ACRONYMS AND ABBREVIATIONS

A-A	Air-to-Air
AAV	Amphibious Assault Vehicle
AAW	Anti-Aircraft Warfare
ACM	Air Combat Maneuvers
ADEX	Air Defense Exercise
AFP	Artillery Firing Point
agl	above ground level
ALMDS	Airborne Laser Mine Detection System
AMNS	Airborne Mine Neutralization System
AMP	Artillery Maneuver Point
ARPA	Advance Research Projects Agency
A-S	Air-to-Surface
ASBS	Area of Special Biological Significance
ASUW	Anti-Surface Warfare
ASW	Anti-Submarine Warfare
BAT	Ballistic Aerial Target
BMP	Best Management Practices
BUD/S	Basic Underwater Demolition/SEALs
cal	caliber
CCA	California Coastal Act
CD	Consistency Determination
CCR	California Code of Regulations
CDFG	California Department of Fish and Game
CFR	Code of Federal Regulations
cm	centimeter
CO	Commanding Officer
CPAAA	Camp Pendleton Amphibious Assault Area
CPAVA	Camp Pendleton Amphibious Vehicle Area
CRRC	Combat Rubber Raiding Craft
CSAR	Combat Search and Rescue
CSG	Carrier Strike Group
CZ	coastal zone
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Plan
DACT	Dissimilar Air Combat Training
dB	decibel
DDG	Guided Missile Destroyer
Demo	Demolition
DoD	Department of Defense
DoN	Department of the Navy
EER	Extended Echo Ranging
EFEX	Expeditionary Fires Exercise
EFH	Essential Fish Habitat
EFV	Expeditionary Fighting Vehicle
EIS	Environmental Impact Statement
EMATT	Expendable Mobile ASW Training Target
ENETA	Encinitas Naval Electronic Test Area
ESA	Endangered Species Act
ESF	Expeditionary Strike Force
ESG	Expeditionary Strike Group
EOD	Explosive Ordnance Disposal
EW	Electronic Warfare
EXTORP	Exercise Torpedo
FAA	Federal Aviation Administration
FIREX	Firing Exercise
FLETA	Fleet Training Area
FLEETEX	Fleet Training Exercise
FMP	Fishery Management Plan
FR	Federal Register
FRTP	Fleet Response Training Plan
FSA	Fire Support Area
ft	feet or foot
ft^2	square foot or feet
GBU	Glide Bomb Unit
GUNEX	Gunnery Exercise
HCOTA	Helicopter Offshore Training Area
HFM3	High-Frequency Marine Mammal Monitoring
HMMWV	High Mobility Multi-purpose Wheeled Vehicle
Hz	Hertz
IAC	Integrated ASW Course
I/E	Insertion and Extraction
IEER	Improved Extended Echo Ranging
ISE	Independent Steaming Exercise
JSOW	Joint Standoff Weapon
kg	kilogram
kHz	kilo-Hertz
km	kilometer
km^2	square kilometer
KTR	Kingfisher Training Range
lb	pound
LAV	Light Attack Vehicle
LPD	Landing Platform, Dock
LCAC	Landing Craft, Air Cushion
LCS	Littoral Combat Ship
LCU	Landing Craft, Utility
LFA	low-frequency active
LGTR	Laser Guided Training Round
LIDAR	Light Detection and Ranging
LMRS	Long-term Mine Reconnaissance System
LTR	Laser Training Range
m	meter
m^2	meters, squared
mm	millimeter
MCM	Mine Countermeasures
MEF	Marine Expeditionary Force
MEU	Marine Expeditionary Unit
MFAS	Mid-Frequency Active Sonar
MINEX	Mining Exercise
MIR	Missile Impact Range
MISR	Missile Range
MISSILEX	Missile Exercise
MIW	Mine Interdiction Warfare
MMPA	Marine Mammal Protection Act
MOA	Military Operations Area
MPA	Maritime Patrol Aircraft
MPRSA	Marine Protection, Research, and Sanctuaries Act
μPa^2-s	micro-Pascals squared-second
MSAT	Marine Species Awareness Training
msec	meter-second
MSL	mean sea level (above)
MSMP	Multi-Species Monitoring Plan
MTR	Mine Training Range
NALF	Naval Auxiliary Landing Field
NAOPA	Northern Air Operating Area
NAS	Naval Air Station
Navy	Depai

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NBC	Naval Base Coronado
NDE	National Defense Exemption
NEPA	National Environmental Policy Act
n.e.w.	net explosive weight
nm	nautical mile
nm^2	square nautical mile
NAVEDTRA	Naval Education and Training Command
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOTMAR	Notice to Mariners
NOTAM	Notice to Airmen
NOTS	Naval Ordnance Transfer Station
NSFS	Naval Surface Fire Support
NSW	Naval Special Warfare
NUWC	Naval Undersea Warfare Center
OAMCM	Organic Airborne Mine Countermeasures
OASIS	Organic Airborne Surface Influence Sweep
OCE	Officer in Charge of the Exercise
OOD	Officer of the Day
OPAREA	Operating Area
PMAR	Primary Mission Area
PMSR	Point Mugu Sea Range
psi	pounds per square inch
PTS	Permanent Threshold Shift
QA/QC	Quality Assurance / Quality Control
RAMICS	Rapid Airborne Mine Clearance System
RC	Range Complex
RDT&E	Research, Development, Testing and Evaluation
REXTORP	Recoverable Exercise Torpedo
ROC	Range Operations Center
ROV	Remotely Operated Vehicle
RMS	Remote Minehunting System
RPV	Remotely Piloted Vehicle
S-A	Surface-to-Air
SBI	Santa Barbara Island
SCI	San Clemente Island
SCIRC	San Clemente Island Range Complex
SCIUR	San Clemente Island Underwater Range
SCORE	Southern California Offshore Range
SEAL	Sea, Air, and Land
SHOBA	Shore Bombardment Area
SINKEX	Sinking Exercise
SNI	San Nicholas Island
SOAR	Southern California Anti-Submarine Warfare Range
SOCAL	southern California
SPCOA	San Pedro Channel Operating Area
S-S	Surface-to-Surface
SWAT	Special Warfare Training Area
SUA	Special Use Airspace
SURTASS	Surveillance Towed Array Sensor System
SUW	Surface Warfare
SWTR	Shallow Water Training Range
TAR	Training Areas and Ranges
TL	transmission loss
TLAM	Tomahawk Land Attack Missile
TM	tympanic membrane
TMA	Tactical Maneuvering Areas
TORPEX	Torpedo Exercise
TRACKEX	Tracking Exercise
TTS	Temporary Threshold Shift
UAV	Unmanned Aerial Vehicle
U.S.	United States
USC	U.S. Code
USEPA	U.S. Environmental Protection Agency
USMC	U.S. Marine Corps
UUV	Unmanned Underwater Vehicle
VDS	Variable Depth Sonar
W-291	Warning Area 291
WS	Withering Syndrome
WSCOA	Western San Clemente Operating Area
XO	Executive Officer

Table 1-9: Geographical Distribution of Training and RDT&E Activities

TRAINING AND TEST ACTIVITIES		DISTRIBUTION	
		In CZ?	Discussion
TRAINING			
AAW*	Aircraft Combat Maneuvers (1)	NO	> 3 miles from coast, +5,000 ft AGL
	Air Defense Exercise (2)	NO	> 3 miles from coast
	Surface-to-Air Missile Exercise (3)	YES	Missile could fly through CZ
	Surface-to-Air Gunnery Exercise (4)	YES	Some nearshore in CZ but mostly beyond 3 miles from coast
	Air-to-Air Missile Exercise (5)	YES	Some nearshore in CZ but mostly beyond 3 miles from coast
ASW*	Helicopter ASW TRACKEX/TORPEX (6,7)	YES	Some nearshore in CZ but mostly beyond 3 miles from coast
	MPA ASW TRACKEX/TORPEX (8,9)	YES	Some nearshore in CZ but mostly beyond 3 miles from coast
	Surface Ship ASW TRACKEX/TORPEX (11,12)	YES	Some nearshore in CZ but mostly beyond 3 miles from coast
	Extended Echo Ranging (EER) Operations (Integrated ASW Course II) (10)	YES	Some nearshore in CZ but mostly beyond 3 miles from coast
	Submarine ASW TRACKEX/TORPEX (13,14)	YES	Some nearshore in CZ but mostly beyond 3 miles from coast
ASUW*	Visit Board Search and Seizure (15)	YES	Nearshore and beyond 3 miles from coast
	Air-to-Surface Missile Exercise (16)	YES	Nearshore and beyond 3 miles from coast
	Air-to-Surface Bombing Exercise (17)	YES	Nearshore and beyond 3 miles from coast
	Air-to-Surface Gunnery Exercise (18)	YES	Nearshore and beyond 3 miles from coast
	Surface-to-Surface Gunnery Exercise (19)	YES	Some nearshore in CZ but mostly beyond 3 miles from coast
	Sink Exercise (20)	NO	> 50 nm from coast
AMW*	Naval Surface Fire Support (21)	YES	Some nearshore in CZ but mostly beyond 3 miles from coast
	Expeditionary Fires Exercise (22)	YES	Beyond CZ, in CZ, and ashore
	Battalion Landing (23)	YES	Beyond CZ, in CZ, and ashore
	USMC Stinger Firing Exercise (24)	YES	Targets are fired on in the CZ
	Amphibious Landings and Raids (25)	YES	Personnel and vessels pass through CZ
	Amphibious Operations - CPAAA (26)	YES	All activities in CZ
EC*	Electronic Combat Exercises (27)	YES	Some nearshore in CZ but mostly beyond 3 miles from coast
MIW*	Mine Countermeasures (28)	YES	Mostly CZ / nearshore; some open ocean
	Mine Neutralization (29)	YES	Mostly CZ / nearshore; some open ocean
	Mine Laying Exercise (30)	YES	Evenly distributed inside/outside of CZ
NSW*	NSW Land Demolition (31)	NO	All activities on SCI (federally controlled)
	Underwater Demolition - Single Charge (32)	YES	All activities in CZ
	Underwater Demolition - Multiple Charges (33)	YES	All activities in CZ
	Marksmanship - Small Arms Training (34)	NO	All activities on SCI (federally controlled)
	Land Navigation (35)	NO	All activities on SCI (federally controlled)
	NSW UAV Operations (36)	NO	All activities on/above SCI (federally controlled land)
	Insertion/Extraction (37)	YES	Some nearshore in CZ but mostly beyond 3 miles from coast

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Table 1-9: Geographical Distribution of Training and RDT&E Activities (continued)

TRAINING AND TEST ACTIVITIES		DISTRIBUTION	
		In CZ?	Discussion
TRAINING			
NSW*	NSW Boat Operations (38)	YES	Some nearshore in CZ but mostly beyond 3 miles from coast
	NSW SEAL Platoon Operations (39)	YES	All activities in CZ or on SCI
	NSW Direct Action (40)	YES	All activities in CZ or on SCI
STW*	BOMBEX - Land (41)	NO	All activities on SCI
	Combat Search & Rescue (42)	YES	Mostly SCI / and nearshore in CZ; and greater than 3 miles from coast
Other	Explosive Ordnance Disposal (43)	NO	All activities on SCI
	USCG Operations (44)	YES	Evenly distributed inside/outside of CZ
	NALF Activities (45)	NO	On SCI, inbound/outbound traffic over CZ
RDT&E*	Ship Torpedo Tests (46)	YES	Some nearshore in CZ but mostly beyond 3 miles from coast
	Unmanned Underwater Vehicles (47)	YES	All activities in CZ
	Sonobuoy QA/QC Testing (48)	YES	Evenly distributed inside/outside of CZ
	Ocean Engineering (49)	YES	All activities in CZ
	Marine Mammal Mine Shape Location/Research (50)	YES	All activities in CZ
	Missile Flight Tests (51)	YES	Missile could fly through CZ
	NUWC Underwater Acoustics Testing (52)	YES	Evenly distributed inside/outside of CZ

NOTES: AAW - Anti-Air Warfare; ASW - Anti-Submarine Warfare; ASUW - Anti-Surface Warfare; AMW - Amphibious Warfare; EC - Electronic Combat; MIW - Mine Interdiction Warfare; NSW - Naval Special Warfare; STW - Strike Warfare; RDT&E - Research, Development, Test, and Evaluation.

(*Balaenoptera musculus*), fin whale (*B. physalus*), humpback whale (*Megaptera novaeangliae*), sei whale (*B. borealis*), and sperm whale (*Physeter macrocephalus*) are listed as endangered species and are protected under the ESA.

A comparison of cetacean abundance in 1979-1980 with abundance in 1991 indicated that numbers of mysticetes and odontocetes increased in offshore California waters during that period. The status of cetacean stocks and their abundance estimates for California are summarized in Table 3-5 from marine mammal stock assessments prepared by Barlow et al. (1997), Forney et al. (2000), and Carretta et al. (2001 and 2004). The life histories of the cetaceans found in SOCAL Range Complex are described in Section 3.9 of the SOCAL Range Complex Draft EIS/OEIS.

