regions I and II. Although the contribution of survey vessels would be minor in the  
36 context of overall vessel traffic, survey vessels could add to congestion in some areas,  
37 particularly near busy ports and shipping lanes (e.g., in the vicinity of the Santa Barbara  
38 Channel), increasing the potential for vessel interactions during transit or while  
39 conducting survey activities. Survey vessels, however, are required under USCG

1 regulations to make clear their presence through appropriate markings and/or lighting to  
2 designate the vessels as either towing equipment, conducting diver operations, or  
3 operating with limited maneuverability. Furthermore, survey vessels would likely stay  
4 clear of inbound and outbound vessel traffic, not only for safety reasons, but also  
5 because noise from other vessels could interfere with survey data collection. The  
6 potential for collisions would be reduced by following standard procedures used by  
7 vessel operators to avoid collisions, including visual observation, radar, and checking  
8 notices to mariners concerning activity in the area. The implementation of mitigation  
9 measure (MM) **FISH-1** (see **Section 4.1, Commercial and Recreational Fisheries**)  
10 requiring survey applicants to provide notices to local vessel operators through the  
11 issuance of a Local Notice to Mariners (LNM), would further reduce the potential for  
12 vessel collisions. The United States Coast Guard (USCG) issues LNMs on a monthly  
13 basis with weekly supplements categorized by District Boundaries. These advisories  
14 contain information on the locations, times, and details of activities that may pose  
15 hazards to mariners (i.e., barges, buoys). With the addition of this mitigation, the small  
16 increase in vessel traffic under the OGPP would not be expected to substantially reduce  
17 vessel safety conditions and, therefore, would not be expected to result in a significant  
18 transportation impact.

19 Under surveys permitted by the OGPP, survey equipment potentially hazardous to  
20 navigation may be deployed in areas frequented by other vessels, including commercial  
21 fishing and recreational vessels. Most survey equipment is either hull mounted or  
22 deployed over the side, traveling just below the surface either in close proximity to the  
23 vessel or behind the vessel. (There are limited exceptions where some equipment must  
24 be closer to the seafloor.) Possible obstructions for other vessels would include towed  
25 gear (e.g., “towfish”) and the tow line (cable). Towed equipment includes boomers,  
26 subbottom profilers, and side-scan sonar. The amount of cable deployed and the  
27 location of the equipment at the end of the cable is dictated by target water depth and  
28 where the equipment is supposed to be in the water column.

29 Deployed cable and/or equipment are generally not marked at or above the water line  
30 by indicators such as buoys or flashing lights. However, vessels with equipment in the  
31 water must provide some form of visual notification (e.g., red-white-red vertical lights for  
32 limited maneuverability; shapes), but smaller vessels, including some used in low  
33 energy surveys, are not required to adhere to this convention by the USCG. As a result,  
34 the potential exists that survey activities under the OGPP, although intermittent and  
35 short-term, could reduce the existing level of safety for vessels transiting the Project  
36 area by creating in-water hazards for vessel traffic. This impact can also be reduced to  
37 a less than significant level through the implementation of **MM FISH-1**.

1 **e) Result in inadequate emergency access?**

2 **No Impact.** Under the OGPP, permitted survey operations would occur in marine  
3 waters and would have no effects on emergency access to the Project area or other  
4 locations. As a result, the OGPP would have no impact on existing emergency access  
5 conditions.

6 **f) Conflict with adopted policies, plans or programs regarding public transit,**  
7 **bicycle, or pedestrian facilities or otherwise decrease the performance or safety**  
8 **of such facilities?**

9 **No Impact.** Under the OGPP, permitted survey operations would occur in marine  
10 waters and would have no effects on policies, plans, or programs regarding public  
11 transit, bicycle, or pedestrian facilities. As a result, the OGPP would not decrease the  
12 performance or safety of such facilities, and would have no impact on these facilities.

13 3.3.15.4 Mitigation and Residual Impacts

14 **Mitigation.** Implement mitigation measure **MM FISH-1**. With implementation of this  
15 measure, divers would have notification of the timing and locations of planned surveys  
16 and would be able to avoid the area.

17 **Residual Impacts.** No residual impacts would occur.



1 **3.3.16 Utilities and Service Systems**

<b>XVII. UTILITIES AND SERVICE SYSTEMS:</b> Would the Project:	<b>Potentially Significant Impact</b>	<b>Less Than Significant with Mitigation</b>	<b>Less Than Significant Impact</b>	<b>No Impact</b>
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d) Have sufficient water supplies available to serve the Project from existing entitlements and resources, or are new or expanded entitlements needed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
g) Comply with federal, state, and local statutes and regulations related to solid waste?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

2 **3.3.16.1 Environmental Setting**

3 The environmental setting concerning utilities and service systems in the four coastal  
4 regions can be found in the following documents:

- 5 • **Region I:** South Coast Marine Protected Areas Project Environmental Impact  
6 Report (EIR) (United Research Services [URS] 2010a,b);
- 7 • **Region II:** South Coast Marine Protected Areas Project EIR (URS 2010a,b) and  
8 California Marine Life Protection Act Initiative Central Coast Marine Protected  
9 Areas Project EIR (Jones & Stokes 2006, 2007);
- 10 • **Region III:** California Marine Life Protection Act Initiative Central Coast Marine  
11 Protected Areas Project EIR (Jones & Stokes 2006, 2007) and California Marine  
12 Life Protection Act Initiative North Central Coast Marine Protection Areas Project  
13 EIR (ICF Jones & Stokes 2009a,b); and
- 14 • **Region IV:** Marine Life Protection Act – North Coast Study Region EIR (Horizon  
15 Water and Environment LLC 2012a,b).

1 3.3.16.2 Regulatory Setting

- 2 Federal and State laws and regulations pertaining to this issue area and relevant to the  
 3 Offshore Geophysical Permit Program (OGPP or Project) are identified in **Table 3-76**.  
 4 No local laws and regulations relevant to this issue are applicable to the Project

**Table 3-76. Federal and/or State Laws, Regulations, and Policies Potentially Applicable to the Project (Utilities and Service Systems)**

CA	California Coastal Act Chapter 3 policies	<p>Coastal Act Chapter 3 policies applicable to utilities and service systems are:</p> <ul style="list-style-type: none"> <li>• Section 30254 states: New or expanded public works facilities shall be designed and limited to accommodate needs generated by development or uses permitted consistent with the provisions of this division; provided, however, that it is the intent of the Legislature that State Highway Route 1 in rural areas of the coastal zone remain a scenic two-lane road. Special districts shall not be formed or expanded except where assessment for, and provision of, the service would not induce new development inconsistent with this division. Where existing or planned public works facilities can accommodate only a limited amount of new development, services to coastal-dependent land use, essential public services and basic industries vital to the economic health of the region, state, or nation, public recreation, commercial recreation, and visitor-serving land uses shall not be precluded by other development.</li> <li>• Section 30254.5 states in part: Notwithstanding any other provision of law, the commission may not impose any term or condition on the development of any sewage treatment plant which is applicable to any future development that the commission finds can be accommodated by that plant consistent with this division....</li> </ul>
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5 3.3.16.3 Impact Discussion

6 ***a) Would the Project exceed wastewater treatment requirements of the applicable***  
 7 ***Regional Water Quality Control Board?***

8 **No Impact.** Anticipated offshore survey activities permitted under the OGPP would not  
 9 result in the generation of a substantial amount of domestic wastewater. All wastewater  
 10 generated by the survey vessels presumably would be disposed of at authorized  
 11 facilities, most likely at the harbors hosting the survey vessels. Therefore, the Project  
 12 would not result in significant wastewater treatment or disposal impacts, and would not  
 13 conflict with requirements of the applicable Regional Water Quality Control Board.

14 ***b) Would the Project require or result in the construction of new water or***  
 15 ***wastewater treatment facilities or expansion of existing facilities, the construction***  
 16 ***of which could cause significant environmental effects?***

17 **No Impact.** Anticipated offshore deployment activities permitted under the OGPP would  
 18 not result in the generation of a substantial amount of domestic wastewater, nor would  
 19 they generate a substantial demand for water. The OGPP would not require the  
 20 construction or expansion of water or wastewater treatment facilities. All wastewater  
 21 generated by the survey vessels would be disposed of at an authorized facility in the

1 harbors hosting the survey vessels. Water needed for operations of survey vessels or  
2 for use by onboard employees would be minor. Therefore, the OGPP would have no  
3 wastewater treatment or disposal impacts, nor would it result in an increase in the  
4 demand for potable water.

5 ***c) Would the Project require or result in the construction of new storm water***  
6 ***drainage facilities or expansion of existing facilities, the construction of which***  
7 ***could cause significant environmental effects?***

8 **No Impact.** Anticipated survey activities permitted under the OGPP would have no  
9 impact on the generation of storm water drainage or related facilities.

10 ***d) Would the Project have sufficient water supplies available to serve the Project***  
11 ***from existing entitlements and resources, or are new or expanded entitlements***  
12 ***needed?***

13 **No Impact.** Anticipated offshore survey activities would generate a small demand for  
14 potable water and would use existing potable water sources. Therefore, the OGPP  
15 would have no impact on domestic water supply impacts.

16 ***e) Would the Project result in a determination by the wastewater treatment***  
17 ***provider which serves or may serve the Project that it has adequate capacity to***  
18 ***serve the Project's projected demand in addition to the provider's existing***  
19 ***commitments?***

20 **No Impact.** Anticipated offshore survey activities would not result in the generation of a  
21 substantial amount of domestic wastewater. All wastewater generated by the survey  
22 vessels presumably would be disposed of at an authorized facility in harbors hosting  
23 survey vessels. Therefore, the OGPP would have no impacts related to wastewater  
24 treatment or disposal.

25 ***f) Would the Project be served by a landfill with sufficient permitted capacity to***  
26 ***accommodate the Project's solid waste disposal needs?***

27 **Less than Significant Impact.** Project-related solid wastes generated by anticipated  
28 survey activities would generally be limited to incidental food and paper products that  
29 would be retained onboard the survey vessels. All survey-generated onboard wastes  
30 presumably would be removed from the vessels at the end of each work day or multi-  
31 day survey period. Wastes would be disposed of in covered containers onboard vessels  
32 and would be disposed of at appropriate disposal sites. The extremely small amount of  
33 solid waste generated during surveys would not adversely affect the waste disposal  
34 capacity or recycling capabilities of waste management facilities located in the vicinity of  
35 ports and harbors hosting survey vessels. Survey activities would not be a long-term  
36 source of solid waste. Therefore, impacts related to solid waste management or  
37 disposal will be less than significant.

1 **g) Would the Project comply with federal, state, and local statutes and regulations**  
2 **related to solid waste?**

3 **No Impact.** The OGPP would not violate any regulations related to solid waste.  
4 Therefore, there will be no impact related to conflicts with solid waste regulations.