Table 3-5: Marine Mammal Species Found in Southern California Waters

Common Name Species Name	Abundance in Southern California (number)	Stock (SAR)	ESA/ MMPA Status	Population Trend
Blue whale *Balaenoptera musculus*	842	Eastern North Pacific	E, D, S	May be increasing
Fin whale *Balaenoptera physalus*	359	California, Oregon, & Washington	E, D, S	May be increasing
Humpback whale *Megaptera novaeangliae*	36	California, Oregon, & Washington	E, D, S	Increasing 6-7%
Sei whale *Balaenoptera borealis*	0 (7 Bryde's or Sei)[3]	Eastern North Pacific	E, D, S	May be increasing
Sperm whale *Physeter macrocephalus*	607	California, Oregon, & Washington	E, D, S	Unknown
Guadalupe fur seal *Arctocephalus townsendi*	San Miguel Is. is in southern California, but is outside of the SOCAL Range Complex	Mexico	T, D, S	Increasing 13.7%
Southern Sea Otter *Enhydra lutris*	~29 (ground surveys)	California	T, D	Increasing
Bryde's whale *Balaenoptera edeni*	0 (7 Bryde's or Sei)[3]	California		Unknown
Gray whale *Eschrichtius robustus*	Population migrates through SOCAL Range Complex	Eastern North Pacific		Increasing ~ 2.5%
Minke whale *Balaenoptera acutorostrata*	226	California, Oregon, & Washington		Unknown
Baird's beaked whale *Berardius bairdii*	127	California, Oregon, & Washington		Unknown
Bottlenose dolphin coastal *Tursiops truncatus*	323	California Coastal		Stable
Bottlenose dolphin offshore *Tursiops truncatus*	1,831	California Offshore		Unknown
Cuvier's beaked whale *Ziphius cavirostris*	911	California, Oregon, & Washington		Unknown
Dall's porpoise *Phocoenoides dalli*	727	California, Oregon, & Washington		Unknown
Dwarf sperm whale *Kogia sima*	0	California, Oregon, & Washington		Unknown
False killer whale *Pseudorca crassidens*	Unknown	Eastern Tropical Pacific		Unknown
Killer whale offshore *Orcinus orca*	30	Eastern North Pacific		Unknown
Killer whale transient *Orcinus orca*	Unknown	Eastern North Pacific		Unknown
Long-beaked common dolphin *Delphinus capensis*	17,530	California		Unknown – seasonal

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Table 3-5: Marine Mammal Species Found in Southern California Waters (continued)

Common Name Species Name	Abundance in Southern California (number)	Stock (SAR)	ESA/ MMPA Status	Population Trend
Mesoplodont beaked whales *Mesoplodon spp.*	132	California, Oregon, & Washington		Unknown
Northern right whale dolphin *Lissodelphis borealis*	1,172	California, Oregon, & Washington		No Trend
Pacific white-sided dolphin *Lagenorhynchus obliguidens*	2,196	California, Oregon, & Washington		No Trend
Pantropical spotted dolphin *Stenella attenuate*	Unknown	Eastern Tropical Pacific		Unknown
Pygmy sperm whale *Kogia breviceps*	0	California, Oregon, & Washington		Unknown
Risso's Dolphin *Grampus griseus*	3,418	California, Oregon, & Washington		No Trend
Rough-toothed dolphin *Steno bredanensis*	Unknown	Tropical and warm temperate		Unknown
Short-beaked common dolphin *Delphinus delphis*	165,400	California, Oregon, & Washington		Unknown – seasonal
Short-finned pilot whale *Globicephala macrorhynchus*	118	California, Oregon, & Washington		Unknown
Spinner dolphin *Stenella longirostris*	Unknown	Tropical and warm temperate		Unknown
Striped dolphin *Stenella coeruleoalba*	12,529	California, Oregon, & Washington		No Trend
Harbor seal *Phoca vitulina*	5,271 (All age classes from aerial counts)	California		Stable
Northern elephant seal *Mirounga angustirostris*	SNI 9,794 pups in 2000. SCI up to 16 through 2000	California		Increasing
California sea lion *Zalophus californianus*	All pupping occurs in southern California	U.S. Stock		Increasing 6.1%
Northern fur seal *Callorhinus ursinus*	7,784	San Miguel Island		Increasing 8.3%

Stock or population abundance estimates and the associated correlation of variance (CV) from NMFS Stock Assessment Reports (SAR), their status under the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA), the population trend, and relative abundance in each range area. E=Endangered under the ESA; D = Depleted under the MMPA; and S=Strategic Stock under the MMPA. Due to lack of information, several of the Mesoplodont beaked whales have been grouped together.

Of the 27 species of cetaceans expected to be present in the SOCAL Range Complex areas, only one (bottlenose dolphin) is expected to be regularly present in the CZ (see Table 3-6). Another two species (gray whale, long-beaked common dolphin) are expected to be present in the CZ occasionally, either seasonally for the gray whale, or periodically during foraging or regular movement for long-beaked common dolphin.

After a review of published scientific literature, it was determined that the other 24 cetaceans within Southern California water are more typically open ocean species not normally found in or near the CZ (Forney et al. 1995, Forney and Barlow 1998, Carretta et al. 2000, Soldevilla et al. 2006, Barlow and Forney 2007). Many of these species also have seasonal occurrence within the offshore waters of SOCAL and may not be present during certain times of the year (Forney and Barlow 1998, Barlow and Forney 2007). Because these species are not found in the CZ on a regular or cyclical basis, they are not coastal resources and will not be considered further in this analysis [See 40 C.F.R. § 930.11(b)]. No ESA-listed cetaceans are expected to be present in or near the CZ within the area of the proposed activities.

and test activities in the CZ and Table 1-7 lists the ranges or OPAREAs where they occur. The foreseeable effects of proposed activities in the CZ are described below by major warfare area.

The discussion below is not intended to be a complete description of the exercise (detailed exercise descriptions are provided in Appendix A), but rather a discussion of whether the elements of the exercise have a reasonably foreseeable effect on CZ uses or resources.

2.2.1 Anti-Air Warfare (AAW)

AAW includes Air Combat Maneuvers (ACM), Air Defense Exercises (ADEX), Surface-to-Air (S-A) and Air-to-Air (A-A) Missile Exercises (MISSILEXs), and S-A Gunnery Exercises (GUNEXs). All AAW activities occur in W-291, the eastern boundary of which lies 12 nm off the mainland California coast, 9 nm beyond the 3 mile limit of the CZ along the mainland coast. Some of these activities would occur, however, in the portion of the CZ surrounding SCI.

2.2.1.1 Air Combat Maneuver (ACM)

ACM occurs in Special Use Airspace (SUA), the floor of which is 5,000 feet (ft) above ground level (agl). Thus, while some aircraft involved in ACM may overfly that portion of the CZ surrounding SCI, these activities occur at high altitudes, are very transitory, and are dispersed over large areas, such that their effects on their immediate surroundings are minimal; no effects would occur in the CZ. At the altitudes at which these activities would occur, bird-aircraft strikes are not a hazard (birds, especially shorebirds and seabirds, typically fly close to the surface); CZ resources and uses would not be affected. ACM activities have no reasonably foreseeable effects on CZ uses or resources, and are not considered further in this CD.

2.2.1.2 Air Defense Exercise (ADEX)

ADEX involves no expenditure of ordnance; it consists of aircraft and vessel movements outside of the CZ. Aircraft involved in ADEXs may overfly that portion of the CZ surrounding SCI; effects of these activities would be as described above for aircraft flyovers during ACM. ADEXs would have no reasonably foreseeable effects on CZ uses or resources, and are not considered further in this CD.

2.2.1.3 Surface-to-Air Missile Exercise (S-A MISSILEX)

In a S-A MISSILEX, one live or practice surface-to-air missile is fired at a towed aerial target or BQM-74. Intact targets are recovered at the conclusion of the exercise. West Cove waters must be temporarily cleared of vessels when BQM-74 targets are used.

Expended missiles and targets fall to the ocean's surface and sink to the ocean bottom, and thus are contained within W-291. Residual amounts of liquid propellants disperse quickly due to wave action and currents. Because of their relatively small quantities and the large volume of water into which they disperse, the concentrations of these materials outside of the immediate area of impact are very low. Residual amounts of solid propellants and explosives, if any, settle to the ocean bottom along with other expended training materials.

Missiles and targets are composed mostly of relatively inert materials such as steel, aluminum, and plastic. These unreactive materials degrade slowly, if at all, in the dark, cold, low-oxygen environment generally found on the ocean bottom. Corrosion of the exterior surfaces of metallic items typically creates a relatively insoluble surface layer that greatly slows further corrosion. Interior components generally are not in direct contact with the surrounding seawater, greatly limiting their rate of dissolution or leaching. Plastic parts may be abraded by bottom sediments or cracked or broken by internal stresses or exterior mechanical damage.

The expended items eventually become buried in sediment or encrusted with benthic organisms. These processes further insulate the expended training materials from the exterior environment,

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substantially limiting physical damage to the items and establishing a steep gradient for leaching or dispersion of substances from the training items. Benthic organisms may absorb leached substances and organic and inorganic compounds in benthic sediments may form chemical complexes with leached substances, slowing or preventing their release into the larger marine environment. For the reasons outlined above, any individual releases of potentially hazardous substances into the marine environment would initially be very small, and the release rate would tend to decline over time.

Thus, S-A MISSILEXs in W-291 have no reasonably foreseeable effects on CZ resources, but could have a reasonably foreseeable effect on CZ uses for short periods in the West Cove area, and will be evaluated for consistency with enforceable CZ policies in Section 3.

2.2.1.4 Surface-to-Air Gunnery Exercise (S-A GUNEX)

In a S-A GUNEX, ship's guns are fired at towed aerial targets. Intact targets are recovered at the conclusion of the exercise. Expended ordnance and target materials fall to the ocean's surface and sink to the ocean bottom, and thus are contained within W-291.

Naval gun rounds and target materials are composed mostly of relatively inert materials such as steel, aluminum, and plastic. These unreactive materials degrade slowly, if at all, in the dark, cold, low-oxygen environment generally found on the ocean bottom. Corrosion of the exterior surfaces of metallic items typically creates a relatively insoluble surface layer that greatly slows further corrosion. Interior components generally are not in direct contact with the surrounding seawater, greatly limiting their rate of dissolution or leaching. Plastic parts may be abraded by bottom sediments or cracked or broken by internal stresses or exterior mechanical damage.

The expended items eventually become buried in sediment or encrusted with benthic organisms. These processes further insulate the expended training materials from the exterior environment, substantially limiting physical damage to the items and establishing a steep gradient for leaching or dispersion of substances from the training items. Benthic organisms may absorb leached substances and organic and inorganic compounds in benthic sediments may form chemical complexes with leached substances, slowing or preventing their release into the larger marine environment. For the reasons outlined above, any individual releases of potentially hazardous substances into the marine environment would initially be very small, and the release rate would tend to decline over time.

The potential for a S-A GUNEX to affect a marine animal is very low. Vessels orient the geometry of gunnery exercises to prevent expended materials from falling near sighted marine mammals, sea turtles, and floating kelp. Vessels expedite the recovery of parachutes deploying aerial targets to reduce the potential for entanglement of marine mammals and sea turtles. Target-towing aircraft maintain a lookout. If a marine mammal or sea turtle is sighted near the exercise, the tow aircraft notifies the firing vessel to secure gunnery firing until the area is clear. With these measures, S-A GUNEXs have no effect on sea turtles or marine mammals.

The Navy does not require exclusive control over any portion of the CZ to conduct these exercises. S-A GUNEXs thus have no reasonably foreseeable effects on CZ uses or resources, and are not considered further in this CD.

2.2.1.5 Air-to-Air Missile Exercise (A-A MISSILEX)

A-A MISSILEXs occur in SUA at altitudes of 15,000 ft to 25,000 ft agl. Aircraft fire live or practice missiles at aerial targets. Any live missiles used in the exercise would detonate in the air at high altitudes. Therefore, explosions associated with A-A MISSILEX would have no effect on coastal resources. The environmental fate of expended missile and target materials is as described above for S-A MISSILEXs. While some aircraft involved in A-A MISSILEXs may overfly that portion of the CZ surrounding SCI; effects of these activities would be as described

above for aircraft flyovers during ACM. A-A MISSILEXs have no reasonably foreseeable effects on CZ uses or resources, and are not considered further in this CD.

2.2.2 Anti-Submarine Warfare (ASW)

2.2.2.1 TRACKEXs and TORPEXS

Anti-Submarine Warfare (ASW) training activities include Helicopter, Maritime Patrol Aircraft (MPA), Surface Ship, and Submarine Tracking Exercises (TRACKEXs) and Torpedo Exercises (TORPEXs), as well as Extended Echo Ranging (EER) and Improved EER (IEER) activities.

ASW activities in or affecting the CZ consist primarily of TRACKEXs and TORPEXs conducted by helicopters, aircraft, surface ships, and submarines. None of these ASW activities would take place within 3 miles of the mainland coast. TRACKEXs and TORPEXs would occur, however, in those portions of the CZ within 3 miles of SCI, primarily on the Kingfisher range, the offshore portions of the Shore Bombardment Area (SHOBA), and the proposed SWTR (western portion between SOAR and SCI). MPA, helicopter, and surface ship TRACKEXs/TORPEXs generate airborne and underwater (mid-frequency active sonar [MFAS]) sound. While MFAS may periodically ensonify some portions of the CZ near SCI; the intensity of that sonar would depend on the distance between the source and a receptor, such as marine mammals. ASW sonar activities would require relatively infrequent periods of limited duration, so any sonar exposures would be of relatively short duration.

During TORPEXs, exercise torpedoes may be fired and torpedo launch accessories (guide wire, ballast, hose, etc) could be expended in the CZ; the environmental fate of these materials would be substantially similar to that described above for training materials expended during A-S MISSILEXs and S-A GUNEXs. During these events, recreational and commercial users could be temporarily excluded from the OPAREAs in which they take place. Thus, these activities could have reasonably foreseeable effects on CZ resources and uses, and will be evaluated for consistency with enforceable CZ policies in Section 3.

The Navy would take numerous steps to reduce the potential for adverse sonar exposures of marine mammals during ASW activities. All lookouts onboard platforms involved in ASW training events will review the NMFS-approved Marine Species Awareness Training material prior to use of mid-frequency active sonar. All COs, XOs, and officers standing watch on the bridge will review the Marine Species Awareness Training material prior to a training event employing the use of mid-frequency active sonar. Navy lookouts will undertake extensive training to qualify as a watchstander in accordance with the Lookout Training Handbook (Naval Educational Training [NAVEDTRA], 12968 series).

Lookout training will include on-the-job instruction under the supervision of a qualified, experienced watchstander. Following successful completion of this supervised training period, lookouts will complete the Personal Qualification Standard program, certifying that they have demonstrated the necessary skills (such as detection and reporting of partially submerged objects). Lookouts under the instruction of supervisors who monitor their progress and performance are considered legitimate watchstanders for meeting mitigation requirements. In order to facilitate implementation of mitigation measures if marine species are spotted, lookouts will be trained in the most effective means to ensure quick and effective communication within the command structure.

On the bridge of surface ships, there will always be at least three people on watch whose duties include observing the water surface around the vessel. All surface ships participating in ASW training events will, in addition to the three personnel on watch noted previously, have at all times during the exercise at least two additional personnel on watch as marine mammal lookouts. Personnel on lookout and officers on watch on the bridge will have at least one set of binoculars

available for each person to aid in the detection of marine mammals. On surface vessels equipped with mid-frequency active sonar, pedestal mounted "Big Eye" (20x110) binoculars will be present and in good working order to assist in the detection of marine mammals in the vicinity of the vessel. Personnel on lookout will employ visual search procedures employing a scanning methodology in accordance with the Lookout Training Handbook (NAVEDTRA 12968 series). After sunset and prior to sunrise, lookouts will employ Night Lookouts Techniques in accordance with the Lookout Training Handbook. Personnel on lookout will be responsible for reporting all objects or anomalies sighted in the water (regardless of the distance from the vessel) to the Officer of the Deck, since any object or disturbance (e.g., trash, periscope, surface disturbance, discoloration) in the water may be indicative of a threat to the vessel and its crew or indicative of a marine species that may need to be avoided as warranted.

Official guidance will be given prior to the exercise to disseminate further the personnel training requirement and general marine mammal mitigation measures. COs will make use of marine species detection cues and information to limit interaction with marine species to the maximum extent possible consistent with safety of the ship. All personnel engaged in passive acoustic sonar operation (including aircraft, surface ships, or submarines) will monitor for marine mammal vocalizations and report the detection of any marine mammal to the appropriate watch station for dissemination and appropriate action. During mid-frequency active sonar operations, personnel will use all available sensor and optical systems (such as night vision goggles) to aid in the detection of marine mammals. Navy aircraft participating in exercises at sea will conduct and maintain, when operationally feasible and safe, surveillance for marine species of concern as long as it does not violate safety constraints or interfere with the accomplishment of primary operational duties. Aircraft with deployed sonobuoys will use only the passive capability of sonobuoys when marine mammals are detected within 200 yd (183 m) of the sonobuoy. Marine mammal detections will be immediately reported to assigned Aircraft Control Unit for further dissemination to ships in the vicinity of the marine species as appropriate where it is reasonable to conclude that the course of the ship will likely result in a closing of the distance to the detected marine mammal.

Safety Zones—When marine mammals are detected by any means (aircraft, shipboard lookout, or acoustically) within 1,000 yd (914 m) of the sonar dome (the bow), the ship or submarine will limit active transmission levels to at least 6 decibels (dB) below normal operating levels. (A 6 dB reduction equates to a 75 percent power reduction because decibel levels are on a logarithmic scale, not a linear scale.) Thus, a 6 dB reduction results in a power level only 25 percent of the original power. Ships and submarines will continue to limit maximum transmission levels by this 6-dB factor until the animal has been seen to leave the area, has not been detected for 30 minutes, or the vessel has transited more than 2,000 yd (1,829 m) beyond the location of the last detection.

Should a marine mammal be detected within or closing to inside 500 yd (457 m) of the sonar dome, active sonar transmissions will be limited to at least 10 dB below the equipment's normal operating level. (A 10 dB reduction equates to a 90 percent power reduction from normal operating levels.) Ships and submarines will continue to limit maximum ping levels by this 10-dB factor until the animal has been seen to leave the area, has not been detected for 30 minutes, or the vessel has transited more than 2,000 yd (457 m) beyond the location of the last detection.

Should the marine mammal be detected within or closing to inside 200 yd (183 m) of the sonar dome, active sonar transmissions will cease. Sonar will not resume until the animal has been seen to leave the area, has not been detected for 30 minutes, or the vessel has transited more than 2,000 yd (457 m) beyond the location of the last detection.

Special conditions apply to dolphins and porpoises. If, after conducting an initial maneuver to avoid close quarters with dolphins or porpoises, the Officer of the Day (OOD) concludes that

dolphins or porpoises are deliberately closing to ride the vessel's bow wave, no further mitigation actions are necessary while the dolphins or porpoises continue to exhibit bow wave riding behavior.

If the need to power-down should arise, as detailed in "Safety Zones" above, the Navy shall follow the requirements as though they were operating at 235 dB—the normal operating level (i.e., the first power-down will be to 229 dB, regardless of at what level above 235 sonar was being operated). Prior to start up or restart of active sonar, operators will check that the Safety Zone radius around the sound source is clear of marine mammals.

Sonar levels (generally)— The Navy will operate sonar at the lowest practicable level, not to exceed 235 dB, except as required to meet tactical training objectives. Helicopters shall observe/survey the vicinity of an ASW training event for 10 minutes before the first deployment of active (dipping) sonar in the water. Helicopters shall not dip their sonar within 200 yd (183 m) of a marine mammal and shall cease pinging if a marine mammal closes within 200 yd (183 m) after pinging has begun. Submarine sonar operators will review detection indicators of close-aboard marine mammals prior to the commencement of ASW training events involving mid-frequency active sonar. Navy personnel will exercise increased vigilance during ASW training events with tactical active sonar when critical conditions are present.

Based on lessons learned from strandings in Bahamas 2000, Madeiras 2000, Canaries 2002 and Spain 2006, the presence of beaked whales in combination with other conditions are of particular concern because certain beaked whale strandings have been associated with mid-frequency active sonar operations. The Navy will avoid planning Major ASW Training Exercises with mid-frequency active sonar in areas where they will encounter conditions which, in their aggregate, may contribute to a marine mammal stranding event. (Note, however, that these conditions do not exist in the aggregate in the SOCAL Range Complex; they are presented here only for the purpose of providing a complete discussion.)

The conditions to be considered during exercise planning include:

- Areas of at least 1,000-m depth near a shoreline where there is a rapid change in bathymetry on the order of 1,000-6,000 yd (914-5,486 m) occurring across a relatively short horizontal distance (e.g., 5 nautical miles [nm]).
- Cases for which multiple ships or submarines ($\geq$ 3) operating mid-frequency active sonar in the same area over extended periods ($\geq$ 6 hours) in proximity ($\leq$ 10 nm apart).
- An area surrounded by land masses, separated by less than 35 nm and at least 10 nm in length, or an embayment, wherein activities involving multiple ships/subs ($\geq$ 3) employing mid-frequency active sonar near land may produce sound directed toward the channel or embayment that may cut off the lines of egress for marine mammals.
- Though not as dominant a condition as bathymetric features, the historical presence of a significant surface duct (i.e., a mixed layer of constant water temperature extending from the sea surface to 100 or more ft).

If a Major Range Event is to occur in an area where the above conditions exist in their aggregate, then these conditions must be fully analyzed in environmental planning documentation. The Navy will increase vigilance by undertaking the following additional mitigation measures:

- A dedicated aircraft (Navy asset or contracted aircraft) will undertake reconnaissance of the embayment or channel ahead of the exercise participants to detect marine mammals that may be in the area exposed to active sonar. Where practical, advance survey should occur within about 2 hours prior to mid-frequency active sonar use and periodic surveillance should continue for the duration of the exercise. Any unusual conditions (e.g., presence of sensitive

species, groups of species milling out of habitat, and any stranded animals) shall be reported to the Officer in Tactical Command, who should give consideration to delaying, suspending, or altering the exercise.

- All safety zone power down requirements described above will apply.
- The post-exercise report must include specific reference to any event conducted in areas where the above conditions exist, with exact location and time/duration of the event, and noting results of surveys conducted.

2.2.2.2 Extended Echo Ranging/Improved Extended Echo Ranging (EER/IEER Exercise)

EER/IEER exercises may occur anywhere in the SOCAL OPAREAs, including portions of the CZ near SCI. P-3 aircraft would drop explosive and non-explosive sonobuoys into the water, and the explosive sonobuoys, each armed with two 4.2-lb net explosive weight (n.e.w.) high-explosives charges, would be detonated. Byproducts of the detonations would be primarily non-toxic inorganic compounds that are common in the environment. During operation, sonobuoy seawater batteries would release small amounts of potentially hazardous substances, but trace concentrations of these substances would not affect seawater quality or biological productivity (DoN 2008). Expended sonobuoys would sink to the ocean bottom; their environmental fate would be substantially similar to that described above for S-A MISSILEXs and S-A GUNEXs.

Detonations associated with these exercises may injure or startle nearby fish, sea turtles, or marine mammals (DoN 2008). Sound from these detonations could affect marine biota at various distances from the source. The Navy would require exclusive use of the range for this exercise. These activities thus could have reasonably foreseeable effects on CZ resources (e.g., fish) and uses, and will be evaluated for consistency with enforceable CZ policies in Section 3.

Several measures would be implemented prior to the exercise to avoid effects on sea turtles and marine mammals. Crews would conduct a visual reconnaissance of the intended drop area prior to laying their intended sonobuoy pattern. This search will be conducted below 1,500 ft (457 m) at a slow speed, if operationally feasible and weather conditions permit. In dual aircraft operations, crews would conduct coordinated area clearances. Crews would conduct a minimum of 30 minutes of visual and aural monitoring of the search area prior to commanding the first post detonation. This 30-minute observation period may include pattern deployment time. For any part of the briefed pattern where a post (source/receiver sonobuoy pair) will be deployed within 1,000 yd (914 m) of observed marine mammal activity, only the receiver would be deployed and the crew would monitor it while conducting a visual search. When marine mammals were no longer detected within 1,000 yd (914 m) of the intended post position, the crew would co-locate the explosive source sonobuoy (AN/SSQ-110A) (source) with the receiver and proceed with the exercise.

When able, crews would conduct continuous visual and aural monitoring of marine mammal activity. They would monitor the aircraft's own sensors from first sensor placement to checking off station and out of radio-frequency range of these sensors. If marine mammals were detected aurally, then that would cue the aircrew to increase visual surveillance. Subsequently, if no marine mammals were visually detected, then the crew would continue a multi-static active search. If marine mammals were detected aurally, then that would cue the aircrew to increase their visual surveillance. Subsequently, if no marine mammals were visually detected, then the crew would continue a multi-static active search.

If marine mammals are visually detected within 1,000 yd (914 m) of the explosive source sonobuoy (AN/SSQ-110A) intended for use, then that payload would not be detonated. Aircrews may use this post once the marine mammals have not been re-sighted for 10 minutes, or are observed to have moved outside the 1,000 yd (914 m) safety buffer. Aircrews may shift their

multi-static active search to another post, where marine mammals are outside the 1,000 yd (914 m) safety buffer.

Following the exercise, aircrews will make every attempt to detonate manually the unexploded charges at each post in the pattern prior to departing the operations area. Aircrews will not use the "Scuttle" command when two payloads remain at a given post. When manually detonating the devices, aircrews will ensure that a 1,000 yd (914 m) safety buffer, visually clear of marine mammals, is maintained around each post as is done during active search operations. Aircrews will only leave posts with unexploded charges if a sonobuoy or aircraft system malfunctions, or when an aircraft must immediately depart the area due to fuel constraints, inclement weather, or in-flight emergencies. In these cases, the sonobuoy will self-scuttle. Explosive source sonobuoys (AN/SSQ-110A) that cannot be scuttled will be reported as unexploded ordnance and would eventually sink to the sea floor. Mammal monitoring shall continue until out of own-aircraft sensor range.

2.2.3 Anti-Surface Warfare (ASUW)

Anti-Surface Warfare (ASUW) training activities include Visit, Board, Search, and Seizure (VBSS); A-S MISSILEX; A-S Bombing Exercise (BOMBEX); A-S GUNEX; Surface-to-Surface (S-S) GUNEX; and Sinking Exercise (SINKEX).

2.2.3.1 Visit, Board, Search, and Seizure (VBSS)

VBSS activities take place in W-291, OPAREA 3803, and SOAR. VBSS activities may take place within 3 miles of shore in OPAREA 3803, but most of the activities would occur beyond the CZ in SOAR or W-291. The exercise involves rotary-wing aircraft and surface vessels, and includes the firing of small arms. The environmental fate of expended projectiles from small arms would be substantially as described above for S-A GUNEXs; no environmental effects are expected. This brief, occasional, small-scale activity would not require that commercial or recreational users be generally excluded from ocean areas normally available for public use. This activity has no reasonably foreseeable effects on CZ uses or resources, and is not considered further in this CD.

2.2.3.2 Air-to-Surface Missile Exercise (A-S MISSILEX)

A-S MISSILEXs occur in SOAR, MIR, or SHOBA; portions of SHOBA are in the CZ. Fixed- or rotary-winged aircraft fire missiles at surface targets. Missiles detonate at the ocean's surface, potentially injuring or affecting the behavior of marine animals in the target area; some of these animals could be CZ resources.

To minimize the potential effects of this activity on marine mammals or sea turtles, ordnance would not be targeted to impact within 1,800 yd (1,646 m) of known or observed floating kelp, which may be inhabited by immature sea turtles. In addition, aircraft would visually survey the target area for marine mammals and sea turtles. Visual inspection of the target area would be made by flying at 1,500 ft (457 m) or lower, if safe to do so, and at slowest safe speed. Firing or range clearance aircraft would be required to actually see the ordnance impact areas. Explosive ordnance would not be targeted to impact within 1,800 yd (1,646 m) of sighted marine mammals and sea turtles. A-S MISSILEXs could affect a small number of fish near the point of detonation, but population-level effects are not expected.

Intact targets are recovered at the conclusion of the exercise. Expended missiles and target materials are deposited in the water, where their environmental fate is as described above for S-A MISSILEX. A-S MISSILEXs in SHOBA require that offshore areas within the CZ offshore of the southern portion of SCI be closed to the public for public safety. A-S MISSILEXs thus could have reasonably foreseeable effects on CZ resources and on commercial or recreational uses in

portions of the CZ offshore of SCI, and will be evaluated for consistency with enforceable CCA policies in Section 3.

2.2.3.3 Air-to-Surface Bombing Exercise (A-S BOMBEX)

A-S BOMBEXs occur in SOAR, TMA-3, TMA-4, TMA-5, and MISR-1; these ranges are outside of the CZ in W-291. Fixed- or rotary-winged aircraft drop bombs on surface targets. Smoke canisters may be used to mark the target. Bombs detonate at the ocean's surface, potentially injuring or affecting the behavior of marine animals in the target area; some of these animals could be CZ resources.

If surface vessels are involved, trained lookouts will survey for floating kelp, which may be inhabited by immature sea turtles, and for sea turtles and marine mammals. A 1,000 yd (914 m) radius buffer zone will be established around the intended target. Aircraft will visually survey the target and buffer zone for marine mammals and sea turtles prior to and during the exercise. The survey of the impact area will be made by flying at 1,500 ft (457 m) or lower, if safe to do so, and at the slowest safe speed. Release of ordnance through cloud cover is prohibited: aircraft must actually be able to see ordnance impact areas. Exercises are conducted only if marine mammals and sea turtles are not visible in the buffer zone.

Expended training materials are contained within the range. Bombs, targets, and smoke canisters may be deposited in the water; the environmental fate of expended bomb and target materials would be as described above for S-A MISSILEXs and S-A GUNEXs. A-S BOMBEXs would have no reasonably foreseeable effects on CZ uses, but could affect CZ resources outside of the CZ, and will be evaluated for consistency with enforceable CCA policies in Section 3.

2.2.3.4 Air-to-Surface Gunnery Exercise (A-S GUNEX)

A-S GUNEXs occur in SOAR, TMA-3, TMA-4, TMA-5, and MISR-1; these ranges are outside of the CZ in W-291. Fixed- or rotary-winged aircraft fire on surface targets. Smoke canisters may be used to mark the target. Ordnance strikes the ocean's surface, potentially injuring or affecting the behavior of marine animals in the target area; some of these animals could be CZ resources.

A 200 yd (183 m) radius buffer zone will be established around the intended target. If surface vessels are involved, lookouts will visually survey the buffer zone for marine mammals and sea turtles prior to and during the exercise. Aerial surveillance of the buffer zone for marine mammals and sea turtles will be conducted prior to commencing the exercise, preferably from an altitude of 500 feet to 1,500 feet (ft) (152 - 457 m). Aircraft crew and pilot will maintain a visual watch during exercises. Release of ordnance through cloud cover is prohibited: aircraft must actually be able to see ordnance impact areas. The exercise will be conducted only if marine mammals and sea turtles are not visible within the buffer zone.

Expended training materials are contained within the range. Ordnance, targets, and smoke canisters may be deposited in the water; the environmental fate of expended ordnance and target materials is as described above for S-A GUNEX. A-S GUNEXs would have no reasonably foreseeable effects on CZ uses, but could affect CZ resources outside of the CZ, and will be evaluated for consistency with enforceable CCA policies in Section 3.

2.2.3.5 Surface-to-Surface Gunnery Exercise (S-S GUNEX)

Surface-to-Surface (S-S) GUNEXs occur in W-291 and SHOBA. Surface ship crews fire on surface targets. Smoke canisters may be used to mark the target. Ordnance strikes the ocean's surface, potentially injuring or affecting the behavior of marine animals in the target area; some of these animals could be CZ resources.

For exercises using targets towed by a vessel or aircraft, target-towing vessels and aircraft maintain trained lookouts for marine mammals and sea turtles. A 200 yd (183 m) to 600-yd (585-m) radius buffer zone is established around the intended target. From the intended firing position, trained lookouts survey the buffer zone for marine mammals and sea turtles prior to commencement and during the exercise as long as practicable. Due to the distance between the firing position and the buffer zone, lookouts are only expected to visually detect breaching whales, whale blows, and large pods of dolphins and porpoises. If applicable, target-towing vessels maintain a lookout. If a marine mammal or sea turtle is sighted near the exercise, the tow vessel immediately notifies the firing vessel to secure gunnery firing until the area is clear. The exercise is conducted only when the buffer zone is visible and marine mammals and sea turtles are not detected within the target area and the buffer zone.