5 3.3.16.4 Mitigation and Residual Impacts

6 **Mitigation.** The OGPP would not result in significant impacts to utilities or municipal  
7 services; therefore, no mitigation measures are required.

8 **Residual Impacts.** The OGPP would have no impact on existing municipal services.  
9 No mitigation is required, and no residual impacts would occur.

1 **3.3.17 Mandatory Findings of Significance**

<b>XVIII. MANDATORY FINDINGS OF SIGNIFICANCE</b>	<b>Potentially Significant Impact</b>	<b>Less Than Significant with Mitigation</b>	<b>Less Than Significant Impact</b>	<b>No Impact</b>
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Does the project have the potential to achieve short-term environmental goals to the disadvantage of long-term environmental goals?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c) Does the project have impacts that are individually limited, but cumulatively considerable? (“Cumulatively considerable” means that the incremental effects of a project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of past, present and probable future projects)?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
d) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2 **3.3.17.1 Impact Analysis**

3 **a) Does the project have the potential to degrade the quality of the environment,**  
4 **substantially reduce the habitat of a fish or wildlife species, cause a fish or**  
5 **wildlife population to drop below self-sustaining levels, threaten to eliminate a**  
6 **plant or animal community, substantially reduce the number or restrict the range**  
7 **of a rare or endangered plant or animal or eliminate important examples of the**  
8 **major periods of California history or prehistory?**

9 **Less than Significant with Mitigation.** For purposes of this MND, the CSLC  
10 interpreted the phrase “degrade the quality of the environment” broadly. The below  
11 discussion provides an explanation of the CSLC’s significance conclusion.

12 As described in **Section 3.3.3, Air Quality and Greenhouse Gas (GHG) Emissions,**  
13 each air district along the California coast is required to have an air quality plan to  
14 demonstrate how it will either come into attainment for nonattainment areas, or maintain  
15 existing attainment of air quality standards. Project impacts would be potentially  
16 significant if the Project would conflict with or obstruct implementation of the applicable  
17 air quality plan. Based on this criterion and review of district-specific criteria, the

OGPP's impact would be less than significant with implementation of identified mitigation measures (MMs) for San Luis Obispo, Ventura, Los Angeles, and Orange Counties, and less than significant for all other counties.

As described in **Section 3.3.5, Cultural Resources**, in the absence of bottom-founded operations, the Project would not result in significant impacts to any known cultural resources.

As described in **Section 3.3.4, Biological Resources**, with implementation of all identified MMs, the Project would not result in significant impacts to sensitive marine resources and would not have a significant effect on listed species or habitat used by those species.

Low energy geophysical survey operations may occur in sensitive habitats (e.g., over sea grass and kelp beds, Marine Protected Areas [MPAs], hard bottom features), however, the impacts to invertebrates, fish, sea turtles, and marine mammals would be less than significant with mitigation measures identified for biological resources.

Impacts to algae and macrophytes (e.g., kelp) from acoustic sources are considered to be less than significant.

No injury or mortality of listed or protected species will occur from acoustic exposure; limited behavioral modification may occur to a limited number of marine mammal species. The implementation of **MMs BIO-1** through **BIO-9** (e.g., equipment-specific safety zones; restrictions on nighttime survey operations; limitations on survey operations within select MPAs) will reduce the potential for impact to less than significant.

Impacts to other species that may result from noise exposure would not result in a significant impact. Therefore, the Project would not result in significant impacts related to habitat reduction, fish or wildlife populations, or the range of sensitive species.

Essential Fish Habitat (EFH) (see **Section 4.1, Commercial and Recreational Fisheries**) impacts will be less than significant, based on the relatively small area affected by each survey, the localized and short-term nature of the survey activity, and the absence of any impact to water quality or habitat suitability.

***b) Does the project have the potential to achieve short-term environmental goals to the disadvantage of long-term environmental goals?***

**No Impact.** All impacts identified as potentially significant in this MND will be avoided or substantially lessened through the implementation of the identified mitigation measures and standard permit conditions, such that those impacts would be less than significant. No long-term environmental goals have been identified that would be compromised by

OGPP survey activities. In contrast, many surveys carried out under the OGPP are either required by permitting agencies for the protection of the environment, or are related to scientific investigations intended to benefit the environment.

**c) Does the project have impacts that are individually limited, but cumulatively considerable? (“Cumulatively considerable” means that the incremental effects of a project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of past, present and probable future projects)?**

**Less than Significant.** Sound from low energy geophysical survey equipment has the potential to produce behavioral changes in marine mammals. However, it is unlikely that sound levels would be sufficiently intense or prolonged such that they would affect migration, feeding, breeding, and the ability to avoid predators. Existing ambient underwater noise from natural and anthropogenic sources is part of the physical marine environment. Surface waves and animal vocalizations provide the greatest source of naturally occurring ocean noise. Sources of anthropogenic noise include vessel propellers, seismic airguns, explosives, construction, naval sonars, and standard vessel depth finders, particularly near major commercial ports and harbors and along transportation routes.

OGPP surveys to be conducted in Region I and the southern portion of Region II will represent an extremely small percentage of vessel activity, particularly in the Los Angeles-Long Beach and San Diego port areas. In Region III, port operations at San Francisco and Oakland are extensive. Other commercial, military, and recreational traffic along the California coast is significant. The limited number of annual OGPP surveys (i.e., 10-12 surveys per year) represents a very minor contribution to total vessel traffic, such that it would not be cumulatively considerable.

Low energy geophysical surveys conducted under the OGPP, and their associated transit operations, will add to the general vessel traffic present along the California coast. Survey vessels introduce an additional source of vessel noise into the existing baseline of underwater ambient sound, the latter of which is particularly heavy in high volume commercial traffic areas (i.e., major ports, traffic corridors). However, the cumulative impact of this additional source of noise is negligible in the context of existing commercial and recreational vessel traffic, particularly in those areas where large port operations are conducted. In addition, all vessels (with the possible exception of smaller boats) are typically equipped with a single-beam depth finder that is used for navigational safety in conjunction with nautical charts. These depth finders determine the instantaneous depth underneath the vessel in real-time, although they operate in the same manner as a typical survey single beam echosounder.

**d) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?**

**Less than Significant with Mitigation.** The Project would not result in significant air quality, noise, hazards or other environmental impacts that would result in substantial adverse impacts to California's coastal residents or visitors.

Air quality modeling has been completed which shows that the Project would not violate any air quality standard or contribute substantially to an existing or projected air quality violation. Based on the criteria provided by the respective air quality districts, the impact would be less than significant with mitigation for San Luis Obispo, Ventura, Los Angeles, and Orange Counties, and less than significant for all other counties.

In terms of potential impacts of noise, survey vessels at their closest point to shore (i.e., just beyond the surf zone) may be several hundred meters from the beach. Levels of sound pressure and levels of sound intensity decrease equally with the distance from the sound source, at a rate of 6 dB per distance doubling. At source levels of 70 or 75 decibels, A-weighted (dBA) originating aboard the survey vessel, received levels at 100 m would be 30 or 35 dBA, respectively. Vessel sound levels, while contributing to ambient noise levels in the survey area, will have less than a significant impact on onshore sensitive receptors.

The OGPP would be consistent with Coastal Act policies related to recreation and recreational fishing because permitted geophysical surveys would not result in impacts to existing recreation facilities or require the development of new facilities. Also, as described in **Section 4.1, Commercial and Recreational Fisheries**, and **Section 3.3.14. Recreation**, the OGPP would not result in significant impacts to recreational fishing or recreational diving with implementation of **MM REC-1** and **MM FISH-1**. With notification of pending survey activity (e.g., harbormasters; Local Notices to Mariners), ocean users will be aware of planned OGPP survey activity in their respective areas.

In terms of hazards and hazardous materials, the implementation of existing permit requirements regarding development and adherence to an Oil Spill Contingency Plan (OSCP) and other identified MMs would reduce the potential for an accidental release of diesel fuel and other hazardous material products to a less than significant level. No hazardous material release mitigation measures are required. Low energy geophysical surveys would have no impact related to airport operations, wildfire risk, evacuation planning, or other hazardous material-related impacts.



## 4.0 OTHER MAJOR AREAS OF CONCERN

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### 4.1 Commercial and Recreational Fishing

Coastal waters support both commercial and recreational fishing activities throughout the study region. Surveys conducted under permits granted by the Offshore Geophysical Permit Program (OGPP) have the potential to affect both commercial and recreational fisheries. Although this environmental issue is not included in the California Environmental Quality Act (CEQA) Appendix G checklist, the California State Lands Commission (CSLC) is including it here due to the probable location of survey-related activities within the nearshore marine waters of California. Because most (90 to 95 percent) future survey activities permitted under the OGPP are anticipated to occur in coastal Regions I and II, the emphasis of the environmental setting and impact assessment is focused on these regions.

#### 4.1.1 Environmental Setting

##### 4.1.1.1 Catch Species of Statewide Importance

Red sea urchins are harvested for their roe, which is sold mostly as an export product. Statewide landings of red sea urchins in 2008 were 10.3 million pounds, with 2.6 million pounds landed in Fort Bragg. The statewide catch has remained in a relatively narrow range, from 10.3 to 14.0 million pounds since 2002. A small amount of recreational sea urchin take occurs in tidepool areas.

The commercial fishery for Dungeness crab occurs from Avila in San Luis Obispo County to the California/Oregon border, with commercial and recreational seasons beginning in late fall and ending in early summer. Almost all of California's commercial Dungeness crab catch is landed in the trap fishery. Only limited sport take of Dungeness crab occurs in Central and Northern California. The total annual recreational harvest is unknown, but it is believed to be less than one percent of the commercial take. The recreational fishery is managed through seasonal and area closures, gear restrictions, size limits, and a limit on the number of crabs that may be possessed.

The species distribution for gaper clams stretches from Alaska to Baja California. The fishery for Pacific gapers and the fat gapers is almost exclusively sport, although the California Fish and Game Commission (CFGF) allows these clams to be harvested commercially in Humboldt Bay. The Pacific and fat gaper support a significant sport fishery that takes place in intertidal areas of bays with sand and mud bottoms.

Additional information on the general environmental setting and marine species important to California fisheries can be found in **Section 3.3.4, Biological Resources**.

#### 4.1.1.2 Commercial Fishing

Commercial fishing occurs in marine waters of all four coastal regions in the Project area. Since 1980, there has been a trend of a decreasing number of commercial fishermen and commercial fishing vessels participating in California's commercial fisheries. Between 1980 and 2004, the number of commercial fishing vessels registered statewide has declined by 64 percent, from approximately 9,200 in 1980 to 3,300 in 2004. Although not every year since 1988 has seen a decline in registered vessels, the overall decline has averaged 3.2 percent per year since then (California Department of Fish and Game [CDFG] 2005).

### Region I

Major commercial fisheries within Region I include market squid, sea urchin, California spiny lobster, coastal pelagic finfish, spot prawn, and California halibut. The region also includes kelp harvest areas and aquaculture leases. Commercial fishermen in the region deploy a variety of gear types, including round haul nets, hook-and-line, trawl, trap, entangling nets, diver, and hand capture (CDFG 2009). Commercial fishing is supported by several large and small ports in the region. In Los Angeles County, commercial fishing ports are located at San Pedro, Terminal Island, Long Beach, Redondo Beach, Marina Del Rey, Avila, Wilmington, and Santa Monica. In Orange County, commercial fishing vessels operate out of ports at Dana Point, Newport Beach, Huntington Beach (Huntington Harbor), and Seal Beach. In San Diego County, commercial fishing vessels originate out of San Diego, Mission Bay, Oceanside, and Point Loma

Detailed information on south coast (Region I) marine fisheries can be found in the Regional Profile of the South Coast Study Region (CDFG 2009).

### Region II

In Region II, important commercial fisheries include:

- **Finfishes:** Finfish fisheries in Region II include king salmon; Pacific sardine; sablefish; albacore and other tuna; thornyheads; northern anchovy; Dover sole; California halibut; nearshore, shelf, and slope rockfishes; sanddabs; other flatfish; cabezon; grenadier; lingcod; sharks; white seabass; mackerel; butterfish; kelp greenling; jacksmelt; and surfperches.
- **Invertebrates:** Invertebrate fisheries in Region II include squid, spot prawn, Dungeness crab, rock crab, ocean shrimp, and red urchin (Jones & Stokes 2006, 2007).

1 Live fish trapping of rockfish, cabezon, and other nearshore species occurs primarily in  
2 the shallower waters near the coastline. Hook-and-line fisheries catch a variety of  
3 species using hand lines, longlines, rod-and-reel, and trolled gear. The main species  
4 caught in hook-and-line fisheries is rockfish. The use of gill nets is not allowed within  
5 State waters. Commercial drift gill netting for pelagic sharks and swordfish occurs in the  
6 open waters throughout portions of the Pacific Ocean (Jones & Stokes 2006, 2007).  
7 Some of the fisheries in Region II operate largely or entirely outside State waters; these  
8 include the albacore and other tuna, swordfish, shark, and ocean shrimp fisheries. In  
9 addition, red urchins are harvested within State waters outside the central coast region,  
10 but are then processed in Region II. These fisheries are important to the local economy  
11 within the region (Jones & Stokes 2006, 2007).

12 Within Region II, commercial fishing vessels operate primarily out of ports in  
13 Port Hueneme and Oxnard (Channel Island Harbor) in Ventura County; Santa Barbara  
14 in Santa Barbara County; and Morro Bay, Port San Luis/Avila, and San Simeon in  
15 San Luis Obispo County.

16 More information on commercial fisheries in Region II can be found in Regional Profile  
17 of the South Coast Study Region (CDFG 2009), Draft Environmental Impact Report  
18 (EIR): California Marine Life Protection Act Initiative Central Coast Marine Protected  
19 Areas Project (Jones & Stokes 2006a,b), and Central Coastal California Seismic  
20 Imaging Project Final EIR (CSLC 2012a).

### 21 **Region III**

22 Within Region III, commercial fishing occurs along the entire coastline, with fishing  
23 vessels originating from ports in the Monterey Bay port complex (Monterey, Moss  
24 Landing, and Santa Cruz), the San Francisco Bay port complex (Princeton/Half Moon  
25 Bay, San Francisco, Sausalito, Richmond, Oakland, and Berkeley), and the Bodega  
26 Bay port complex (Dillon Beach, Timber Cove, Marshall, Bodega Bay, Inverness, Point  
27 Reyes, Marconi Cove, Bolinas Bay, and Tomales Bay). Important commercial fisheries  
28 in Region III include red urchin, salmon, Dungeness crab, nearshore finfish, lingcod,  
29 tuna, slope rockfish/grenadier, shelf rockfish, California halibut, thornyheads (non-trawl),  
30 sablefish (non-trawl, line and trap), skates/rays/sharks, and other flatfish.

31 Additional information on commercial fishing in Region III can be found in the draft and  
32 final EIRs: California Marine Life Protection Act Initiative Central Coast Marine  
33 Protected Areas Project (Jones & Stokes 2006, 2007) and draft and final EIRs:  
34 California Marine Life Protection Act Initiative North Central Coast Marine Protection  
35 Areas Project (ICF Jones & Stokes 2009a,b).

## 1    **Region IV**

2    Commercial fishing is an important industry along the more isolated coastline of Region  
3    IV. Important finfish fisheries in the region include salmon, smelt, deeper nearshore  
4    finfish, hagfish, shallow nearshore finfish, lingcod, herring, skates, rays, sharks,  
5    surfperch, and California halibut. Key invertebrate fisheries include Dungeness crab, red  
6    urchin, and coonstripe shrimp. Several commercial fishing ports are located along the  
7    Region IV coastline (Mendocino, Humboldt, and Del Norte counties), including ports in  
8    Albion, Fort Bragg, Point Arena, Anchor Bay, Shelter Cove, Fields Landing,  
9    King Salmon, Eureka, Trinidad, and Crescent City.

10   Dungeness crab fishing grounds extend from Fort Bragg to the California/Oregon  
11   Border, with the prime area located between Eureka and Crescent City, and the three  
12   northernmost subpopulations support a commercial fishery. In Northern California, the  
13   size limit is 5.75 inches (in) across the widest part of the carapace.

14   Detailed information on Region IV's commercial fisheries can be found in Marine Life  
15   Protection Act – North Coast Study Region draft and final EIRs (Horizon Water and  
16   Environment LLC 2012a,b).

### 17    4.1.1.3    Recreational Fishing

18   Recreational fishing is also an important activity along the entire California coastline,  
19   contributing to many local and regional economies. Second only to Florida, California  
20   has more than 2.7 million sportfishing participants (Pendleton and Rooke 2006).

## 21   **Region I**

22   Recreational fishing is a significant part of southern California's tourism and recreation  
23   industry. The main boat-based modes of marine fishing include commercial passenger  
24   fishing vessels (CPFVs, also called party boats), and private and rental boats, including  
25   kayaks (angling and diving). Shore-based modes of recreational fishing include beach  
26   and bank fishing, fishing from man-made structures, and shore-based diving. In 2007,  
27   fishing from man-made structures was the most common mode of recreational fishing  
28   and accounted for 1,341,343 recorded angler days. The second most common mode of  
29   recreational fishing was beach and bank fishing with 766,709 angler days (CDFG 2009).

30   The Region I coastline is well protected, and the distribution of recreational fishing  
31   activity is more influenced by population centers than by access or local sea conditions.  
32   Anglers in larger boats often venture to offshore banks and coastal islands for highly  
33   migratory species. CPFVs, ranging in passenger capacity from two to 150 persons,  
34   operate out of ports in all three Region I counties. CPFVs typically fish in nearshore  
35   waters of the mainland coast and Santa Catalina, in addition to fishing in Mexican  
36   waters and offshore banks (CDFG 2009).

1 Private and rental boats including kayaks, float tubes, sailboats, skiffs, and large motor  
2 boats are used for fishing, including consumptive diving. In general, private and rental  
3 boats fish the same areas in Region I as CPFVs, although areas accessed vary by  
4 vessel type and size (CDFG 2009).

5 Shore-based fishing occurs on beaches, rocky shores, and man-made structures, such  
6 as public piers. Among piers and public jetties that allow fishing access, public piers are  
7 numerous, including the Malibu Pier, Santa Monica Pier, Venice Pier, Manhattan Beach  
8 Pier, Hermosa Beach Pier, Redondo Beach Pier, Cabrillo Beach Pier, Belmont Pier,  
9 Seal Beach Pier, Huntington Beach Pier, Newport Pier, Balboa Pier, San Clemente  
10 Pier, Oceanside Pier, Ocean Beach Pier, Shelter Island Pier, and Imperial Beach Pier  
11 (CDFG 2009).

12 More information on Region I recreational fisheries can be found in Regional Profile of  
13 the South Coast Study Region (CDFG 2009).

## 14 **Region II**

15 Recreational fishing occurs throughout the coastal waters of Region II, although less  
16 activity occurs in the more remote areas of the region. According to data provided by  
17 the Pacific States Marine Fisheries Commission, more than 150 species of finfish were  
18 caught by recreational anglers in 2004 within the region; however, many of these  
19 species were seen infrequently in sampled catches (CDFG 2005). The distribution of  
20 recreational fishing activity varies by mode of fishing and access availability. Similar to  
21 other coastal regions, fishing activity in Region II falls into three major modes of fishing:  
22 from CPFVs, from private and rental skiffs, and on beaches, banks, and manmade  
23 structures.

24 Anglers and divers using CPFVs or private or rental skiffs typically have a target species  
25 or species group in mind when they head out to fish, although some anglers or divers  
26 fish for whatever is available in their region. Primary target species/species groups in  
27 this region are king salmon, nearshore finfishes (rockfishes/lingcod/cabazon/kelp  
28 greenling), California halibut, sanddabs, and albacore (Jones & Stokes 2006, 2007).  
29 CPFVs and private/rental skiffs operate out of ports in Port Hueneme, Oxnard (Channel  
30 Island Harbor), Santa Barbara, and Morro Bay, as well as other smaller ports in the  
31 region. CPFVs fish in nearshore waters of the mainland coast, as well as waters around  
32 the Santa Barbara, San Nicholas, San Clemente, and Channel Islands (CDFG 2009).

33 Beach and bank fishing includes, in addition to shore-based angling, divers and anglers  
34 entering the water in kayaks, royaks, or on other floatation devices directly from the  
35 shore. Kayak fishing generally has a range of 5 miles (mi) from any publicly accessible  
36 beach or other launch site (CDFG 2005). Primary target species/species groups in this  
37 region are surfperches, jacksmelt, and several nearshore rockfishes. One of the

1 relatively high activity shore areas in the region is the beach area south of Guadalupe  
2 Nipomo Dunes in San Luis Obispo County (CDFG 2005).

3 Man-made structures, including piers, jetties, and breakwaters, are relatively limited  
4 within Region II and, with few exceptions, are in close proximity to the major port areas.  
5 Public piers in Region II include Gaviota Pier, Goleta Pier, Santa Barbara Pier, Ventura  
6 Pier, Hueneme Pier, San Simeon Pier, and Cayucos Pier. Primary target  
7 species/species groups in Region II for anglers fishing from manmade structures are  
8 Pacific sardine, northern anchovy, jacksmelt, surfperches, white croaker, and several  
9 nearshore rockfishes (CDFG 2005).

10 More information on recreational fisheries in Region II can be found in Regional Profile  
11 of the South Coast Study Region (CDFG 2009) and EIR: California Marine Life  
12 Protection Act Initiative Central Coast Marine Protected Areas Project (Jones & Stokes  
13 2006, 2007).