Expended training materials are contained within the range. Ordnance, targets, and smoke canisters may be deposited in the water; the environmental fate of expended ordnance and target materials is as described above for S-A GUNEX. S-S GUNEXs in SHOBA require exclusive use of the marine portions of this range. This activity thus could have reasonably foreseeable effects on CZ resources and uses, and will be evaluated for consistency with enforceable CCA policies in Section 3.

2.2.3.6 Sinking Exercise (SINKEX)

Sinking Exercises (SINKEXs) occur in SOAR and W-291 well outside of the CZ. By law, SINKEXs are held at least 50 nm offshore and in at least 6,000 feet of water. Aircraft and vessels fire numerous types of ordnance at an environmentally clean ship hulk (i.e., a hulk that has been stripped of all hazardous materials and potential marine water contaminants in accordance with the requirements of 40 CFR §229.2 [*Transport of target vessels*]). Ordnance detonates at the ocean's surface, potentially injuring or affecting the behavior of marine animals in the target area but, because this activity occurs so far from the CZ, none of these animals would be CZ resources. Expended training materials are contained within the immediate area of the SINKEX. Expended training materials are deposited in the water, along with the ship hulk; the environmental fate of expended ordnance and target materials is as described above for S-A MISSILEX and S-A GUNEX. There are no spillover effects in the CZ. SINKEXs have no reasonably foreseeable effects on CZ uses or resources, and are not considered further in this CD.

2.2.4 Electronic Warfare (EW)

Electronic Warfare (EW) activities could occur anywhere within the SOCAL OPAREAs. EW activities involve aircraft and vessel movements and dispensing of chaff (bundles of glass fibers), flares, and smokey Surface-to-Air Missiles (smoke cartridges that simulate the launch of a surface-to-air missile). Chaff fibers would be widely dispersed before settling on the ocean surface, and would not affect turbidity or water chemistry. Flare and smoke cartridge residues would sink to the ocean bottom; their environmental fate would be as described above for S-A GUNEX. EW activities have no reasonably foreseeable effects on CZ uses or resources, and are not considered further in this CD.

2.2.5 Amphibious Warfare

Amphibious Warfare activities include Naval Surface Fire Support (NSFS), Expeditionary Fires (EFEX), Battalion Landing, Stinger Firing, and Amphibious Landings and Raids. These activities occur exclusively at SCI. Amphibious Warfare also includes Amphibious Operations, which occurs in the ocean waters off Marine Corps Base Camp Pendleton.

2.2.5.1 Naval Surface Fire Support (NSFS)

NSFS consists of naval gunfire from surface ships on land targets. In this exercise, surface ships use their main gun batteries to support forces ashore. NSFS normally consists of one or more surface ships bombarding a land target within the SHOBA Impact Areas from a distance of 4-6 nm (i.e., beyond the CZ). This activity is often supported by Navy or Marine spotters ashore or by spotters in fixed-wing or rotary-wing aircraft aloft. A Shore Fire Control Party may consist of up to 10 personnel who supply target information to the ship. Offshore waters of SHOBA are closed to the public for public safety during the exercise; some of the rounds fired may fall short and land in the water. NSFS thus could have reasonably foreseeable effects on CZ resources and uses, and will be evaluated for consistency with enforceable CCA policies in Section 3.

2.2.5.2 Expeditionary Fires Exercise (EFEX)

EFEX involves coordinating naval gunfire from surface ships (i.e., NSFS - described above) with land-based artillery in support of ground amphibious activities. During an EFEX, artillery units are brought ashore and extracted using Landing Craft Air Cushion (LCACs), resulting in occasional, temporary disturbance of selected beaches on SCI (disturbance of sand and sediments in the surf zone). Offshore waters of SHOBA are closed to the public for public safety during the exercise. This activity could have reasonably foreseeable effects on resources and uses in the CZ, and will be evaluated for consistency with enforceable CCA policies in Section 3.

2.2.5.3 Battalion Landing Exercise

In the Battalion Landing exercise, four companies of infantry land at four different beaches on SCI, using Landing Craft Utility (LCUs), LCACs, and Assault Amphibian Vehicles (AAVs), and proceed inland (LCACs are high-speed cargo vessels, while AAVs are lightly armored troop carriers). The LCACs air cushion allows it to ride onto the beach, offloading cargo, vehicles, and personnel. The AAVs are tracked vehicles.

Reconnaissance forces also land in small inflatable boats. Tanks, Expeditionary Fighting Vehicles (EFVs), and other military vehicles also come ashore. Use of live ordnance is restricted to SHOBA. The units generally leave SCI in the same manner as they arrived. The entire exercise takes approximately four days. Physical effects consist mostly of disturbance of sand and sediment in the surf zone. Movement of personnel and equipment into upland areas would disturb soils, increasing erosion of soils along transportation routes; this effect, however, would be substantially mitigated by the Navy's Erosion Control Plan (see below). Battalion Landings require use of nearshore waters off landing beaches. This activity could have reasonably foreseeable effects on resources and uses in the CZ, and will be evaluated for consistency with enforceable CCA policies in Section 3.

Erosion Control Plan

As a result of the 2008 SCI Terrestrial Biological Assessment, the Navy proposed to develop a plan that would address soil erosion associated with planned military activities in the Artillery Vehicle Maneuver Corridor (AVMA), Artillery Firing Points (AFPs), Artillery Maneuver Points (AMPs), and the Infantry Operations Area (IOA). Control of erosion would promote sustainable land use in support of military activities in these areas. The goals of the plan are to:

1) minimize soil erosion in each of these operational areas and minimize off-site impacts;
2) prevent soil erosion from affecting federally listed or proposed species or their habitats; and
3) prevent soil erosion from substantially affecting other sensitive resources, including sensitive plants and wildlife and their habitats, jurisdictional wetlands and non-wetland waters, the Area of Special Biological Significance (ASBS) surrounding SCI, and cultural resources.

The plan would describe the Navy's approach to assessing and reducing soil erosion in the AVMA, AMPs, AFPs, and Infantry Operations Area, as well as on routes used to access these areas. The plan would consider the variety of available erosion control measures and determine the most appropriate measure(s) to control erosion in each area. The plan would include an adaptive management approach, and would contain the following essential elements:

- Site-specific Best Management Practices (BMPs) to minimize soil erosion on site and minimize off site impacts, which could include:
  - Setbacks or buffers from steep slopes, drainages, and sensitive resources,
  - Engineered or bio-engineered structures to reduce soil erosion and off-sit transport of sediment,
  - Revegetation,
  - Maps defining boundaries of operational areas that provide appropriate setbacks, and
  - A BMP maintenance schedule.
- A plan to monitor soil erosion and review the effectiveness of BMPs.
- A mechanism for determining and implementing appropriate remedial measures and refining BMPs should the need arise.

2.2.5.4 Stinger Exercise

The Stinger is a small shoulder-fired or vehicle-mounted anti-aircraft missile used by Marine and NSW forces. Training is conducted from positions on-shore in SHOBA, or by NSW units firing the missiles from boats in the near-shore area. The missiles are fired toward a target (Ballistic Aerial Target [BAT] or Remotely Piloted Vehicle [RPV]) over the ocean portion of SHOBA. BATs usually are destroyed during the exercise; small quantities of missile and target materials fall in the CZ; the environmental fate of these expended training materials is as described for S-A MISSILEX. RPVs land in SHOBA after the exercise, and are reused. CZ effects consist primarily of restricting nearshore waters for public safety. Stinger training thus would have no reasonably foreseeable effects on CZ resources, but could have a reasonably foreseeable effect on CZ uses, and will be evaluated for consistency with enforceable CCA policies in Section 3.

2.2.5.5 Amphibious Landings

Amphibious Landing units come ashore on SCI (West Cove, SHOBA Impact Areas, Horse Beach Cove, Northwest Harbor) from Navy ships in LCACs, AAVs, and EFVs. A typical landing includes one or two High-Mobility Multi-purpose Wheeled Vehicles (HMMWVs) and one or two 5-ton trucks. Light Armored Vehicles (LAVs), high-speed armored personnel carriers, also are used for amphibious landings. Effects of this activity in the CZ are similar to those described for a Battalion Landing, but involve fewer personnel and equipment per exercise. This activity could have reasonably foreseeable effects on resources and uses in the CZ, and will be evaluated for consistency with enforceable CCA policies in Section 3.

2.2.5.6 Amphibious Exercises

Amphibious exercises in CPAAA would consist primarily of vessel movements into and out of CZ waters; no shore activities would be included in these exercises. No live fire or other expenditures of training materials would occur. These amphibious exercises would have no reasonably foreseeable effects on CZ uses or resources, and are not considered further in this CD.

2.2.6 Mine Warfare (MIW)

MIW training includes Mine Countermeasures (MCM) Exercises, Mine Neutralization, and Mine Laying Exercises (MINEX).

2.2.6.1 Mine Countermeasures Exercise (MCM)

MCM training is conducted on the Kingfisher Range, part of which lies in the CZ; in the future, MIW training is also planned in ARPA. MCM training uses sonar to detect and avoid mines. Assets could include MCM ships, airborne mine countermeasures helicopters, divers, unmanned underwater vehicles, and Navy marine mammals. Equipment could include side-scan sonar, high-frequency sonar, laser line scans, magnetic sweep gear, and influence sweep gear. Sonar emissions during these activities could affect marine mammals in or outside of the CZ. Devices towed through the water (sweep gear) could disturb marine animals. Some MCM activities could require temporary exclusive use of ocean areas. This activity could have reasonably foreseeable effects on resources and uses in the CZ, and will be evaluated for consistency with enforceable CCA policies in Section 3.

2.2.6.2 Mine Neutralization Exercise

Mine neutralization training would involve Organic Airborne Mine Countermeasures (OAMCM) systems employed by helicopters in simulated threat minefields with the goal of clearing a safe channel through the minefield for the passage of friendly ships. Once a mine shape is located, mine neutralization is simulated. Helicopters engaged in Mine Neutralization training would be configured with one or more of the following systems: AN/AQS-20 Mine Hunting System; AN/AES-1 Airborne Laser Mine Detection System; AN/ALQ-220 Organic Airborne Surface Influence Sweep (OASIS); Airborne Mine Neutralization System; and AN/AWS-2 Rapid Airborne Mine Clearance System (RAMICS). Mine neutralization exercises also involve shipboard MCM systems, such as the Remote Minehunting System (RMS) and the submarine-deployed Long-term Mine Reconnaissance System (LMRS). Mine neutralization training would be conducted at: Pyramid Cove and Northwest Harbor. Mine Neutralization training could have reasonably foreseeable effects on resources and uses in the CZ, and will be evaluated for consistency with enforceable CCA policies in Section 3.

2.2.6.3 Mine-Laying Exercise (MINEX)

MINEX events are conducted in the Castle Rock, Eel Point, China Point, and Pyramid Head areas offshore of SCI. MINEX events involve aircraft dropping inert training shapes (inert general purpose bombs, such as the MK62 [inert 500-lb MK82 bomb]) and, less frequently, submarine mine laying. The training shapes are recovered at the end of the operation to the extent feasible (historically about 66 percent); some training shapes cannot be retrieved because retrieval is technically infeasible or cost-prohibitive. Under the proposed activities, up to 68 25-lb MK-76 shapes, up to 11 MK-18 shapes, and up to 13 500-lb MK-62 shapes would be used, and the MK-18s and MK-62s would be recovered, to the extent possible..

The probability of a marine species being in the exact spot in the ocean where an inert object is dropped is remote. Initial target points will be briefly surveyed prior to inert ordnance release from an aircraft to ensure the intended drop area is clear of marine mammals and sea turtles. With the implementation of this measure, MINEXs would not affect marine mammals or sea turtles.

The environmental fate of unrecovered training shapes would be as described for other mostly inert expended training materials (e.g., S-A GUNEX). The public would be temporarily excluded from the area of the exercise for safety. This activity would not affect CZ resources, but could have a reasonably foreseeable effect on CZ uses, and will be evaluated for consistency with enforceable CCA policies in Section 3.

2.2.6.4 MIW Mitigation Measures

All Mine Warfare and Mine Countermeasures Operations involving the use of explosive charges would include exclusion zones for marine mammals and sea turtles to prevent physical or

acoustic effects on those species. These exclusion zones would extend in a 700-yard radius arc around the detonation site.

For Ship Mine Countermeasures Operations, pre-exercise survey shall be conducted within 30 minutes prior to the commencement of the scheduled explosive event. The survey may be conducted from the surface, by divers, or from the air, and personnel shall be alert to the presence of any marine mammal or sea turtle. Should such an animal be present within the survey area, the exercise shall be paused until the animal voluntarily leaves the area. The Navy will suspend detonation exercises and ensure the area is clear. Personnel will record any protected species marine mammal and sea turtle observations during the exercise as well as measures taken if species are detected within the exclusion zone.

Surveys within the same radius also will be conducted within 30 minutes after the completion of the explosive event. If there is evidence that a marine mammal or sea turtle may have been stranded, injured or killed by the action, Navy training activities will be immediately suspended and the situation immediately reported by the participating unit to the Officer in Charge of the Exercise (OCE), who will follow Navy procedures for reporting the incident to Commander, Pacific Fleet, Commander, Navy Region Southwest, Environmental Director, and the chain-of-command.

2.2.7 Naval Special Warfare (NSW)

Naval Special Warfare (NSW) activities include Land Demolition, Underwater Demolition, Marksmanship, Land Navigation, Unmanned Aerial Surveillance, Insertion / Extraction, Boat Operations, SEAL Platoon Operations, and Direct Action.

2.2.7.1 Land Demolition

Land Demolition activities are conducted in the Impact Areas, in SWAT 1 and SWAT 2, and in the TARs on SCI. These activities result in some local soil disturbance and the release of small amounts of explosives byproducts, most of which are contained within the range. These activities are expected to have no effects on marine water quality, bottom sediments, or other resources of the CZ (DoN 2008); studies have shown that offsite migration of potentially hazardous constituents is negligible (see Range Sustainability Environmental Program Assessment below). Located outside of the CZ, they have no effect on CZ uses. Because these activities have no reasonably foreseeable effects on CZ uses or resources, they will not be further considered in this CD.

Range Sustainability Environmental Program Assessment

The Range Sustainability Environmental Program Assessment (RSEPA) is a component of the Navy's Tactical Training Theater Assessment and Planning Program. RSEPA is a range compliance management process intended to ensure long-term sustainability of the range. Its purposes are to ensure compliance with applicable environmental regulations and to assess the potential for off-site migration of munitions and their constituents. The first phase of the RSEPA process is the Range Condition Assessment (RCA). This is a qualitative and quantitative assessment of facility compliance with environmental regulations and evaluation of the status of munitions constituents on the site.