#### 14 **Region III**

15 According to data provided by the Pacific States Marine Fisheries Commission, at least  
16 109 species of finfishes were caught by recreational anglers from 2004 to 2006 within  
17 the north central coast area (Region III); however, many of these were seen infrequently  
18 in sampled catches. Salmon fisheries are important to anglers in the region utilizing  
19 boat-based modes of fishing. Other fisheries important to both boat-based and  
20 shore-based fishers are rockfish, lingcod, cabezon, greenling, and California halibut and  
21 surfperches. The harvest of invertebrates such as Dungeness crab, red abalone, and  
22 various species of clams is also important (CDFG 2007).

23 Boat-based recreational fishing originates from ports and marinas throughout Region III,  
24 including ports in Monterey, Moss Landing, Santa Cruz, Princeton/Half Moon Bay,  
25 San Francisco, Sausalito, Richmond, Oakland, Berkeley, Dillon Beach, Timber Cove,  
26 Marshall, Bodega Bay, Inverness, Point Reyes, Marconi Cove, Bolinas Bay, and  
27 Tomales Bay. Shore-based fishing occurs from public piers and beaches throughout the  
28 region.

29 Additional information on recreational fishing in Region III can be found in the following  
30 EIRs: California Marine Life Protection Act Initiative Central Coast Marine Protected  
31 Areas Project (Jones & Stokes 2006, 2007) and California Marine Life Protection Act  
32 Initiative North Central Coast Marine Protection Areas Project (ICF Jones & Stokes  
33 2009a,b).

#### 34 **Region IV**

35 Similar to other regions, modes of fishing in Region IV include CPFVs, private boats,  
36 and shore-based facilities (beaches, banks, man-made structures). CPFVs operate out

of ports in all three north coast (Region IV) counties and fish in nearshore waters and bays of the mainland coast, as well as offshore. Areas fished by private boats are similar to those fished by CPFVs, but vary by vessel type and size. Most fishing effort is by hook-and-line, but crabbing by trap and consumptive diving also are popular from private boats.

Important finfish species targeted by boat-based recreational anglers in Region IV include rockfish, Chinook salmon, lingcod, and albacore tuna. Shore-based fishing is limited in many locations throughout Region IV because of private land ownership and difficult or dangerous terrain. Shore access frequently occurs in the region's more populated areas, such as the Fort Bragg, Eureka, and Crescent City areas. Species important to shore-based anglers include surfperches, nearshore rockfishes, and greenlings.

Additionally, the harvest of invertebrates, including red abalone, Dungeness crab, rock scallops, and various species of clams is important to the recreational fishery in Region IV. Beaches in Del Norte and Humboldt counties are some of the best places in California to take razor clams. Clam Beach and Crescent City both support similar fisheries, where beds are divided into north and south beaches with alternate year closures. In both areas, the northern beach was more heavily fished and more productive than the southern beach for many years. The El Niño events of the past two decades have had large storms associated with them, and this may have had some impact on Northern California razor clam populations. The razor clam population in the Crescent City area is recovering, but the Clam Beach population is still much diminished from former levels.

The Washington clam is the principal species sought, with highest yields noted for Humboldt Bay. The butter clam, also known as the smooth Washington clam, is seldom taken south of Humboldt Bay but is common enough to support a minor fishery near Fields Landing in Humboldt Bay. Historically, the butter clam fishery was almost exclusively a recreational fishery, however, there was a small commercial component. Since the 1980s, this fishery has been exclusively recreational.

Detailed information on recreational fisheries in Region IV can be found in Marine Life Protection Act – North Coast Study Region draft and final EIRs (Horizon Water and Environment LLC 2012a,b).

#### 4.1.2 Regulatory Setting

Federal regulations pertaining to Commercial and Recreational Fisheries and relevant to the proposed Project, if any, are presented in **Table 4-1**. No local laws and regulations relevant to this issue are applicable to the Project.

**Table 4-1. Federal and/or State Laws, Regulations, and Policies Potentially Applicable to the Project (Commercial Fishing)**

CA	California Coastal Act Chapter 3 policies	Coastal Act Chapter 3 policies applicable to commercial fishing are: <ul style="list-style-type: none"> <li>• Section 30234 states: Facilities serving the commercial fishing and recreational boating industries shall be protected and, where feasible, upgraded. Existing commercial fishing and recreational boating harbor space shall not be reduced unless the demand for those facilities no longer exists or adequate substitute space has been provided. Proposed recreational boating facilities shall, where feasible, be designed and located in such a fashion as not to interfere with the needs of the commercial fishing industry.</li> <li>• Section 30234.5 states: The economic, commercial, and recreational importance of fishing activities shall be recognized and protected.</li> </ul>
CA	California Commercial Fishing Laws and Licensing Requirements	Commercial fishing is regulated by a series of laws passed by the CFGC and issued each year in a summary document. Seasonal and gear restrictions within the various CDFW Districts, licensing instructions and restrictions, and species-specific fishing requirements are provided in the document. Most of the MPAs have commercial fishing restrictions (based on the designation of each area), which are also listed in the summary document.
CA	California Ocean Sport Fishing Regulations	Each year, the CFGC issues regulations on the recreational fishing within the marine waters of the State, specifying the fishing season for species, size and bag limits, and gear restrictions, licensing requirements; a section on fishing restrictions within MPAs is also now included.

#### 1 4.1.3 Impact Analysis

2 Potential conflicts with commercial and recreational vessel traffic are discussed in  
3 **Section 3.3.15, Transportation/Traffic.**

4 **Significance Criteria.** No Federal or State criteria for significant impacts to the fisheries  
5 in the Project area have been established, and Appendix G of the State CEQA  
6 Guidelines does not list fisheries as a specific resource area; however, given the  
7 prevalence and importance of recreational and commercial fishing in California,  
8 previous CSLC environmental analyses have used loss of available area, reduction of  
9 habitat, and/or substantial decrease in the number of organisms of commercial or  
10 recreational value as the basis for analyzing impacts (CSLC 2012a). The criteria are  
11 generally based on what level of loss of access to fishing areas or seasons would be  
12 expected to substantially interfere with or adversely affect commercial or recreational  
13 fishers' livelihoods. For this assessment of the OGPP, a significant impact to  
14 commercial or recreational fisheries would occur if the following is expected.

15 ***a) Ten percent or more of the currently available fishing area used by a target***  
16 ***species was lost (Less than Significant);***

17 ***b) Commercial or recreational fishing activities were precluded from a currently***  
18 ***utilized area for more than 1 month (Less than Significant); or***



1 ***c) Commercial or recreational fishing vessel movement is substantially disrupted***  
2 ***and/or OGPP surveys substantially damage in-place fishing gear (Less than***  
3 ***Significant with Mitigation)***.

4 **Impact Discussion.** Geophysical surveys permitted under the OGPP could adversely  
5 affect commercial and recreational fishing if survey activities displace commercial and  
6 recreational fishing activity from usual fishing grounds, substantially disturb target fish  
7 species, or cause the damage or destruction of in-water fishing gear.

8 In Regions I and II, where 90 to 95 percent of survey operations are anticipated to occur  
9 under the OGPP, fisheries that have the greatest potential to be affected by survey  
10 activities are those targeted species that are resident, non-migratory, or that are highly  
11 mobile, but spawn in nearshore waters (i.e., within 3 nautical miles [nm] of the shore).  
12 The nearshore waters along the coast contain large rocky reefs, kelp beds, and  
13 expanses of soft bottom that provide habitats for numerous species. These may include  
14 nearshore and shelf rockfishes, lingcod, cabezon, kelp greenling, California halibut,  
15 butterfly, jacksmelt, surfperches, squid, Dungeness crab, and rock crab (CDFG 2009).  
16 Many of these species, including nearshore rockfishes, lingcod, cabezon, kelp  
17 greenling, and California halibut, are harvested in both commercial and recreational  
18 fisheries (Jones & Stokes 2006, 2007; URS 2010a,b).

19 Displacement of fishing by geophysical surveys would occur if the extent and duration of  
20 survey activities were such that commercial and recreation fishing vessels could not  
21 access usual fishing grounds for lengthy periods of time. As discussed in **Section 2.5,**  
22 **Predicted Activity Scenario**, only 10 to 12 surveys, representing 70 to 80 survey days  
23 (possibly to 100 survey days or more, depending upon initiation of longer duration  
24 surveys, are anticipated to occur annually under the OGPP; these surveys, while  
25 concentrated in Regions I and II, would expect to be spread over a relatively large  
26 coastal area, limiting potential displacement impacts in any particular fishing grounds.  
27 Additionally, future surveys, with minor exceptions, are expected to typically last fewer  
28 than five days, with many lasting only one or two days, so any displacement of fishing  
29 activities in a particular location would be short term.

30 Given these factors, it is unlikely that any occasional, short-term displacements that  
31 would be spread over a large coastal area would approach the 10 percent or  
32 month-long displacement thresholds signifying potentially significant impacts on  
33 commercial and recreational fishing in Regions I and II (see Significance Criteria  
34 above). In Regions III and IV, survey activities are expected to be very limited (possibly  
35 one or two surveys per year), greatly decreasing the potential for substantial  
36 displacement effects in the large coastal environment encompassed by these regions.  
37 Although short-term impacts to recreational and commercial fishing operations within  
38 the immediate areas of survey vessels would likely occur due to preclusion of available

1 fishing areas, these temporary impacts are not considered to be significant due to the  
2 availability of similar seafloor habitat and open water areas within the four study regions.

3 Fish disturbance, resulting in temporary or permanent reductions in commercial and  
4 recreational catch levels, could occur if survey activities substantially harm or frighten  
5 fish in fishing areas near these activities. Low energy survey equipment is designed to  
6 produce a relatively narrow, focused beam directed toward the seafloor. Beam width  
7 varies between pieces of equipment and between fore-aft and athwartship. Effects of  
8 low energy survey activities on fisheries are uncertain; however, a few studies have  
9 evaluated the effects of high energy seismic surveys on fish catch. For example, Engås  
10 et al. (1996) and Engås and Løkkeborg (2002) examined fish movements before and  
11 after a seismic survey. Based on catch rates of haddock and Atlantic cod, they  
12 determined that exposure to airguns resulted in a decline in catch rate that lasted for  
13 several days following completion of the seismic survey, after which catch rates  
14 returned to normal. The reductions noted in catch rate were attributed to fish leaving the  
15 survey area due to seismic noise.