In 2003, the Navy conducted a RCA of SCI. Operational range site models were developed for SWATs 1 and 2, MIR, and SHOBA. Potential releases of munitions constituents from high-order detonations, low-order detonations, and duds [items that failed to function] were estimated, based on recorded munitions use at SCI in Fiscal Years 2001 and 2002, and maximum soil concentrations of these constituents were estimated. The conclusions of the RCA were that further steps were not required to maintain compliance with federal environmental regulations,

and further analysis was not required to assess the risks of off-range releases of munitions or their constituents, because the estimated offsite migration of munitions constituents was negligible.

The vertical and horizontal migration of some munitions constituents in SHOBA were modeled for the RCA, based upon their estimated maximum soil concentrations. This predictive analysis indicated that some constituents could migrate as much as 0.16 foot (0.05 meter) below the ground surface in detectable concentrations, and that perchlorate (the most mobile of the compounds that were modeled) could migrate vertically as far as the groundwater table (5.4 feet [1.6 meters] below the ground surface). Perchlorate could migrate horizontally in groundwater a distance of up to 300 meters (984 feet) beyond the boundary of the Impact Area over 400 years at a concentration of up to 0.6 microgram per liter. This concentration is below current laboratory detection limits and no known human or ecological receptors would be exposed to the groundwater.

The potential transport of munitions constituents via overland flow in storm water runoff also was modeled. This analysis determined that TNT concentrations at the SHOBA shoreline could be up to 4.3 milligrams per liter and that perchlorate concentrations could be up to 0.001 microgram per liter. These negligible concentrations hazardous constituents would be conveyed into nearshore waters infrequently during substantial rainfall events, dispersed among several drainages, and would be further diluted by the large volumes of seawater into which the storm water runoff would flow.

2.2.7.2 Underwater Detonation (UNDET)

Underwater detonation activities take place primarily in the CZ (Northwest Harbor, TARs 2 and 3, Horse Beach Cove, SWATs 1 and 2), but may occur outside of the CZ (SOAR, FLETA HOT). In underwater detonations, NSW or EOD personnel use explosives charges to destroy underwater obstacles or other structures. These charges may be detonated near the SCI shoreline in shallow water. Single charge detonations usually use less than 5 lb of C-4 explosives, while large underwater demolition training (conducted in Northwest Harbor and SWAT 2) uses larger, multiple charges laid in a pattern; up to 1,000 lb, n.e.w., may be detonated at one time. A safety zone surrounding the activity would need to be temporarily cleared of commercial and recreational users for public safety.

The detonations could damage marine vegetation or kill, injure, or disorient fish or other marine animals near the point of detonation. To ensure protection of marine mammals and sea turtles during underwater detonation training, the exercise area would be determined to be clear of marine mammals and sea turtles prior to detonation. Implementing this measure would ensure that marine mammals and sea turtles were not exposed to temporary threshold shift (TTS), permanent threshold shift (PTS), or injury from physical contact with training mine shapes.

Pre-exercise surveys would be conducted within 30 minutes prior to the commencement of the scheduled explosive event. The survey could be conducted from the surface, by divers, or from the air, and personnel would be alert to the presence of any marine mammal or sea turtle. If an animal were present within the survey area, the exercise would be paused until the animal voluntarily left the area. The Navy would suspend the detonation exercise and ensure that the area was clear for a full 30 minutes prior to detonation. Personnel would record any protected species marine mammal and sea turtle observations during the exercise, as well as any measures taken if species were detected within the Exclusion Zone. Surveys would also be conducted within 30 minutes after the completion of the explosive event. These measures would ensure that underwater demolition had no effect on sea turtles or marine mammals in the CZ. The potential still exists for fish or diving birds to be killed or injured in the vicinity of the exercise.

These training activities thus would have reasonably foreseeable effects on coastal resources and uses, and will be evaluated for consistency with enforceable CCA policies in Section 3.

2.2.7.3 Small Arms Training

Small Arms Training activities are conducted at TARs 4, 9, 13, 16, and 20 on SCI. These activities result in some local soil disturbance and the expenditure of small amounts of training materials (small arms rounds), most of which are contained within the range. These activities are expected to have no effects on water quality, bottom sediments, or other resources of the CZ (see Section 2.2.7.1). The Surface Danger Zone for the small arms range extends out over the ocean, however, and this area must be cleared prior to use of the range. Personnel will adhere to range safety procedures. Weapons will not be fired in the direction of known or observed floating weeds or kelp, marine mammals, sea turtles. Thus, this activity would have no reasonably foreseeable effect on CZ resources but could have a reasonably foreseeable effect on CZ uses near SCI, so this activity will be evaluated for consistency with enforceable CCA policies in Section 3.

2.2.7.4 Land Navigation

Land Navigation activities occur between MIR and NALF on SCI. These activities result in some soil disturbance from foot traffic. These activities would have no effects on marine water quality, bottom sediments, or other resources of the CZ (see discussion in Section 2.2.7.1). Because these activities have no reasonably foreseeable effects in the CZ, they will not be further considered in this CD.

2.2.7.5 Unmanned Aerial Vehicle (UAV) Exercises

Unmanned Aerial Vehicle (UAV) activities consist of launching these vehicles and flying them over SCI. The vehicles are recovered after their use. These activities would have no effects on marine water quality, bottom sediments, or other resources of the CZ. UAV operating areas extend over the nearshore waters, however, which may require these areas to be temporarily cleared of commercial and recreational users. Thus, these activities would have no reasonably foreseeable effects on CZ resources, but could have reasonably foreseeable effects on CZ uses near SCI, so this activity will be evaluated for consistency with enforceable CCA policies in Section 3.

2.2.7.6 Insertion and Extraction (I/E)

Insertion/Extraction (I/E) activities may occur on SCI or anywhere within the SOCAL OPAREAs. I/Es may involve fixed-wing or rotary-wing aircraft or surface or subsurface vessel movements. No training materials are expended in these exercises, so CZ resources are not affected. These activities do not require the Navy to have exclusive control over any portion of the CZ, so CZ uses are not affected. I/Es have no reasonably foreseeable effects on CZ uses or resources, and are not considered further in this CD.

2.2.7.7 NSW Small Boat, SEAL Platoon, and Direct Action

NSW Small Boat, SEAL Platoon, and Direct Action activities are dispersed, small-scale clandestine activities in which one of the objectives is to avoid attracting attention by minimizing effects on the environment. Small Boat and Direct Action training may occur anywhere on SCI or within the SOCAL OPAREAs, while SEAL Platoon activities may occur on SCI, in SHOBA, or in FLETA HOT. The ocean portions of these activities consist primarily of small boat movements. The ashore portions of these activities consist primarily of foot traffic from the shoreline to upland areas by small groups. SEAL Platoon and Direct Action training may include live fire of small arms on the beach and in upland areas. Ocean resources are not affected. These activities do not require the Navy to have exclusive control over any portion of the CZ. NSW Small Boat, SEAL Platoon, and Direct Action activities have no reasonably foreseeable effects on CZ uses or resources, and are not considered further in this CD.

2.2.8 Strike Warfare

Strike Warfare consists of Bombing Exercises (BOMBEX) and Combat Search and Rescue (CSAR).

2.2.8.1 Bombing Exercise

BOMBEXs are conducted by fixed-wing aircraft that approach SHOBA Impact Area I or II at altitudes above 5,000 feet agl, and then release live or practice unguided or precision-guided bombs on land targets. These activities result in some local soil disturbance and the release of small amounts of explosives byproducts, most of which are innocuous compounds. These activities are expected to have no effects on marine water quality, bottom sediments, or other resources of the CZ, similar to the effects of Land Demolition, as discussed in Section 2.2.7.1. BOMBEXs require exclusive use of the marine portions of SHOBA. Thus, while these activities would not have a reasonably foreseeable effect on CZ resources, they could have a reasonably foreseeable effect on CZ uses, so this activity will be evaluated for consistency with enforceable CCA policies in Section 3.

2.2.8.2 Combat Search and Rescue

CSAR exercises can include reconnaissance aircraft, helicopters, and fighter aircraft. Most of the CSAR activity would occur outside of the CZ on or over SCI, and ground activities would take place primarily on SCI. In addition, the surface activity associated with a CSAR exercise is minimal and dispersed. No training materials would be expended in the CZ. The Navy would not need to exercise exclusive control over portions of the CZ around SCI for this training. CSAR activities thus would have no reasonably foreseeable effects on CZ uses or resources, and are not considered further in this CD.

2.2.9 U.S. Coast Guard Training Activities

U.S. Coast Guard training events include: search and rescue, maritime patrol training, boat handling, and helicopter and surface vessel live-fire training with small arms. The exercise involves rotary-wing aircraft and surface vessels, and includes the firing of small arms. Expended projectiles from small arms firing would sink to the ocean bottom and quickly become buried in sediment or encrusted with benthic organisms. Leaching and dispersion of potentially hazardous constituents would be negligible, and would be dispersed over a large area, so as to have no effect on CZ uses or resources, as discussed in the SOCAL Range Complex Draft EIS/OEIS (DoN 2008). This brief, occasional, small-scale activity would not require that commercial or recreational users be generally excluded from ocean areas normally available for public use. U.S. Coast Guard activities thus would have no reasonably foreseeable effects on CZ uses or resources, and are not considered further in this CD.

2.2.10 Naval Auxiliary Landing Field (NALF)

NALF activities consist of approaches to and landings at NALF and takeoffs and departures from NALF on SCI. Storm water runoff from paved surfaces at the airfield may convey potential marine contaminants into nearshore waters, but the amounts of these substances would be minimal, these events would occur intermittently, and the substances would be dispersed into large volumes of seawater, so as to have no effect on water quality. Therefore, these activities would have no effects on marine water quality, bottom sediments, or other resources of the CZ. CZ uses would not be affected by activities at NALF. Because these activities have no reasonably foreseeable effects on CZ resources or uses, they will not be further considered in this CD.

2.2.11 Research, Development, Test, and Evaluation (RDT, &E)

RDT&E activities include Ship Torpedo Tests, Unmanned Underwater Vehicles, Sonobuoy QA/QC Tests, Ocean Engineering, Marine Mammal Mine Shape Location, Missile Flight Tests, and NUWC Underwater Acoustics Tests.

2.2.11.1 Ship Torpedo Tests

Ship Torpedo Tests occur in SOAR, San Clemente Island Underwater Range (SCIUR), and OPAREA 3803; when the SWTR Extensions are implemented as part of the proposed activities, these activities also may occur in the SWTR. Ship Torpedo Tests check the reliability, maintainability, and performance of training (recoverable exercise torpedoes [REXTORP] and exercise torpedoes [EXTORP]) and operational torpedoes. Aircraft and vessels fire non-explosive exercise torpedoes for various purposes. Test torpedoes are recovered to the extent practicable. Expended training materials are deposited in the water, where their environmental fate is as described for other expended training materials (e.g., S-A MISSILEX, S-A GUNEX). Portions of the CZ around SCI could be closed for safety during these tests, possibly affecting commercial and recreational uses of the area. Ship Torpedo Tests would have no reasonably foreseeable effects on CZ resources, but could have a reasonably foreseeable effect on public uses of the CZ surrounding SCI, and will be evaluated for consistency with enforceable CCA policies in Section 3.

2.2.11.2 Unmanned Underwater Vehicle (UUV) Exercises

Unmanned Underwater Vehicle (UUV) tests occur at NOTS Pier and in SOAR; the latter area is outside of the CZ. These tests consist primarily of infrequent movements of small underwater vessels through CZ waters. The UUVs would emit no substances under normal operating conditions, so CZ resources would not be affected. These tests do not require that the public be cleared from portions of the CZ, so CZ uses would not be affected. These activities would have no reasonably foreseeable effects on CZ uses or resources, and are not considered further in this CD.

2.2.11.3 Sonobuoy QA / QC Tests

Sonobuoy QA/QC tests are conducted in SCIUR. These tests evaluate random lots of sonobuoys (passive, active, and explosive) to determine the quality of the set received from the manufacturer. The sonobuoys are dropped from an aircraft into the SCI Underwater Range area to the east of SCI, and are allowed to operate for a representative period. All defective sonobuoys are recovered. In addition, 10 percent of a given sonobuoy model may be recovered for QA/QC purposes. All other sonobuoys are expended in the range; they self-scuttle (i.e., a port opens and it floods) and sink to the ocean bottom. Typically, about 3,000 - 3,100 sonobuoys per year are tested, and about 420 - 430 are recovered. An analysis by the Navy determined that the battery constituents released during sonobuoy operation had no effect on water quality, and that the scuttled sonobuoys had no effect on the quality of bottom sediments or ocean waters. Sonobuoy QA/QC tests do not require exclusive Navy control over any portion of the CZ off of SCI. This activity would have no reasonably foreseeable effects on CZ resources or uses, and is not considered further in this CD.

2.2.11.4 Ocean Engineering Tests

Ocean engineering tests are conducted off NOTS Pier. These tests are used to determine the characteristics, reliability, maintainability, and endurance of various items of marine design. The items to be tested are placed in the water off NOTS Pier and left for an extended period. No water pollutants would be emitted from these items, so CZ resources would not be affected. These tests do not require exclusive Navy control over any portion of the CZ off of SCI. This

activity thus would have no reasonably foreseeable effects on CZ uses or resources, and is not considered further in this CD.

2.2.11.5 Marine Mammal Units

Marine Mammal Mine Shape tests occur in MTRs 1 and 2, NOTS Pier area, SCIUR, and SOAR. Activities in the CZ consist primarily of trained Navy marine mammals finding objects and communicating with their human handlers. No training materials are expended, and no pollutants are released into the water column. These tests do not require exclusive Navy control over any portion of the CZ off of SCI. This activity would have no reasonably foreseeable effects on CZ uses or resources, and is not considered further in this CD.

2.2.11.6 Underwater Acoustical Tests

Underwater acoustical tests evaluate the accuracy of acoustical and non-acoustical ship sensors. MK-46 torpedoes are used for some of the tests. All tests are conducted in the SCI Underwater Range (SCIUR). These tests do not affect the quality of marine waters or sediments. These tests do not require exclusive Navy control over any portion of the CZ off of SCI. These activities thus would have no reasonably foreseeable effects on CZ uses or resources, and are not considered further in this CD.

2.2.11.7 Missile Flight Tests

Missile Flight Tests occur in W-291 12 nm or more offshore. Aircraft or vessels fire different types of missiles for various purposes. Expended training materials are contained within W-291. Expended training materials are deposited in the water; the environmental fate of these materials is as discussed for other expended training materials under S-A MISSILEX. Missile Flight Tests having targets on SCI would require that nearshore areas be cleared of commercial and recreational users. Missile Flight Tests thus have no reasonably foreseeable effects on CZ resources, but may have a reasonably foreseeable effect on CZ uses, and will be evaluated for consistency with enforceable CCA policies in Section 3.

2.2.12 Range Enhancements

2.2.12.1 Shallow Water Minefield

The Navy proposes to construct a shallow water minefield in SOCAL Range Complex for expanding MCM training. Multiple site options off Tanner Bank, Cortes Bank, La Jolla, and Point Loma have been identified, with consideration being given to bathymetry and required capabilities. Of the five areas identified, an area known as Advanced Research Project Agency Training Minefield (ARPA) off La Jolla (and historically used for shallow water submarine MCM training) is the desired location. The Tanner Bank and Cortes Bank locations are outside the CZ, while the La Jolla and Point Loma locations would be partly in the CZ. MCM training is addressed above in Section 2.1.1.4.