16 Løkkeborg et al. (2012) have reported similar experiments and obtained data that could  
17 be interpreted to suggest that some sounds actually result in an increase in fish catch.  
18 Skalski et al. (1992) studied the potential effects of seismic airgun sound on the  
19 distribution and catchability of rockfishes. The source SPL of the single airgun used in  
20 the study was 223 dB re 1  $\mu\text{Pa}_{0-p}$  at 1 m, and the received SPLs at the bases of the  
21 rockfish aggregations ranged from 186 to 191 dB re 1  $\mu\text{Pa}_{0-p}$ . Characteristics of the fish  
22 aggregations were assessed using echosounders. During long-term stationary seismic  
23 airgun discharge, there was an overall downward shift in fish distribution. Researchers  
24 reported a 52 percent decrease in rockfish (*Sebastes* spp.) catch. The experimental  
25 approach used was different from a seismic survey (i.e., duration of exposure was  
26 considerably longer). Additional data are presented in Pearson et al. (1987, 1992).  
27 Skalski et al. (1992) also demonstrated a startle response among fishes exposed to  
28 sounds as low as 160 dB; however, this exposure level failed to produce a decline in  
29 catch rates.

30 A recent synthesis of available information from studies assessing the effects of sounds  
31 from seismic airguns on fish behavior and commercial fisheries was presented by  
32 Løkkeborg (2013). Results provide clear indications that fish react to airgun sounds,  
33 with species-specific differences in the documented responses, the latter of which may  
34 lead to both increased or reduced catch rates depending on the type of fishing gear and  
35 fishing ground, and on the hearing ability and behavior of the exposed fish species.

36 These studies have shown that, in general, high energy surveys have the potential to  
37 startle fish and force them away from preferred habitat for short periods (i.e., days).  
38 Additional discussion regarding acoustic effects on fish is provided in **Section 3.3.4**.  
39 Post-survey catch rates and observations of fish species have reportedly returned to

normal levels within several days following cessation of acoustic operations (e.g., Engås et al. 1996; Engås and Løkkeborg 2002).

While there may not be studies focused on the effects of low energy geophysical survey sources on fish catch rates or fish habitat abandonment, some equipment used during low energy geophysical surveys is the same as the equipment used by recreational and commercial vessels (e.g., echosounders and fish finders). Unless fish are maintaining territory or protecting an area, they routinely move around, foraging and interacting. Differentiating between normal movements of fish and those caused by survey noise exposure, especially focused low energy noise exposure, would be challenging. Reasonable conclusions regarding fishery disturbance effects of low energy surveys, however, can be made based on information from the few studies of the effects of high energy surveys. Generally speaking, high energy surveys would have greater disturbance effects than low energy surveys because of the acoustic pulse generation intensity, directionality, and propagation over long distances; therefore, it is reasonable to conclude that survey-related fishery disturbance would only last a few days, if at all. Additionally, disturbance effects caused by 10 to 12 surveys a year, spread over a large area, with most lasting fewer than five days, would not be expected to cause more than minor reductions in commercial and recreational catch in potentially affected marine fishing grounds in the four OGPP Regions.

Lastly, OGPP surveys could adversely affect commercial and recreational fisheries by the conduct of activities that could damage or destroy fishing gear deployed by fishing vessels, including hand lines, longlines, trolling gear, traps, round haul nets, and entangling nets. Potentially significant impacts to in-place commercial fishing gear could occur if survey vessels pass across gear or if survey equipment is laid onto fishing gear. As described in **Section 2, Project Description**, most equipment used for low energy surveys is either hull mounted or deployed over the side, either in close proximity to the vessel or behind the vessel. Possible obstructions would include towed gear (e.g., “towfish”) and the tow line (cable). Towed survey equipment could include certain types of subbottom profiler (e.g., boomers) or side-scan sonar. The amount of cable deployed and the location of the equipment (at the end of the cable) is dependent on water depth and where the equipment is supposed to be in the water column. Although surveys would be limited to 10 to 12 per year and would be disbursed over a large area, deployed cable and equipment is an entanglement hazard for in-water fishing gear, potentially affecting commercial or recreational catch or causing costly equipment repairs.

The potential for gear-related impacts would be reduced by CSLC requirements that survey applicants provide notices to local fishing interests through the issuance of a Local Notice to Mariners (LNM), and through the posting of notices in the harbor masters’ offices of regional harbors at least 15 days in advance of in-water operations (mitigation measure [MM] **FISH-1**). There remains, however, a possibility

that commercial fishing gear (or, less likely, recreation gear) could be in place during survey operations. Implementation of mitigation measure **MM FISH-2** would ensure this potential impact remains less than significant.

Surveys permitted under the OGPP would generate a relatively small number of boats moving in and out of affected harbors, particularly in Regions I and II; however, this level of vessel activity would not be expected to result in the need for any physical changes to harbor facilities in the Project area. Therefore, the OGPP would not result in adverse effects to existing commercial or recreational fishing facilities. The OGPP also would not result in activities that would substantially diminish the importance of commercial or recreational fishing activities occurring in the Project area.

#### **4.1.4 Mitigation and Residual Impacts**

**Mitigation.** The following measures would reduce the potential for vessel interactions/collisions with fishing vessels and avoid damage to fishing gear.

**MM FISH-1 U.S. Coast Guard (USCG) and Harbormaster Notification.** Survey operators shall provide the USCG with survey details, including information on vessel types, survey locations, times, contact information, and other details of activities that may pose a hazard to mariners and fishers so that USCG can include the information in the Local Notice to Mariners, advising vessels to avoid potential hazards near survey areas. Furthermore, survey operators shall post such notices in the harbormasters' offices of regional harbors at least 15 days in advance of in-water operations.

**MM FISH-2 Minimize Interaction with Fishing Gear.** To minimize interaction with fishing gear that may be present within a survey area, the geophysical vessel (or designated vessel) will traverse the proposed survey corridor prior to commencing survey operations to note and record the presence of deployed fishing gear. Type and location of fishing gear (i.e., buoys) observed will be noted, and the local California Department of Fish and Wildlife (CDFW) field office will be contacted.

No survey lines within 30 m (100 ft) of observed fishing gear will be conducted. The survey crew will not remove or relocate any fishing gear; removal or relocation will only be accomplished by the owner of the gear or by an authorized CDFW agent.

**Residual Impacts.** With the incorporation of the proposed mitigation, no residual impacts are expected.

## 4.2 CSLC Environmental Justice Policy

Environmental justice is defined by California law as “the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies.” This definition is consistent with the Public Trust Doctrine principle that the management of trust lands is for the benefit of all of the people. The CSLC adopted an environmental justice policy in October 2002 to ensure that environmental justice is an essential consideration in the agency’s processes, decisions, and programs. Through its policy, CSLC reaffirms its commitment to an informed and open process in which all people are treated equitably and with dignity, and in which its decisions are tempered by environmental justice considerations.

As part of the CSLC environmental justice policy, the CSLC pledges to continue and enhance its processes, decisions, and programs with environmental justice as an essential consideration by:

- 1) Identifying relevant populations that might be adversely affected by CSLC programs or by projects submitted by outside parties for its consideration.
- 2) Seeking out community groups and leaders to encourage communication and collaboration with the CSLC and its staff.
- 3) Distributing public information as broadly as possible and in multiple languages, as needed, to encourage participation in the CSLC’s public processes.
- 4) Incorporating consultations with affected community groups and leaders while preparing environmental analyses of projects submitted to the CSLC for its consideration.
- 5) Ensuring that public documents and notices relating to human health or environmental issues are concise, understandable, and readily accessible to the public, in multiple languages, as needed.
- 6) Holding public meetings, public hearings, and public workshops at times and in locations that encourage meaningful public involvement by members of the affected communities.
- 7) Educating present and future generations in all walks of life about public access to lands and resources managed by the CSLC.
- 8) Ensuring that a range of reasonable alternatives is identified when siting facilities that may adversely affect relevant populations and identifying, for the CSLC’s consideration, those that would minimize or eliminate environmental impacts affecting such populations.

- 9) Working in conjunction with federal, State, regional, and local agencies to ensure consideration of disproportionate impacts on relevant populations, by instant or cumulative environmental pollution or degradation.
- 10) Fostering research and data collection to better define cumulative sources of pollution, exposures, risks, and impacts.
- 11) Providing appropriate training on environmental justice issues to staff and the CSLC so that recognition and consideration of such issues are incorporated into its daily activities.
- 12) Reporting periodically to the CSLC on how environmental justice is a part of the programs, processes, and activities conducted by the CSLC and by proposing modifications as necessary.

#### 4.2.1 Methodology

The CSLC environmental justice policy does not specify a methodology for conducting programmatic-level analysis of environmental justice issues. Due to the limited extent of the Project's impacts on the human environment, as discussed in **Section 3** of this document, and because of the programmatic nature of the OGPP, the assessment in this section is presented in general characterizations and is non-site-specific. As a result, the assessment provides a qualitative consideration of the Project's potential to disproportionately affect low-income or minority communities. Additionally, as discussed in **Section 2, Project Description**, certain low energy survey activities not covered under the OGPP would be subject to separate environmental review.

This analysis focuses primarily on whether the Project's impacts have the potential to affect areas of high-minority populations and/or low-income communities disproportionately and thus would create an adverse environmental justice effect. For the purpose of the environmental analysis, inconsistency with the CSLC's Environmental Justice Policy would occur if the Project would:

- Have the potential to disproportionately affect minority and/or low-income populations adversely; or
- Result in a substantial, disproportionate decrease in employment and economic base of minority and/or low-income populations residing in immediately adjacent communities.

#### 4.2.2 Project Analysis

The Project's limited impact on the human environment is established in various sections of this document, including **Section 3.3.1, Aesthetics**, **Section 3.3.3, Air Quality and Greenhouse Gas Emissions**, **3.3.7, Hazards and Hazardous Materials**, **Section 3.3.11, Noise**, **Section 3.3.12, Population and Housing**, **Section 3.3.14, Recreation**, **Section 3.3.15, Transportation/Traffic**, and **Section 4.1,**

1 **Commercial and Recreational Fishing.** The discussion in this section considers the  
2 Project's potential to disproportionately affect any low-income or minority communities.

3 As detailed in **Section 3.3.1, Aesthetics**, geophysical surveys permitted under the  
4 OGPP could affect scenic vistas and the aesthetics of beaches, coastal homes,  
5 tourist-serving businesses, and coastal highways used by people of all socioeconomic  
6 backgrounds through the nearshore presence of survey vessels that generate light,  
7 glare, noise, or odors. This would be particularly true in Regions I and II, where  
8 90 percent to 95 percent of future surveys are anticipated to occur and where several  
9 heavily used beaches and tourist areas are located. As discussed in **Section 2.5,**  
10 **Predicted Activity Scenario**, only 10 to 12 surveys, representing 70 to 80 survey days,  
11 are anticipated to occur annually under the OGPP although the implementation of  
12 longer duration surveys may push the total survey days to 100 or more. These surveys,  
13 while concentrated in Regions I and II, would be spread over a relatively large coastal  
14 area with some beyond the visibility of the shoreline, thereby limiting impacts on any  
15 specific location. Additionally, future surveys, with minor exceptions, are typically  
16 expected to last fewer than 5 days, with some (more than 30 percent in recent years)  
17 lasting only a day or two. Therefore, even if the operations of survey vessels negatively  
18 affect scenic vistas and aesthetics from a particular location or produce minor odors  
19 from diesel engines, these effects would be short term and disbursed over a relatively  
20 large geographic area. As a result, no disproportionate aesthetics impacts on low-  
21 income or minority populations are anticipated from the Project.

22 As described in **Section 3.3.3, Air Quality and Greenhouse Gas Emissions**, the  
23 Project would generate emissions through the use of marine vessels when conducting  
24 surveying activities, potentially affecting the human environment directly adjacent to the  
25 coastline in any of the study area's 15 coastal counties. The analysis of the Project's air  
26 quality effects, however, concludes that the Project would not cause or contribute to a  
27 violation of an air quality standard for relevant pollutants, nor would it result in significant  
28 air toxic impacts. When potential emission effects are evaluated against local air  
29 districts' significance standards, worst-case emission levels could exceed significance  
30 criteria set by the San Luis Obispo County and Ventura County Air Pollution Control  
31 Districts (APCDs), and the South Coast (Los Angeles and Orange Counties) Air Quality  
32 Management District (AQMD). These impacts would be mitigated to a less than  
33 significant level by implementation of Mitigation Measure (MM) **AIR-1**. By not causing or  
34 contributing to air quality standards violations, impacts on onshore receptors, including  
35 coastal populations, would be less than significant in all counties. As a result, no  
36 disproportionate impacts on low-income or minority populations in coastal areas are  
37 anticipated to be caused by the Project.

38 Potential impacts on the human environment from hazardous materials are evaluated in  
39 **Section 3.3.7, Hazards and Hazardous Materials**. Under the Project, potential  
40 hazardous material impacts attributable to low energy geophysical surveys would be

1 limited to the accidental release of hydrocarbons (diesel fuel) associated with fueling  
2 and maintenance of equipment and vessels. As described in **Section 3.3.7**, an  
3 accidental diesel release would not be expected to affect socioeconomic or cultural  
4 conditions in the study area. In the event of an accidental release, natural weathering  
5 processes would remove the released hydrocarbons from the water column and dilute  
6 the constituents to background levels relatively quickly. Impacts on fishing from a diesel  
7 release are unlikely, because fishers would be warned to avoid a release site. Similarly,  
8 impacts on shipping from a diesel release offshore are unlikely. From a tourism and  
9 recreation perspective, the likelihood that a diesel fuel spill would reach coastal waters  
10 where recreation and tourism activities are located would be dependent on the survey  
11 location and the timing of the spill. The potential for a survey-related release of diesel  
12 fuel or other hazardous substances would be substantially reduced because vessel  
13 fueling would occur at an approved docking facility only, and no cross vessel fueling  
14 would occur. Additionally, the OGPP requires, through an Oil Spill Contingency Plan  
15 (OSCP), that onboard spill response equipment and supplies are available and  
16 sufficient to contain and recover a diesel fuel spill. Implementation of existing permit  
17 requirements regarding development and adherence to an OSCP and the  
18 implementation of **MMs HAZ-1 through HAZ-3** (see **Section 3.3.7.4**) would reduce the  
19 potential for an accidental release of diesel fuel and other hazardous material products  
20 to a less than significant level. As a result, no disproportionate impacts on low-income  
21 or minority populations in coastal areas are anticipated to be caused by the Project.

22 The potential noise impacts of the Project on the human environment are evaluated in  
23 **Section 3.3.11, Noise**. Low energy geophysical survey vessels may include one or two  
24 main vessel engines and generators that generate exterior noise, with sound levels  
25 usually highest directly behind a vessel. Vessel-generated noise, however, is not  
26 anticipated to result in noise impacts on any nearby sensitive onshore receptors  
27 (e.g., beaches and coastal residential developments) because survey vessels, at their  
28 closest point to shore (i.e., just beyond the surf zone), may be several hundred meters  
29 from the shoreline. The relatively low sound levels generated by survey vessels would  
30 be naturally attenuated by distance. Additionally, low energy geophysical surveys would  
31 be temporary, mobile and generally very short term. Such short-term survey operations  
32 would not produce a substantial or permanent increase in ambient noise levels in any  
33 one area. No long-term or permanent changes in the existing noise environment would  
34 occur. As a result, the Project would not result in disproportionate noise impacts on  
35 minority or low-income populations visiting coastal access areas or residing in coastal  
36 communities.

37 As discussed in **Section 3.3.12, Population and Housing**, surveys permitted by the  
38 OGPP would not be expected to create short- or long-term jobs that would, in turn,  
39 generate an increase in population and indirect impacts on coastal residential  
40 communities, regardless of their socioeconomic character. Should survey activity spur  
41 an increase in vessels and staff, the employment opportunities would be limited and



spread over several port communities, generating little, if any, population growth in individual communities. Additionally, activities permitted under the OGPP would not result in the extension of an infrastructure system (e.g., roads, water or sewer service) that would have growth-inducing effects, nor would it induce growth through construction of new housing. No measurable disproportionate impacts on communities and specific demographic populations would result.

With permit-required notification of pending survey activity (e.g., harbormasters; Local Notices to Mariners [LNMs]), recreational divers will be aware of planned OGPP survey activity in their respective areas. With proper notification, as required by **MM REC-1**, impacts to recreational divers will be less than significant.

Coastal waters support both commercial and recreational fishing activities throughout the study area, as discussed in **Section 4.1, Commercial and Recreational Fishing**. Geophysical surveys permitted under the OGPP could adversely affect commercial and recreational fishing if survey activities displace commercial and recreational fishing activity in usual fishing grounds, substantially disturb target fish species, or cause the damage or destruction of in-water fishing gear. Although the socioeconomic composition of commercial and recreational fishers is unknown, disruptive effects on fish populations could result in economic harm to commercial fishers and to those providing goods and services to commercial and recreational fishers, as well as potentially diminish the quality of the recreational fishing experience. As concluded in the analysis and as further analyzed in **Section 3.3.4, Biological Resources**, the OGPP would not be expected to result in activities that would substantially displace fishing activity in usual fishing grounds, nor would it substantially disturb target fish species in the study area. Low energy geophysical surveys, however, could adversely affect commercial and recreational fisheries by the conduct of activities that could damage fishing gear deployed by fishing vessels. Potentially significant impacts to in-place commercial fishing gear could occur if survey vessels pass across gear or if survey equipment is laid onto fishing gear. Although surveys would be limited to 10 to 12 per year and would be disbursed over a large area, deployed cable and equipment is an entanglement hazard for in-water fishing gear, potentially affecting commercial or recreational catch or causing costly equipment repairs. The potential for gear-related impacts would be reduced by CSLC requirements that survey applicants provide notices to local fishing interests through the issuance of an LNM) and through the posting of notices in the harbormasters' offices of regional harbors at least 15 days in advance of in-water operations (**MM FISH-1**). As a result, no disproportionate economic impacts on specific socioeconomic groups are anticipated from the Project.

As discussed in **Section 3.3.15, Transportation/Traffic**, geophysical surveys permitted under the OGPP could reduce the existing level of safety for vessels, including commercial and recreational fishing vessels transiting the study area, or increase the potential for vessel collisions by adding vessel traffic to marine waters or by deploying

1 equipment hazardous to marine transportation. The potential for collisions would be  
2 reduced by following standard procedures used by vessel operators to avoid collisions,  
3 including visual observation, radar, and checking LNM's concerning activity in the area.  
4 Under surveys permitted by the OGPP, however, survey equipment potentially  
5 hazardous to navigation may be deployed in areas frequented by other vessels,  
6 including commercial fishing and recreational vessels. This impact, as well as the  
7 potential for vessel collisions, can be reduced to a less than significant level through the  
8 issuance, by the U.S. Coast Guard (USCG), of an LNM (see **MM FISH-1**). The USCG  
9 issues LNM's on a monthly basis with weekly supplements categorized by District  
10 Boundaries. These advisories contain information on the locations, times, and details of  
11 activities that may pose hazards to mariners (e.g., barges, buoys). Accordingly, the  
12 Project's impacts on any low-income or minority persons who may use the study area  
13 for boating would be negligible.

14 In summary, the Project has little potential to disproportionately affect any low-income or  
15 minority populations that may reside in nearby communities or use the surrounding area  
16 for recreation or commerce, because effects on the human environment would be  
17 limited and short-term, and would be disbursed over a large geographic area.

## 5.0 MITIGATION MONITORING PROGRAM

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### 5.1 Authority

The California State Lands Commission (CSLC), as manager of the Offshore Geophysical Permit Program (OGPP), is the Lead Agency under the California Environmental Quality Act (CEQA) for development of this mitigated negative declaration (MND). In its role as Lead Agency, the CSLC is required to adopt a program for reporting and/or monitoring regarding the implementation of identified mitigation measures (MMs). This Lead Agency responsibility originates in State CEQA Guidelines section 15097 (Mitigation Monitoring or Reporting). If the MND and associated mitigation measures are approved, the Mitigation Monitoring Program (MMP) will identify the mechanisms by which adopted MMs are implemented as defined in this MND.

Mitigation measure implementation and effectiveness, as identified in this document, are key elements of an MMP. They represent important procedures and survey-specific requirements implemented to ensure that impacts associated with low energy geophysical survey operations are reduced to a less than significant level.

### 5.2 Mitigation Compliance Responsibility

The CSLC is responsible for successfully implementing all of the mitigation measures outlined in the MMP, and is responsible for assuring that these requirements are met by OGPP permit holders or their subcontractors (e.g., survey vessel operators). Additional mitigation measures may be imposed by applicable agencies with jurisdiction through their respective permit processes (e.g., California Department of Fish and Wildlife [CDFW] and Marine Protected Area [MPA] permitted activities).

### 5.3 General Monitoring and Reporting Procedures

The OGPP permit holders are responsible for integrating the mitigation monitoring procedures into survey-specific operations in coordination with the CSLC. To oversee the monitoring procedures and to ensure the required measures are implemented properly, an environmental monitor will be selected by the CSLC (i.e., either CSLC staff or designee). The environmental monitor may be required to be present on-site during any portion of OGPP survey implementation that has the potential to create a significant environmental impact for which mitigation is required. Under such circumstances, the environmental monitor will be responsible for ensuring that all procedures specified in the MMP are followed.

In the absence of on-site inspection by the environmental monitor, site visits and specified monitoring procedures may be performed by other individuals, as determined through a coordinated effort and agreement between the CSLC environmental monitor

(or his/her designee) and the OGPP permit holder. Under these circumstances, mitigation compliance will be reported to the assigned CSLC environmental monitor. A monitoring record form will be submitted to the environmental monitor by the individual conducting the visit or procedure so that details of the visit can be recorded and progress tracked by the environmental monitor. A checklist will be developed and maintained by the environmental monitor to track all procedures required for each mitigation measure and to ensure compliance with the specifications of each MM (e.g., timing, notification procedures, observations, etc.).