Installation of anchors on the ocean bottom for the inert mine shapes would disturb bottom sediments and benthic organisms. This disturbance would occur over very small areas, and would be temporary. These installed materials would eventually become encrusted by marine organisms, and the anchor points on the bottom would be buried in sediment. If in the future the Navy no longer has a requirement for ASW training or no longer uses the Shallow Water Minefield for training, then the Navy will comply with applicable federal environmental planning and regulatory requirements pertaining to the disposition of these facilities.

Installation of the in-water minefield elements could temporarily exclude the public from small portions of the range for short periods. Installation thus would have no reasonably foreseeable

effects on CZ resources, but may have a reasonably foreseeable effect on CZ uses, and will be evaluated for consistency with enforceable CCA policies in Section 3.

2.2.12.2 Shallow Water Training Range (SWTR) Extension

The proposed activities include the installation of instrumented extensions of SOAR. The areas of the proposed extensions of the SOAR are called the Shallow Water Training Range (SWTR). These areas currently are used for undersea activities, but are not instrumented. Proposed training activities on the SWTR are addressed above.

Installation of ocean bottom elements of the range would disturb bottom sediments and benthic organisms. This disturbance would occur over very small areas, and would be temporary. These installed materials would eventually become encrusted by marine organisms, and buried in sediment. The Navy has no plans to remove these inert materials at the conclusion of their useful life. Installation of the in-water range elements could temporarily exclude the public from small portions of the range for short periods. Installation thus would have no reasonably foreseeable effects on CZ resources, but may have a reasonably foreseeable effect on CZ uses, and will be evaluated for consistency with enforceable CCA policies in Section 3.

2.3 Summary of Proposed Activities in the Coastal Zone

Twenty-nine of the 53 activities included in the proposed activities could have reasonably foreseeable effects on CZ resources or uses, along with the installation of the SWTR. In addition, the installation of the Shallow Water Minefield could affect CZ uses depending upon where it is located. The potential effects on CZ uses and resources of these activities are summarized below in Table 2-1. These effects will be evaluated for consistency with CCA enforceable policies in Section 3.

5.5 ACOUSTIC ENVIRONMENT (AIRBORNE SOUND)

The Navy has developed detailed SOPs regarding sound in the ocean environment, particularly with respect to sonar and explosive sources. These measures are discussed in detail below in Section 5.8 with regard to potential effects of sound on marine mammals and sea turtles.

Military personnel who might be exposed to sound from military activities are required to take precautions, such as the wearing of protective equipment, to reduce or eliminate potential harmful effects of such exposure. With regard to potential exposure of non-military personnel in ocean areas (such as fishermen in the vicinity of SCI) precautions are taken pursuant to SOPs to prevent such exposure. These include advance notice of scheduled operations to the public and the commercial fishing community via the worldwide web, Notices to Mariners (NOTMARs), and Notices to Airmen (NOTAMs). In addition, range safety SOPs ensure that civilians are excluded from, and if necessary removed from areas of military operations, or that military activities do not occur when civilians are present. These procedures have proven effective at minimizing potential military / civilian interactions in the course of active training or other military activities.

5.6 MARINE PLANTS AND INVERTEBRATES

In order to reduce or eliminate potential effects of Navy activities on marine plants and invertebrates, buffer zones have been designated for training events using both explosive and non-explosive ordnance. Lookouts are posted to visually survey for floating kelp, plants, or algal mats. For training activities using explosive ordnance, the intended impact area shall not be within 600 yards (yds) (585 meters [m]) of known or observed live hard-bottom communities, kelp beds, floating plants, or algal mats. For training events using non-explosive ordnance, intended impact area shall not be within 200 yds (183 m) of known or observed live hard-bottom communities, kelp beds, floating plants, or algal mats. For air-to-surface missile exercises, the buffer zone is extended to 1,800 yds (1646 m) around hard bottom communities, kelp forests, floating plants, and algal mats, for both explosive and non-explosive ordnance

5.7 FISH

Mitigation measures for activities involving underwater detonations, implemented for marine mammals and sea turtles, also offer protections to habitats associated with fish communities. No additional mitigation measures are proposed or warranted because no substantial effects on fish or fish habitat were identified.

5.8 SEA TURTLES AND MARINE MAMMALS

As discussed in Section 3.8 and 3.9, the comprehensive suite of protective measures and SOPs implemented by the Navy to reduce impacts to marine mammals also serves to mitigate potential impacts on sea turtles. In particular, personnel and watchstander training, establishment of turtle-free exclusion zones for underwater detonations of explosives, and pre- and post-exercise surveys, all serve to reduce or eliminate potential impacts of Navy activities on sea turtles that may be present in the vicinity.

Effective training in the SOCAL Range Complex dictates that ship, submarine, and aircraft participants utilize their sensors and exercise weapons to their optimum capabilities as required by the mission. This section is a comprehensive list of mitigation measures that would be utilized for training activities analyzed in the SOCAL EIS/OEIS in order to minimize potential for impacts on marine mammals and sea turtles in the SOCAL Range Complex.

This section includes protective and mitigation measures that are followed for all types of exercises; those that are associated with a particular type of training event; and those that apply to a particular geographic region or season. For major exercises, the applicable mitigation measures are incorporated into a naval message which is disseminated to all of the units participating in the

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exercise or training event and applicable responsible commands. Appropriate measures are also provided to non-Navy participants (other DoD and allied forces) as information in order to ensure their use by these participants.

5.8.1 General Maritime Measures

5.8.1.1 Personnel Training – Watchstanders and Lookouts

The use of shipboard lookouts is a critical component of all Navy protective measures. Navy shipboard lookouts (also referred to as "watchstanders") are highly qualified and experienced observers of the marine environment. Their duties require that they report all objects sighted in the water to the officer of the deck (OOD) (e.g., trash, a periscope, marine mammals, sea turtles) and all disturbances (e.g., surface disturbance, discoloration) that may be indicative of a threat to the vessel and its crew. There are personnel serving as lookouts on station at all times (day and night) when a ship or surfaced submarine is moving through the water.

- All commanding officers (COs), executive officers (XOs), lookouts, OODs, junior OODs (JOODs), maritime patrol aircraft aircrews, and Anti-submarine Warfare (ASW)/Mine Warfare (MIW) helicopter crews will complete the NMFS-approved Marine Species Awareness Training (MSAT) by viewing the U.S. Navy MSAT digital versatile disk (DVD). MSAT may also be viewed on-line at https://mmrc.tecquest.net. All bridge watchstanders/lookouts will complete both parts one and two of the MSAT; part two is optional for other personnel. This training addresses the lookout's role in environmental protection, laws governing the protection of marine species, Navy stewardship commitments and general observation information to aid in avoiding interactions with marine species.
- Navy lookouts will undertake extensive training in order to qualify as a watchstander in accordance with the Lookout Training Handbook (Naval Education and Training Command [NAVEDTRA] 12968-B).
- Lookout training will include on-the-job instruction under the supervision of a qualified, experienced watchstander. Following successful completion of this supervised training period, lookouts will complete the Personal Qualification Standard Program, certifying that they have demonstrated the necessary skills (such as detection and reporting of partially submerged objects). Personnel being trained as lookouts can be counted among those listed below as long as supervisors monitor their progress and performance.
- Lookouts will be trained in the most effective means to ensure quick and effective communication within the command structure in order to facilitate implementation of protective measures if marine species are spotted.

5.8.1.2 Operating Procedures & Collision Avoidance

- Prior to major exercises, a Letter of Instruction, Mitigation Measures Message or Environmental Annex to the Operational Order will be issued to further disseminate the personnel training requirement and general marine species protective measures.
- COs will make use of marine species detection cues and information to limit interaction with marine species to the maximum extent possible consistent with safety of the ship.
- While underway, surface vessels will have at least two lookouts with binoculars; surfaced submarines will have at least one lookout with binoculars. Lookouts already posted for safety of navigation and man-overboard precautions may be used to fill this requirement. As part of their regular duties, lookouts will watch for and report to the OOD the presence of marine mammals and sea turtles.

- On surface vessels equipped with a multi-function active sensor, pedestal mounted "Big Eye" (20x10) binoculars will be properly installed and in good working order to assist in the detection of marine mammals and sea turtles in the vicinity of the vessel.
- Personnel on lookout will employ visual search procedures employing a scanning methodology in accordance with the Lookout Training Handbook (NAVEDTRA 12968-B).
- After sunset and prior to sunrise, lookouts will employ Night Lookouts Techniques in accordance with the Lookout Training Handbook. (NAVEDTRA 12968-B)
- While in transit, naval vessels will be alert at all times, use extreme caution, and proceed at a "safe speed" so that the vessel can take proper and effective action to avoid a collision with any marine animal and can be stopped within a distance appropriate to the prevailing circumstances and conditions.
- When whales have been sighted in the area, Navy vessels will increase vigilance and take reasonable and practicable actions to avoid collisions and activities that might result in close interaction of naval assets and marine mammals. Actions may include changing speed and/or direction and are dictated by environmental and other conditions (e.g., safety, weather).
- Naval vessels will maneuver to keep at least 460 m (1,500 ft) away from any observed whale and avoid approaching whales head-on. This requirement does not apply if a vessel's safety is threatened, such as when change of course will create an imminent and serious threat to a person, vessel, or aircraft, and to the extent vessels are restricted in their ability to maneuver. Restricted maneuverability includes, but is not limited to, situations when vessels are engaged in dredging, submerged operations, launching and recovering aircraft or landing craft, minesweeping operations, replenishment while underway and towing operations that severely restrict a vessel's ability to deviate course. Vessels will take reasonable steps to alert other vessels in the vicinity of the whale.
- Where feasible and consistent with mission and safety, vessels will avoid closing to within 200-yd of sea turtles and marine mammals other than whales (whales addressed above).
- Floating weeds and kelp, algal mats, clusters of seabirds, and jellyfish are good indicators of sea turtles and marine mammals. Therefore, increased vigilance in watching for sea turtles and marine mammals will be taken where these are present.
- Navy aircraft participating in exercises at sea will conduct and maintain, when operationally feasible and safe, surveillance for marine species of concern as long as it does not violate safety constraints or interfere with the accomplishment of primary operational duties. Marine mammal detections will be immediately reported to assigned Aircraft Control Unit for further dissemination to ships in the vicinity of the marine species as appropriate where it is reasonable to conclude that the course of the ship will likely result in a closing of the distance to the detected marine mammal.
- All vessels will maintain logs and records documenting training operations should they be required for event reconstruction purposes. Logs and records will be kept for a period of 30 days following completion of a major training exercise.

5.8.2 Measures for Specific Training Events

5.8.2.1 Mid-Frequency Active Sonar Operations

5.8.2.1.1 General Maritime Mitigation Measures: Personnel Training

- All lookouts onboard platforms involved in ASW training events will review the NMFS-approved Marine Species Awareness Training material prior to use of mid-frequency active sonar.
- All COs, XOs, and officers standing watch on the bridge will have reviewed the Marine Species Awareness Training material prior to a training event employing the use of mid-frequency active sonar.
- Navy lookouts will undertake extensive training in order to qualify as a watchstander in accordance with the Lookout Training Handbook (Naval Educational Training [NAVEDTRA], 12968-B).
- Lookout training will include on-the-job instruction under the supervision of a qualified, experienced watchstander. Following successful completion of this supervised training period, lookouts will complete the Personal Qualification Standard program, certifying that they have demonstrated the necessary skills (such as detection and reporting of partially submerged objects). This does not forbid personnel being trained as lookouts from being counted as those listed in previous measures so long as supervisors monitor their progress and performance.
- Lookouts will be trained in the most effective means to ensure quick and effective communication within the command structure in order to facilitate implementation of mitigation measures if marine species are spotted.

5.8.2.1.2 General Maritime Mitigation Measures: Lookout and Watchstander Responsibilities

- On the bridge of surface ships, there will always be at least three people on watch whose duties include observing the water surface around the vessel.
- All surface ships participating in ASW training events will, in addition to the three personnel on watch noted previously, have at all times during the exercise at least two additional personnel on watch as marine mammal lookouts.
- Personnel on lookout and officers on watch on the bridge will have at least one set of binoculars available for each person to aid in the detection of marine mammals.
- On surface vessels equipped with mid-frequency active sonar, pedestal mounted "Big Eye" (20x110) binoculars will be present and in good working order to assist in the detection of marine mammals in the vicinity of the vessel.
- Personnel on lookout will employ visual search procedures employing a scanning methodology in accordance with the Lookout Training Handbook (NAVEDTRA 12968-B).
- After sunset and prior to sunrise, lookouts will employ Night Lookouts Techniques in accordance with the Lookout Training Handbook.
- Personnel on lookout will be responsible for reporting all objects or anomalies sighted in the water (regardless of the distance from the vessel) to the Officer of the Deck, since any object or disturbance (e.g., trash, periscope, surface disturbance, discoloration) in the water may be indicative of a threat to the vessel and its crew or indicative of a marine species that may need to be avoided as warranted.

5.8.2.1.3 Operating Procedures

- A Letter of Instruction, Mitigation Measures Message, or Environmental Annex to the Operational Order will be issued prior to the exercise to further disseminate the personnel training requirement and general marine mammal mitigation measures.
- COs will make use of marine species detection cues and information to limit interaction with marine species to the maximum extent possible consistent with safety of the ship.
- All personnel engaged in passive acoustic sonar operation (including aircraft, surface ships, or submarines) will monitor for marine mammal vocalizations and report the detection of any marine mammal to the appropriate watch station for dissemination and appropriate action.
- During mid-frequency active sonar operations, personnel will utilize all available sensor and optical systems (such as night vision goggles) to aid in the detection of marine mammals.
- Navy aircraft participating in exercises at sea will conduct and maintain, when operationally feasible and safe, surveillance for marine species of concern as long as it does not violate safety constraints or interfere with the accomplishment of primary operational duties.
- Aircraft with deployed sonobuoys will use only the passive capability of sonobuoys when marine mammals are detected within 200 yds (183 m) of the sonobuoy.
- Marine mammal detections will be immediately reported to assigned Aircraft Control Unit for further dissemination to ships in the vicinity of the marine species as appropriate where it is reasonable to conclude that the course of the ship will likely result in a closing of the distance to the detected marine mammal.
- Safety Zones—When marine mammals are detected by any means (aircraft, shipboard lookout, or acoustically) within 1,000 yds (914 m) of the sonar dome (the bow), the ship or submarine will limit active transmission levels to at least 6 decibels (dB) below normal operating levels. (A 6 dB reduction equates to a 75 percent power reduction. The reason is that decibel levels are on a logarithmic scale, not a linear scale. Thus, a 6 dB reduction results in a power level only 25 percent of the original power.)
    - Ships and submarines will continue to limit maximum transmission levels by this 6-dB factor until the animal has been seen to leave the area, has not been detected for 30 minutes, or the vessel has transited more than 2,000 yds (1829 m) beyond the location of the last detection.
    - Should a marine mammal be detected within or closing to inside 500 yds (457 m) of the sonar dome, active sonar transmissions will be limited to at least 10 dB below the equipment's normal operating level. (A 10 dB reduction equates to a 90 percent power reduction from normal operating levels.) Ships and submarines will continue to limit maximum ping levels by this 10-dB factor until the animal has been seen to leave the area, has not been detected for 30 minutes, or the vessel has transited more than 2,000 yds (457 m) beyond the location of the last detection.
    - Should the marine mammal be detected within or closing to inside 200 yds (183 m) of the sonar dome, active sonar transmissions will cease. Sonar will not resume until the animal has been seen to leave the area, has not been detected for

30 minutes, or the vessel has transited more than 2,000 yds (457 m) beyond the location of the last detection.