OGPP permit holders completing low energy geophysical surveys in California waters will be required to complete and submit to the CSLC environmental monitor a Final Monitoring Report which outlines their compliance with survey-related MMs.

#### 5.4 Mitigation Monitoring Table

**Table 5-1** outlines the mitigation monitoring program for each environmental and socioeconomic resource area. The table provides information on the following MMP elements, the majority of which are resource-specific mitigation measures developed through the impact analysis presented in this MND:

- Impact (impact description, by resource area);
- Mitigation measure (title, including resource affected);
- Location (where the impact occurs and the mitigation should be applied) and scope of mitigation (i.e., description of mitigation measure);
- Effectiveness criteria (how the agency can know if the measure is effective);
- Monitoring or reporting action (the action to be taken by CSLC environmental monitor or his/her designee);
- Responsible party; and
- Timing (i.e., pre-, during, and/or post-survey).

1 **Table 5-1. OGPP Mitigation Monitoring Program**

Impact	Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing
<b>Air Quality and Greenhouse Gas (GHG) Emissions (MND Section 3.3.3)</b>						
Impacts to local air quality (i.e., conflict with or obstruct implementation of the applicable air quality plan) through exceedance of one or more criteria. Survey activities would result in daily emissions of criteria pollutants that would exceed air quality significance thresholds.	<b>MM AIR-1: Engine Tuning, Engine Certification, and Fuels.</b> The following measures will be required to be implemented by all permittees under the Offshore Geophysical Permit Program (OGPP), as applicable depending on the county offshore which a survey is being conducted	<u>All Counties:</u> Maintain all construction equipment in proper tune according to manufacturers' specifications; fuel all off-road and portable diesel-powered equipment with California Air Resources Board (CARB)-certified motor vehicle diesel fuel limiting sulfur content to 15 parts per million or less (CARB Diesel).	Daily emissions of criteria pollutants during survey activities are minimized.	Determine engine certification of vessel engines.	OGPP permit holder and contract vessel operator; California State Lands Commission (CSLC) review of Final Monitoring Report.	Prior to, during, and after survey activities.  Submit Final Monitoring Report after completion of survey activities.
		<u>Los Angeles and Orange Counties:</u> Use vessel engines meeting CARB's Tier 2-certified engines or cleaner; the survey shall be operated such that daily NO <sub>x</sub> emissions do not exceed 100 pounds based on engine certification emission factors. This can be accomplished with Tier 2 engines if daily fuel use is 585 gallons or less, and with Tier 3 engines if daily fuel use is 935 gallons or less.		Review engine emissions data to assess compliance, determine if changes in tuning or fuel are required.		
		<u>San Luis Obispo County:</u> Use vessel engines meeting CARB's Tier 2-certified engines or cleaner; all diesel equipment shall not idle for more than 5 minutes; engine use needed to maintain position in the water is not considered idling; diesel idling within 300 meters (1,000 feet) of sensitive receptors is not permitted; use alternatively fueled construction equipment on site where feasible, such as compressed natural gas, liquefied natural gas, propane or biodiesel.		Verify that Tier-2 or cleaner engines are being used.		
		<u>Ventura County:</u> Use alternatively fueled construction equipment on site where feasible, such as compressed natural gas, liquefied natural gas, propane or biodiesel.		Calculate daily NO <sub>x</sub> emissions to verify compliance with limitations.		
				Verify that Tier-2 or cleaner engines are being used.		
				Inform vessel operator(s) of idling limitation.		
				Investigate availability of alternative fuels.		
				Investigate availability of alternative fuels.		

Impact	Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing
<b>Biological Resources (MND Section 3.3.4)</b>						
Impacts to marine mammals and sea turtles from survey operations.	<b>MM BIO-1:</b> Marine Mammal and Sea Turtle Presence – Current Information.	All State waters; prior to commencement of survey operations, the geophysical operator shall (1) contact the National Oceanic and Atmospheric Administration Long Beach office staff and local whale-watching operations and shall acquire information on the current composition and relative abundance of marine wildlife offshore, and (2) convey sightings data to the vessel operator and crew, survey party chief, and onboard Marine Wildlife Monitors (MWMs) prior to departure. This information will aid the MWMs by providing data on the approximate number and types of organisms that may be in the area.	No adverse effects to marine mammals or sea turtles due to survey activities are observed.	Document contact with appropriate sources.  Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder; Inquiry to NOAA and local whale watching operators.	Prior to survey.
Impacts to marine mammals and sea turtles from survey operations.	<b>MM BIO-2:</b> Marine Wildlife Monitors.	A minimum of two qualified MWMs who are experienced in marine wildlife observations shall be onboard the survey vessel throughout both transit and data collection activities. The specific monitoring, observation, and data collection responsibilities shall be identified in the Marine Wildlife Contingency Plan required as part of all Offshore Geophysical Permit Program permits. Qualifications of proposed MWMs shall be submitted to the National Oceanic and Atmospheric Administration (NOAA) and CSLC at least two weeks in advance of the survey for their approval by the agencies. Survey operations shall not commence until the CSLC approves the MWMs.	Competent and professional monitoring or marine mammals and sea turtles; compliance with established monitoring policies.	Document contact with and approval by appropriate agencies.  Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Prior to survey.
Impacts to marine mammals and sea turtles from survey operations.	<b>MM BIO-3:</b> Safety Zone Monitoring.	Onboard MWMs responsible for observations during vessel transit shall be responsible for monitoring during the survey equipment operations. All visual monitoring shall occur from the highest practical vantage point aboard the survey vessel; binoculars shall be used to observe the surrounding area, as appropriate. The MWMs will survey an area (i.e., safety or exclusion zone) based on the equipment used, centered on the sound source (i.e., vessel, towfish), throughout time that the survey equipment is operating. Radial distances for the safety zone of each equipment type are as follows:	No adverse effects to marine mammals or sea turtles due to survey activities are observed; compliance with established safety zones.	Compliance with permit requirements (observers); compliance with established safety zones.  Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Prior to survey.

Impact	Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing												
		<table><tr><th>Equipment Type</th><th>Safety Zone (radius, m)</th></tr><tr><td>Single Beam Echosounder</td><td>50</td></tr><tr><td>Multibeam Echosounder</td><td>200</td></tr><tr><td>Side-Scan Sonar</td><td>600</td></tr><tr><td>Subbottom Profiler</td><td>50</td></tr><tr><td>Boomer System</td><td>75</td></tr></table> <p>The onboard MWMs shall have authority to stop operations if a mammal or turtle is observed within the specified safety zone and may be negatively affected by survey activities. The MWMs shall also have authority to recommend continuation (or cessation) of operations during periods of limited visibility (i.e., fog, rain) based on the observed abundance of marine wildlife. Periodic reevaluation of weather conditions and reassessment of the continuation/cessation recommendation shall be completed by the onboard MWMs. During operations, if an animal's actions are observed to be irregular, the monitor shall have authority to recommend that equipment be shut down until the animal moves further away from the sound source. If irregular behavior is observed, the equipment shall be shut-off and will be restarted and ramped-up to full power, as applicable, or will not be started until the animal(s) is/are outside of the safety zone or have not been observed for 15 minutes.</p>	Equipment Type	Safety Zone (radius, m)	Single Beam Echosounder	50	Multibeam Echosounder	200	Side-Scan Sonar	600	Subbottom Profiler	50	Boomer System	75				
Equipment Type	Safety Zone (radius, m)																	
Single Beam Echosounder	50																	
Multibeam Echosounder	200																	
Side-Scan Sonar	600																	
Subbottom Profiler	50																	
Boomer System	75																	

Impact	Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing
Impacts to marine mammals and sea turtles from survey operations.	<b>MM BIO-4:</b> Limits on Nighttime OGPP Surveys.	All State waters; nighttime survey operations are prohibited under the OGPP, except as provided below. The CSLC will consider the use of single beam echosounders and subbottom profilers at night on a case-by-case basis, taking into consideration the equipment specifications, location, timing, and duration of survey activity.	No adverse effects to marine mammals or sea turtles due to survey activities are observed.	Pre-survey request for nighttime operations, including equipment specifications and proposed use schedule.  Document equipment use.  Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Approval required before survey is initiated.  Monitoring Report following completion of survey.
Impacts to marine mammals and sea turtles from survey operations.	<b>MM BIO-5:</b> Soft Start.	All State waters; The survey operator shall use a "soft-start" technique at the beginning of survey activities each day (or following a shut down) to allow any marine mammal that may be in the immediate area to leave before the sound sources reach full energy. Surveys shall not commence at nighttime or when the safety zone cannot be effectively monitored. Operators shall initiate each piece of equipment at the lowest practical sound level, increasing output in such a manner as to increase in steps not exceeding approximately 6 decibels (dB) per 5-minute period. During ramp-up, the marine wildlife monitors shall monitor the safety zone. If marine mammals are sighted within or about to enter the safety zone, a power-down or shut-down shall be implemented as though the equipment was operating at full power. Initiation of ramp-up procedures from shut-down requires that the marine wildlife monitors be able to visually observe the full safety zone.	No adverse effects to marine mammals or sea turtles due to survey activities are observed.	Compliance with permit requirements (observers); compliance with safe start procedures.  Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Immediately prior to survey.



Impact	Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing
Impacts to marine mammals and sea turtles from survey operations.	<b>MM BIO-6:</b> Verification of Sound Output and Practical Limitations on Equipment Use.	All State waters; prior to commencing survey operations, geophysical operators shall test the low energy geophysical equipment to verify the sound source levels are within manufacturer's specifications. Geophysical operators shall follow, to the maximum extent possible, the guidelines of Zykov et al. (2013) as they pertain to the use of subbottom profilers and side-scan sonar, including: <ul style="list-style-type: none"> <li>• Use the highest frequency band possible for the subbottom profiler;</li> <li>• Using the shortest possible pulse length; and</li> <li>• Lowering the pulse rate (pings per second) as much as feasible.</li> </ul> Geophysical operators shall consider the potential applicability of these measures to other equipment types (e.g., boomer).	No adverse effects to marine mammals or sea turtles due to survey activities are observed.	Document initial and during survey sound source levels or equipment output measurements or settings.  Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Immediately prior to and during survey.
Impacts to hauled out pinnipeds from survey operations.	<b>MM BIO-7:</b> Avoidance of Pinniped Haul-Out Sites.	The Marine Wildlife Contingency Plan (MWCP) developed and implemented for each survey shall include identification of haul-out sites within or immediately adjacent to the proposed survey area. For surveys within 300 meters (m) of a haul-out site, the MWCP shall further require that: <ul style="list-style-type: none"> <li>• The (survey) vessel shall not approach within 91 m of a haul-out site, consistent with National Marine Fisheries Service (NMFS) guidelines;</li> <li>• Survey activity close to haul-out sites shall be conducted in an expedited manner to minimize the potential for disturbance of pinnipeds on land; and</li> <li>• Marine wildlife observers shall monitor pinniped activity onshore as the vessel approaches, observing and reporting on the number of pinnipeds potentially disturbed (e.g., via head lifting, flushing into the water). The purpose of such reporting is to provide CSLC and California Department of Fish and Wildlife (CDFW) with information regarding potential disturbance associated with OGPP surveys.</li> </ul>	No adverse effects to pinnipeds at haul outs are observed.	Document pinniped reactions to vessel presence and equipment use.  Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Monitoring Report following completion of survey.
Impacts to marine mammals and sea turtles from survey operations.	<b>MM BIO-8:</b> Reporting Requirements - Collision.	All State waters; if a collision with marine mammal or reptile occurs, the vessel operator shall document the conditions under which the accident occurred, including the following: <ul style="list-style-type: none"> <li>• Vessel location (latitude, longitude) when the collision occurred;</li> <li>• Date and time of collision;</li> <li>• Speed and heading of the vessel at the time of collision;</li> <li>• Observation conditions (e.g., wind speed and direction,</li> </ul>	No adverse effects to marine mammals or sea turtles due to survey activities are observed.	Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Monitoring Report following completion of survey.

Impact	Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing
		<p>swell height, visibility in miles or kilometers, and presence of rain or fog) at the time of collision;</p> <ul style="list-style-type: none"> <li>Species of marine wildlife contacted (if known);</li> <li>Whether an observer was monitoring marine wildlife at the time of collision; and,</li> <li>Name of vessel, vessel owner/operator, and captain officer in charge of the vessel at time of collision.</li> </ul> <p>After a collision, the vessel shall stop, 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 animal by doing so. The vessel will then immediately communicate by radio or telephone all details to the vessel's base of operations, and shall immediately report the incident. Consistent with Marine Mammal Protection Act requirements, the vessel's base of operations or, if an onboard telephone is available, the vessel captain him/herself, will then immediately call the NOAA Stranding Coordinator to report the collision and follow any subsequent instructions. From the report, the Stranding Coordinator will coordinate subsequent action, including enlisting the aid of marine mammal rescue organizations, if appropriate. From the vessel's base of operations, a telephone call will be placed to the Stranding Coordinator, NOAA NMFS, Southwest Region, Long Beach, to obtain instructions. Although NOAA has primary responsibility for marine mammals in both State and Federal waters, The California Department of Fish and Wildlife will also be advised that an incident has occurred in State waters affecting a protected species.</p>				
Impacts to marine resources present within MPAs.	<b>MM BIO-9:</b> Limitations on Survey Operations in Select Marine Protected Areas (MPAs).	All MPAs; prior to commencing survey activities, geophysical operators shall coordinate with the CLSC and CDFW regarding proposed operations within MPAs. The scope and purpose of each survey proposed within a MPA shall be defined, and the applicability to the survey to the allowable MPA activities shall be conducted. No Offshore Geophysical Permit Program surveys shall be allowed within special closure areas. If deemed necessary by CDFW, geophysical operators will pursue a scientific collecting permit, or other appropriate permit, to secure approval to work within a MPA, and shall provide a copy of such authorization to the CSLC as part of the required 15-day notification. CSLC and/or CDFW may impose further	No adverse effects to MPA resources due to survey activities are observed.	<p>Monitor reactions of wildlife to survey operations; report on shutdown conditions and survey restart.</p> <p>Submit Final Monitoring Report after completion of survey activities.</p>	OGPP permit holder; survey permitted by CDFW.	Prior to survey.

Impact	Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing
		restrictions on survey activities as conditions of approval.				
Hazards and Hazardous Materials (MND Section 3.3.7)						
Impacts to sensitive resources, including air quality, water quality and sediments, marine biota, sensitive habitat areas, fishing, shipping industry, maritime activities, recreation, and aesthetics/ tourism.	MM HAZ-1: Oil Spill Contingency Plan (OSCP) Required Information.	Permittees shall develop and submit to CSLC staff for review and approval an OSCP that addresses accidental releases of petroleum and/or non petroleum products during survey operations. Permittees' OSCP's shall include the following information for each vessel to be involved with the survey: <ul style="list-style-type: none"><li>• Specific steps to be taken in the event of a spill, including notification names, phone numbers, and locations of: (1) nearby emergency medical facilities, and (2) wildlife rescue/response organizations (e.g., Oiled Wildlife Care Network);</li><li>• Description of crew training and equipment testing procedures; and</li><li>• Description, quantities and location of spill response equipment onboard the vessel.</li></ul>	Reduction in the potential for an accidental spill. Proper and timely response and notification of responsible parties in the event of a spill.	Documentation of proper spill training. Notification of responsible parties in the event of a spill.	OGPP permit holder and contract vessel operator.	Prior to survey.
Impacts to sensitive resources, as summarized in MM HAZ-2.	MM HAZ-2: Vessel fueling restrictions.	Vessel fueling shall only occur at an approved docking facility. No cross vessel fueling shall be allowed.	Reduction in the potential for an accidental spill.	Documentation of fueling activities.	Contract vessel operator.	Following survey.
Impacts to sensitive resources, as summarized in MM HAZ-2.	MM HAZ-3: OSCP equipment and supplies.	Onboard spill response equipment and supplies shall be sufficient to contain and recover the worst-case scenario spill of petroleum products as outlined in the OSCP.	Proper and timely response in the event of a spill.	Notification to CSLC of onboard spill response equipment/supplies inventory, verify ability to respond to worst-case spill.	Contract vessel operator.	Prior to survey.
Hydrology and Water Quality						
Impacts to water quality	MM HAZ-1: Oil Spill Contingency Plan (OSCP) Required Information.	Outlined under Hazards and Hazardous Materials (above)				
Impacts to water quality	MM HAZ-2: Vessel fueling restrictions.	Outlined under Hazards and Hazardous Materials (above)				
Impacts to water quality	MM HAZ-3: OSCP equipment and supplies.	Outlined under Hazards and Hazardous Materials (above)				
Land Use and Planning						

Impact	Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing
Impacts to MPA resources.	<b>MM BIO-9:</b> Limitations on Survey Operations in Select MPAs.	Outlined under <b>Biological Resources</b> (above)				
<b>Recreation</b>						
Survey equipment noise could affect recreational divers.	<b>MM REC-1:</b> U.S. Coast Guard (USCG), Harbormaster, and Dive Shop Operator Notification.	All California waters where recreational diving may occur; as a survey permit condition, the CSLC shall require survey applicants to provide the USCG with survey details, including information on vessel types, survey locations, times, contact information, and other details of activities that may pose a hazard to mariners and fishers so that USCG can include the information in the Local Notice to Mariners, advising vessels to avoid potential hazards near survey areas. Furthermore, survey operators shall post such notices in the harbormasters' offices of regional harbors at least 15 days in advance of in-water operations. Local dive operations shall also be notified of proposed survey operations at least 15 days in advance of in-water operations.	No adverse effects to recreational divers from survey operations.	Notify the USCG, local harbor-masters, and local dive shops of planned survey activity.  Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Prior to survey.
<b>Commercial and Recreational Fishing</b>						
Surveys could adversely affect commercial and recreational fisheries by causing damage to or destruction of fishing gear deployed by fishing vessels, including hand lines, longlines, trolling gear, traps, round haul nets, and entangling nets.	<b>MM FISH-1:</b> U.S. Coast Guard (USCG) and Harbormaster Notification.	All California waters; as a survey permit condition, the CSLC shall require survey applicants to provide the USCG with survey details, including information on vessel types, survey locations, times, contact information, and other details of activities that may pose a hazard to mariners and fishers so that USCG can include the information in the Local Notice to Mariners, advising vessels to avoid potential hazards near survey areas. Furthermore, survey operators shall post such notices in the harbormasters' offices of regional harbors at least 15 days in advance of in-water operations.	No adverse effects to commercial fishing gear in place.	Notify the USCG and local harbor-masters of planned survey activity.  Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Prior to survey.
	<b>MM FISH-2:</b> Minimize Interaction with Fishing Gear.	To minimize interaction with fishing gear that may be present within a survey area, the geophysical vessel (or designated vessel) will traverse the proposed survey corridor prior to commencing survey operations to note and record the presence of deployed fishing gear. Type and location of fishing gear (i.e., buoys) observed will be noted, and the local California Department of Fish and Wildlife (CDFW) field office will be contacted.  No survey lines within 30 m (100 ft) of observed fishing gear will be conducted. The survey crew will not remove or	No adverse effects to commercial fishing gear in place.	Visually observe the survey area for commercial fishing gear. Notify the gear owner and request relocation of gear outside survey area.  Submit Final Monitoring Report	OGPP permit holder.	Immediately prior to survey (prior to each survey day).

Impact	Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing
		relocate any fishing gear; removal or relocation will only be accomplished by the owner of the gear or by an authorized CDFW agent.		after completion of survey activities.		
<b>Traffic/Transportation</b>						
Surveys could adversely affect marine traffic and transportation, especially commercial and recreational fishing activity, by creating space use conflicts.	<b>MM FISH-1:</b> USCG and Harbormaster Notification.	Outlined under <b>Commercial and Recreational Fisheries</b> (above)				

Acronyms/Abbreviations: CARB = California Air Resources Board; CDFW = California Department of Fish and Wildlife; CSLC = California State Lands Commission; cSEL = cumulative sound exposure level; dB = decibels; ft = feet; gal = gallon(s); LNM = Local Notice to Mariners; MPA = Marine Protected Area; MWCP = Marine Wildlife Contingency Plan; MWM = Marine Wildlife Monitor; m= meter(s); ms = millisecond(s); min = minute; NOAA = National Oceanic and Atmospheric Administration; NO<sub>x</sub> = Nitrogen Oxide; OGPP = Offshore Geophysical Permit Program; OSCP = Oil Spill Contingency Plan; ppm = parts per million; lb = pound(s); rms = root mean square; SEL = sound exposure level; SPL = sound pressure level; USCG = U.S. Coast Guard.

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## 6.0 MND PREPARATION SOURCES AND REFERENCES

This Mitigated Negative Declaration (MND) was prepared by the staff of the California State Lands Commission's (CSLC) Division of Environmental Planning and Management (DEPM), with the assistance of CSA Ocean Sciences, Inc. (CSA) and its subcontractors. The analysis in the MND is based on information identified, acquired, reviewed, and synthesized based on DEPM guidance and recommendations. Primary synthesis efforts on the MND were completed by both DEPM and CSA and its subcontractors. MND sections have been independently reviewed by DEPM staff and by the Ocean Protection Council.

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