- Special conditions applicable for dolphins and porpoises only: If, after conducting an initial maneuver to avoid close quarters with dolphins or porpoises, the OOD concludes that dolphins or porpoises are deliberately closing to ride the vessel's bow wave, no further mitigation actions are necessary while the dolphins or porpoises continue to exhibit bow wave riding behavior.
- If the need for power-down should arise as detailed in "Safety Zones" above, the Navy shall follow the requirements as though they were operating at 235 dB—the normal operating level (i.e., the first power-down will be to 229 dB, regardless of at what level above 235 sonar was being operated).

- Prior to start up or restart of active sonar, operators will check that the Safety Zone radius around the sound source is clear of marine mammals.
- Sonar levels (generally)—Navy will operate sonar at the lowest practicable level, not to exceed 235 dB, except as required to meet tactical training objectives.
- Helicopters shall observe/survey the vicinity of an ASW training event for 10 minutes before the first deployment of active (dipping) sonar in the water.
- Helicopters shall not dip their sonar within 200 yds (183 m) of a marine mammal and shall cease pinging if a marine mammal closes within 200 yds (183 m) after pinging has begun.
- Submarine sonar operators will review detection indicators of close-aboard marine mammals prior to the commencement of ASW training events involving active mid-frequency sonar.
- Increased vigilance during ASW training events with tactical active sonar when critical conditions are present.

  Based on lessons learned from strandings in Bahamas 2000, Madeiras 2000, Canaries 2002 and Spain 2006, beaked whales are of particular concern since they have been associated with mid-frequency active sonar operations. The Navy should avoid planning Major ASW Training Exercises with mid-frequency active sonar in areas where they will encounter conditions which, in their aggregate, may contribute to a marine mammal stranding event.

  The conditions to be considered during exercise planning include:

  - Areas of at least 1,000-meter depth near a shoreline where there is a rapid change in bathymetry on the order of 1,000-6,000 yds (914-5486 m) occurring across a relatively short horizontal distance (e.g., 5 nautical miles [nm]).
  - Cases for which multiple ships or submarines ($\geq$ 3) operating mid-frequency active sonar in the same area over extended periods of time ($\geq$ 6 hours) in close proximity ($\leq$ 10 nm apart).
  - An area surrounded by land masses, separated by less than 35 nm and at least 10 nm in length, or an embayment, wherein operations involving multiple ships/subs ($\geq$ 3) employing mid-frequency active sonar near land may produce sound directed toward the channel or embayment that may cut off the lines of egress for marine mammals.

- Though not as dominant a condition as bathymetric features, the historical presence of a significant surface duct (i.e., a mixed layer of constant water temperature extending from the sea surface to 100 or more feet [ft]).

If the Major Range Event is to occur in an area where the above conditions exist in their aggregate, these conditions must be fully analyzed in environmental planning documentation. The Navy will increase vigilance by undertaking the following additional mitigation measure:

- A dedicated aircraft (Navy asset or contracted aircraft) will undertake reconnaissance of the embayment or channel ahead of the exercise participants to detect marine mammals that may be in the area exposed to active sonar. Where practical, advance survey should occur within about 2 hours prior to mid-frequency active sonar use and periodic surveillance should continue for the duration of the exercise. Any unusual conditions (e.g., presence of sensitive species, groups of species milling out of habitat, and any stranded animals) shall be reported to the Office in Tactical Command, who should give consideration to delaying, suspending, or altering the exercise.
- All safety zone power down requirements described above will apply.
- The post-exercise report must include specific reference to any event conducted in areas where the above conditions exist, with exact location and time/duration of the event, and noting results of surveys conducted.

5.8.2.2 Surface-to-Surface Gunnery (5-inch, 76 mm, 20 mm, 25 mm and 30 mm explosive rounds)

- Lookouts will visually survey for floating weeds and kelp, and algal mats which may be inhabited by immature sea turtles in the target area. Intended impact shall not be within 600 yds (585 m) of known or observed floating weeds and kelp, and algal mats.
- For exercises using targets towed by a vessel or aircraft, target-towing vessels/aircraft shall maintain a trained lookout for marine mammals and sea turtles. If a marine mammal or sea turtle is sighted in the vicinity, the tow aircraft/vessel will immediately notify the firing vessel, which will suspend the exercise until the area is clear.
- A 600 yard radius buffer zone will be established around the intended target.
- From the intended firing position, trained lookouts will survey the buffer zone for marine mammals and sea turtles prior to commencement and during the exercise as long as practicable. Due to the distance between the firing position and the buffer zone, lookouts are only expected to visually detect breaching whales, whale blows, and large pods of dolphins and porpoises.
- The exercise will be conducted only when the buffer zone is visible and marine mammals and sea turtles are not detected within it.

5.8.2.3 Surface-to-Surface Gunnery (non-explosive rounds)

- Lookouts will visually survey for floating weeds and kelp, and algal mats which may be inhabited by immature sea turtles in the target area. Intended impact will not be within 200 yds (183 m) of known or observed floating weeds and kelp, and algal mats.
- A 200 yd (183 m) radius buffer zone will be established around the intended target.
- From the intended firing position, trained lookouts will survey the buffer zone for marine mammals and sea turtles prior to commencement and during the exercise as long as practicable. Due to the distance between the firing position and the buffer zone, lookouts

are only expected to visually detect breaching whales, whale blows, and large pods of dolphins and porpoises.

- If applicable, target towing vessels will maintain a lookout. If a marine mammal or sea turtle is sighted in the vicinity of the exercise, the tow vessel will immediately notify the firing vessel in order to secure gunnery firing until the area is clear.
- The exercise will be conducted only when the buffer zone is visible and marine mammals and sea turtles are not detected within the target area and the buffer zone.

5.8.2.4 Surface-to-Air Gunnery (explosive and non-explosive rounds)

- Vessels will orient the geometry of gunnery exercises in order to prevent debris from falling in the area of sighted marine mammals, sea turtles, algal mats, and floating kelp.
- Vessels will expedite the recovery of any parachute deploying aerial targets to reduce the potential for entanglement of marine mammals and sea turtles.
- Target towing aircraft shall maintain a lookout. If a marine mammal or sea turtle is sighted in the vicinity of the exercise, the tow aircraft will immediately notify the firing vessel in order to secure gunnery firing until the area is clear.

5.8.2.5 Air-to-Surface Gunnery (explosive and non-explosive rounds)

- If surface vessels are involved, lookouts will visually survey for floating kelp, which may be inhabited by immature sea turtles, in the target area. Impact should not occur within 200 yds (183 m) of known or observed floating weeds and kelp or algal mats.
- A 200 yd (183 m) radius buffer zone will be established around the intended target.
- If surface vessels are involved, lookout(s) will visually survey the buffer zone for marine mammals and sea turtles prior to and during the exercise.
- Aerial surveillance of the buffer zone for marine mammals and sea turtles will be conducted prior to commencement of the exercise. Aerial surveillance altitude of 500 feet to 1,500 feet (ft) (152 - 456 m) is optimum. Aircraft crew/pilot will maintain visual watch during exercises. Release of ordnance through cloud cover is prohibited: aircraft must be able to actually see ordnance impact areas.
- The exercise will be conducted only if marine mammals and sea turtles are not visible within the buffer zone.

5.8.2.6 Small Arms Training - (grenades, explosive and non-explosive rounds)

- Lookouts will visually survey for floating weeds or kelp, algal mats, marine mammals, and sea turtles. Weapons will not be fired in the direction of known or observed floating weeds or kelp, algal mats, marine mammals, sea turtles.

5.8.2.7 Air-to-Surface At-Sea Bombing Exercises (explosive bombs and cluster munitions, rockets)

- If surface vessels are involved, trained lookouts will survey for floating kelp, which may be inhabited by immature sea turtles. Ordnance shall not be targeted to impact within 1,000 yds (914 m) of known or observed floating kelp, sea turtles, or marine mammals.
- A buffer zone of 1,000 yd (914 m) radius will be established around the intended target.
- Aircraft will visually survey the target and buffer zone for marine mammals and sea turtles prior to and during the exercise. The survey of the impact area will be made by flying at 1,500 feet or lower, if safe to do so, and at the slowest safe speed. Release of

ordnance through cloud cover is prohibited: aircraft must be able to actually see ordnance impact areas. Survey aircraft should employ most effective search tactics and capabilities.

- The exercises will be conducted only if marine mammals and sea turtles are not visible within the buffer zone.

5.8.2.8 Air-to-Surface At-Sea Bombing Exercises (non-explosive bombs and cluster munitions, rockets)

- If surface vessels are involved, trained lookouts will survey for floating kelp, which may be inhabited by immature sea turtles, and for sea turtles and marine mammals. Ordnance shall not be targeted to impact within 1,000 yds (914 m) of known or observed floating kelp, sea turtles, or marine mammals.
- A 1,000 yd (914 m) radius buffer zone will be established around the intended target.
- Aircraft will visually survey the target and buffer zone for marine mammals and sea turtles prior to and during the exercise. The survey of the impact area will be made by flying at 1,500 ft (152 m) or lower, if safe to do so, and at the slowest safe speed. Release of ordnance through cloud cover is prohibited: aircraft must be able to actually see ordnance impact areas. Survey aircraft should employ most effective search tactics and capabilities.
- The exercise will be conducted only if marine mammals and sea turtles are not visible within the buffer zone.

5.8.2.9 Air-to-Surface Missile Exercises (explosive and non-explosive)

- Ordnance shall not be targeted to impact within 1,800 yds (1646 m) of known or observed floating kelp, which may be inhabited by immature sea turtles, or coral reefs.
- Aircraft will visually survey the target area for marine mammals and sea turtles. Visual inspection of the target area will be made by flying at 1,500 (457 m) feet or lower, if safe to do so, and at slowest safe speed. Firing or range clearance aircraft must be able to actually see ordnance impact areas. Explosive ordnance shall not be targeted to impact within 1,800 yds (1646 m) of sighted marine mammals and sea turtles.

5.8.2.10 Underwater Detonations (up to 20-lb charges)

To ensure protection of marine mammals and sea turtles during underwater detonation training, the operating area must be determined to be clear of marine mammals and sea turtles prior to detonation. Implementation of the following mitigation measures continue to ensure that marine mammals would not be exposed to temporary threshold shift (TTS), permanent threshold shift (PTS), or injury from physical contact with training mine shapes during Major Exercises.

5.8.2.10.1 Exclusion Zones

All Mine Warfare and Mine Countermeasures Operations involving the use of explosive charges must include exclusion zones for marine mammals and sea turtles to prevent physical and/or acoustic effects to those species. These exclusion zones shall extend in a 700-yard arc radius around the detonation site.

5.8.2.10.2 Pre-Exercise Surveys

For Demolition and Ship Mine Countermeasures Operations, pre-exercise survey shall be conducted within 30 minutes prior to the commencement of the scheduled explosive event. The survey may be conducted from the surface, by divers, and/or from the air, and personnel shall be alert to the presence of any marine mammal or sea turtle. Should such an animal be present within

the survey area, the exercise shall be paused until the animal voluntarily leaves the area. The Navy will suspend detonation exercises and ensure the area is clear for a full 30 minutes prior to detonation. Personnel will record any protected species marine mammal and sea turtle observations during the exercise as well as measures taken if species are detected within the exclusion zone.

5.8.2.10.3 Post-Exercise Surveys and Reporting

Surveys within the same radius shall also be conducted within 30 minutes after the completion of the explosive event.

If there is evidence that a marine mammal or sea turtle may have been stranded, injured or killed by the action, Navy training activities will be immediately suspended and the situation immediately reported by the participating unit to the Officer in Charge of the Exercise (OCE), who will follow Navy procedures for reporting the incident to to Commander, Pacific Fleet, Commander, Navy Region Southwest, Environmental Director, and the chain-of-command.

5.8.2.11 Mining Operations

Mining Operations involve aerial drops of inert training shapes on target points. Aircrews are scored for their ability to accurately hit the target points. This operation does not involve live ordnance. The probability of a marine species being in the exact spot in the ocean where an inert object is dropped is remote. However, as a conservative measure, initial target points will be briefly surveyed prior to inert ordnance release from an aircraft to ensure the intended drop area is clear of marine mammals and sea turtles. To the extent feasible, the Navy shall retrieve inert mine shapes dropped during Mining Operations.

5.8.2.12 Sink Exercise (SINKEX)

The selection of sites suitable for SINKEX involves a balance of operational suitability, requirements established under the Marine Protection, Research and Sanctuaries Act (MPRSA) permit granted to the Navy (40 Code of Federal Regulations § 229.2), and the identification of areas with a low likelihood of encountering Endangered Species Act (ESA) listed species. To meet operational suitability criteria, locations must be within a reasonable distance of the target vessels' originating location. The locations should also be close to active military bases to allow participating assets access to shore facilities. For safety purposes, these locations should also be in areas that are not generally used by non-military air or watercraft. The MPRSA permit requires vessels to be sunk in waters which are at least 1,000 fathoms (3,000 yds / 2742 m)) deep and at least 50 nm from land.

In general, most listed species prefer areas with strong bathymetric gradients and oceanographic fronts for significant biological activity such as feeding and reproduction. Typical locations include the continental shelf and shelf-edge.

5.8.2.12.1 SINKEX Mitigation Plan

The Navy has developed range clearance procedures to maximize the probability of sighting any ships or protected species in the vicinity of an exercise, which are as follows:

- All weapons firing would be conducted during the period 1 hour after official sunrise to 30 minutes before official sunset.
- Extensive range clearance operations would be conducted in the hours prior to commencement of the exercise, ensuring that no shipping is located within the hazard range of the longest-range weapon being fired for that event.
- Prior to conducting the exercise, remotely sensed sea surface temperature maps would be reviewed. SINKEX would not be conducted within areas where strong temperature

discontinuities are present, thereby indicating the existence of oceanographic fronts. These areas would be avoided because concentrations of some listed species, or their prey, are known to be associated with these oceanographic features.

- An exclusion zone with a radius of 1.0 nm would be established around each target. This exclusion zone is based on calculations using a 990-pound (lb) H6 net explosive weight high explosive source detonated 5 ft below the surface of the water, which yields a distance of 0.85 nm (cold season) and 0.89 nm (warm season) beyond which the received level is below the 182 decibels (dB) re: 1 micropascal squared-seconds (μPa2-s) threshold established for the WINSTON S. CHURCHILL (DDG 81) shock trials (DoN 2001). An additional buffer of 0.5 nm would be added to account for errors, target drift, and animal movements. Additionally, a safety zone, which extends from the exclusion zone at 1.0 nm out an additional 0.5 nm, would be surveyed. Together, the zones extend out 2 nm from the target.
- A series of surveillance over-flights would be conducted within the exclusion and the safety zones, prior to and during the exercise, when feasible. Survey protocol would be as follows:
    - Overflights within the exclusion zone would be conducted in a manner that optimizes the surface area of the water observed. This may be accomplished through the use of the Navy's Search and Rescue Tactical Aid, which provides the best search altitude, ground speed, and track spacing for the discovery of small, possibly dark objects in the water based on the environmental conditions of the day. These environmental conditions include the angle of sun inclination, amount of daylight, cloud cover, visibility, and sea state.
    - All visual surveillance activities would be conducted by Navy personnel trained in visual surveillance. At least one member of the mitigation team would have completed the Navy's marine mammal training program for lookouts.
    - In addition to the overflights, the exclusion zone would be monitored by passive acoustic means, when assets are available. This passive acoustic monitoring would be maintained throughout the exercise. Potential assets include sonobuoys, which can be utilized to detect any vocalizing marine mammals (particularly sperm whales) in the vicinity of the exercise. The sonobuoys would be re-seeded as necessary throughout the exercise. Additionally, passive sonar onboard submarines may be utilized to detect any vocalizing marine mammals in the area. The OCE would be informed of any aural detection of marine mammals and would include this information in the determination of when it is safe to commence the exercise.
    - On each day of the exercise, aerial surveillance of the exclusion and safety zones would commence 2 hours prior to the first firing.
    - The results of all visual, aerial, and acoustic searches would be reported immediately to the OCE. No weapons launches or firing would commence until the OCE declares the safety and exclusion zones free of marine mammals and threatened and endangered species.
    - If a protected species observed within the exclusion zone is diving, firing would be delayed until the animal is re-sighted outside the exclusion zone, or 30 minutes have elapsed. After 30 minutes, if the animal has not been re-sighted it would be assumed to have left the exclusion zone. This is based on a typical dive

time of 30 minutes for traveling listed species of concern. The OCE would determine if the listed species is in danger of being adversely affected by commencement of the exercise.

- During breaks in the exercise of 30 minutes or more, the exclusion zone would again be surveyed for any protected species. If protected species are sighted within the exclusion zone, the OCE would be notified, and the procedure described above would be followed.
- Upon sinking of the vessel, a final surveillance of the exclusion zone would be monitored for 2 hours, or until sunset, to verify that no listed species were harmed.

- Aerial surveillance would be conducted using helicopters or other aircraft based on necessity and availability. The Navy has several types of aircraft capable of performing this task; however, not all types are available for every exercise. For each exercise, the available asset best suited for identifying objects on and near the surface of the ocean would be used. These aircraft would be capable of flying at the slow safe speeds necessary to enable viewing of marine vertebrates with unobstructed, or minimally obstructed, downward and outward visibility. The exclusion and safety zone surveys may be cancelled in the event that a mechanical problem, emergency search and rescue, or other similar and unexpected event preempts the use of one of the aircraft onsite for the exercise.
- Every attempt would be made to conduct the exercise in sea states that are ideal for marine mammal sighting, Beaufort Sea State 3 or less. In the event of a 4 or above, survey efforts would be increased within the zones. This would be accomplished through the use of an additional aircraft, if available, and conducting tight search patterns.
- The exercise would not be conducted unless the exclusion zone could be adequately monitored visually.
- In the unlikely event that any listed species are observed to be harmed in the area, a detailed description of the animal would be taken, the location noted, and if possible, photos taken. This information would be provided to NMFS via the Navy's regional environmental coordinator for purposes of identification.
- An after action report detailing the exercise's time line, the time the surveys commenced and terminated, amount, and types of all ordnance expended, and the results of survey efforts for each event would be submitted to NMFS.

5.8.2.13 Mitigation Measures Related to Explosive Source Sonobuoys (AN/SSQ-110A)

- Crews will conduct visual reconnaissance of the drop area prior to laying their intended sonobuoy pattern. This search should be conducted below 457 m (500 yd) at a slow speed, if operationally feasible and weather conditions permit. In dual aircraft operations, crews are allowed to conduct coordinated area clearances.
- Crews shall conduct a minimum of 30 minutes of visual and aural monitoring of the search area prior to commanding the first post detonation. This 30-minute observation period may include pattern deployment time.
- For any part of the briefed pattern where a post (source/receiver sonobuoy pair) will be deployed within 914 m (1,000 yd) of observed marine mammal activity, deploy the receiver ONLY and monitor while conducting a visual search. When marine mammals

are no longer detected within 914 m (1,000 yd) of the intended post position, co-locate the explosive source sonobuoy (AN/SSQ-110A) (source) with the receiver.

- When able, crews will conduct continuous visual and aural monitoring of marine mammal activity. This is to include monitoring of own-aircraft sensors from first sensor placement to checking off station and out of RF range of these sensors.
- Aural Detection:
    - If the presence of marine mammals is detected aurally, then that should cue the aircrew to increase the diligence of their visual surveillance. Subsequently, if no marine mammals are visually detected, then the crew may continue multi-static active search.
- Visual Detection:
    - If marine mammals are visually detected within 914 m (1,000 yd) of the explosive source sonobuoy (AN/SSQ-110A) intended for use, then that payload shall not be detonated. Aircrews may utilize this post once the marine mammals have not been re-sighted for 10 minutes, or are observed to have moved outside the 914 m (1,000 yd) safety buffer.
    - Aircrews may shift their multi-static active search to another post, where marine mammals are outside the 914 m (1,000 yd) safety buffer.
- Aircrews shall make every attempt to manually detonate the unexploded charges at each post in the pattern prior to departing the operations area by using the "Payload 1 Release" command followed by the "Payload 2 Release" command. Aircrews shall refrain from using the "Scuttle" command when two payloads remain at a given post. Aircrews will ensure that a 914 m (1,000 yd) safety buffer, visually clear of marine mammals, is maintained around each post as is done during active search operations.
- Aircrews shall only leave posts with unexploded charges in the event of a sonobuoy malfunction, an aircraft system malfunction, or when an aircraft must immediately depart the area due to issues such as fuel constraints, inclement weather, and in-flight emergencies. In these cases, the sonobuoy will self-scuttle using the secondary or tertiary method.
- Ensure all payloads are accounted for. Explosive source sonobuoys (AN/SSQ-110A) that can not be scuttled shall be reported as unexploded ordnance via voice communications while airborne, then upon landing via naval message.
- Mammal monitoring shall continue until out of own-aircraft sensor range.

5.8.3 Conservation Measures

5.8.3.1 SOCAL Marine Species Monitoring Plan

The Navy is developing developed a Marine Species Monitoring Plan (MSMP) that provides recommendations for site-specific monitoring for MMPA and ESA listed species (primarily marine mammals) within the SOCAL Range Complex, including during training exercises. The primary goals of monitoring are to evaluate trends in marine species distribution and abundance in order to assess potential population effects from Navy training activities and determine the effectiveness of the Navy's mitigation measures. The information gained from the monitoring will also allow the Navy to evaluate the models used to predict effects to marine mammals.

By using a combination of monitoring techniques or tools appropriate for the species of concern, type of Navy activities conducted, sea state conditions, and the size of the Range Complex, the

detection, localization, and observation of marine mammals and sea turtles can be maximized. The following available monitoring techniques and tools are described in this monitoring plan for monitoring for range events (several days or weeks) and monitoring of population effects such as abundance and distribution (months or years):

- Visual Observations – Vessel-, Aerial- and Shore-based Surveys (for marine mammals and sea turtles) will provide data on population trends (abundance, distribution, and presence) and response of marine species to Navy training activities. Navy lookouts will also record observations of detected marine mammals from Navy ships during appropriate training and test events.

- Acoustic Monitoring – Passive Acoustic Monitoring possibly using towed hydrophone arrays, Autonomous Acoustic Recording buoys and U.S. Navy Instrument Acoustic Range (for marine mammals only) may provide presence/absence data on cryptic species that are difficult to detect visually (beaked whales and minke whales) that could address long term population trends and response to Navy training exercises.

- Tagging – Tagging marine mammals with instruments to measure their dive depth and duration, determine location and record the received level of natural and anthropogenic sounds.

- Additional Methods – Oceanographic Observations and Other Environmental Factors will be obtained during ship-based surveys and satellite remote sensing data. Oceanographic data is important factor that influences the abundance and distribution of prey items and therefore the distribution and movements of marine mammals.

The monitoring plan will be reviewed annually by Navy biologists to determine the effectiveness of the monitoring elements and to consider any new monitoring tools or techniques that may have become available.

5.8.3.2 Research

The Navy provides a significant amount of funding and support to marine research. The agency provides nearly 10 million dollars annually to universities, research institutions, federal laboratories, private companies, and independent researchers around the world to study marine mammals. The U.S. Navy sponsors seventy percent of all U.S. research concerning the effects of human-generated sound on marine mammals and 50 percent of such research conducted worldwide. Major topics of Navy-supported research include the following:

- Better understanding of marine species distribution and important habitat areas,
- Developing methods to detect and monitor marine species before and during training,
- Understanding the effects of sound on marine mammals, sea turtles, fish, and birds, and
- Developing tools to model and estimate potential effects of sound.

The Navy's Office of Naval Research currently coordinates six programs that examine the marine environment and are devoted solely to studying the effects of noise and/or the implementation of technology tools that will assist the Navy in studying and tracking marine mammals. The six programs are as follows:

- Environmental Consequences of Underwater Sound,
- Non-Auditory Biological Effects of Sound on Marine Mammals,

- Effects of Sound on the Marine Environment,
- Sensors and Models for Marine Environmental Monitoring,
- Effects of Sound on Hearing of Marine Animals, and
- Passive Acoustic Detection, Classification, and Tracking of Marine Mammals.

The Navy has also developed the technical reports referenced within this document, which include the Marine Resource Assessments and the Navy OPAREA Density Estimates (NODE) reports. Furthermore, research cruises by the National Marine Fisheries Service (NMFS) and by academic institutions have received funding from the U.S. Navy.

The Navy has sponsored several workshops to evaluate the current state of knowledge and potential for future acoustic monitoring of marine mammals. The workshops brought together acoustic experts and marine biologists from the Navy and other research organizations to present data and information on current acoustic monitoring research efforts and to evaluate the potential for incorporating similar technology and methods on instrumented ranges. However, acoustic detection, identification, localization, and tracking of individual animals still requires a significant amount of research effort to be considered a reliable method for marine mammal monitoring. The Navy supports research efforts on acoustic monitoring and will continue to investigate the feasibility of passive acoustics as a potential mitigation and monitoring tool.

Overall, the Navy will continue to fund ongoing marine mammal research, and is planning to coordinate long term monitoring/studies of marine mammals on various established ranges and operating areas. The Navy will continue to research and contribute to university/external research to improve the state of the science regarding marine species biology and acoustic effects. These efforts include mitigation and monitoring programs; data sharing with NMFS and via the literature for research and development efforts; and future research as described previously.

5.8.4 Coordination and Reporting

The Navy will coordinate with the local NMFS Stranding Coordinator for any unusual marine mammal behavior and any stranding, beached live/dead or floating marine mammals that may occur coincident with Navy training activities.

5.8.5 Alternative Mitigation Measures Considered but Eliminated

As described in Chapter 3, Section 3.9 and Appendix F, the vast majority of estimated sound exposures of marine mammals during proposed active sonar activities would not cause injury. Potential acoustic effects on marine mammals would be further reduced by the mitigation measures described above. Therefore, the Navy concludes the proposed action and mitigation measures would achieve the least practical adverse impact on species or stocks of marine mammals.

A determination of "least practicable adverse impacts" includes consideration of personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity in consultation with the DoD. Therefore, the following additional mitigation measures were analyzed and eliminated from further consideration:

- Reduction of training. The requirements for training have been developed through many years of iteration to ensure sailors achieve levels of readiness to ensure they are prepared to properly respond to the many contingencies that may occur during an actual mission. These training requirements are designed provide the experience needed to ensure sailors are properly prepared for operational success. There is no extra training built in to the plan, as this would not be an efficient use of the resources needed to support the training

(e.g. fuel, time). Therefore, any reduction of training would not allow sailors to achieve satisfactory levels of readiness needed to accomplish their mission.

- Use of ramp-up to attempt to clear the range prior to the conduct of exercises. Ramp-up procedures, (slowly increasing the sound in the water to necessary levels), are not a viable alternative for training exercises because the ramp-up would alert opponents to the participants' presence. This affects the realism of training in that the target submarine would be able to detect the searching unit prior to themselves being detected, enabling them to take evasive measures. This would insert a significant anomaly to the training, affecting its realism and effectiveness. Though ramp-up procedures have been used in testing, the procedure is not effective in training sailors to react to tactical situations, as it provides an unrealistic advantage by alerting the target. Using these procedures would not allow the Navy to conduct realistic training, thus adversely impacting the effectiveness of the military readiness activity.
- Visual monitoring using third-party observers from air or surface platforms, in addition to the existing Navy-trained lookouts.
    - The use of third-party observers would compromise security due to the requirement to provide advance notification of specific times/locations of Navy platforms.
    - Reliance on the availability of third-party personnel would also impact training flexibility, thus adversely affecting training effectiveness.
    - The presence of other aircraft in the vicinity of naval exercises would raise safety concerns for both the commercial observers and naval aircraft.
    - Use of Navy observers is the most effective means to ensure quick and effective implementation of mitigation measures if marine species are spotted. A critical skill set of effective Navy training is communication. Navy lookouts are trained to act swiftly and decisively to ensure that appropriate actions are taken.
    - Use of third-party observers is not necessary because Navy personnel are extensively trained in spotting items on or near the water surface. Navy spotters receive more hours of training, and use their spotting skills more frequently, than many third-party trained personnel.
    - Crew members participating in training activities involving aerial assets have been specifically trained to detect objects in the water. The crew's ability to sight from both surface and aerial platforms provides excellent survey capabilities using the Navy's existing exercise assets.
    - Security clearance issues would have to be overcome to allow non-Navy observers onboard exercise participants.
    - Some training events will span one or more 24-hour periods, with operations underway continuously in that timeframe. It is not feasible to maintain non-Navy surveillance of these operations, given the number of non-Navy observers that would be required onboard.
    - Surface ships having active mid-frequency sonar have limited berthing capacity. As exercise planning includes careful consideration of this limited capacity in the placement of exercise controllers, data collection personnel, and Afloat Training Group personnel on ships involved in the exercise. Inclusion of non-Navy observers onboard these ships would require that in some cases there would be

no additional berthing space for essential Navy personnel required to fully evaluate and efficiently use the training opportunity to accomplish the exercise objectives.

- Contiguous ASW events may cover many hundreds of square miles. The number of civilian ships and/or aircraft required to monitor the area of these events would be considerable. It is, thus, not feasible to survey or monitor the large exercise areas in the time required ensuring these areas are devoid of marine mammals. In addition, marine mammals may move into or out of an area, if surveyed before an event, or an animal could move into an area after an exercise took place. Given that there are no adequate controls to account for these or other possibilities and there are no identified research objectives, there is no utility to performing either a before or an after the event survey of an exercise area.
- Survey during an event raises safety issues with multiple, slow civilian aircraft operating in the same airspace as military aircraft engaged in combat training activities. In addition, most of the training events take place far from land, limiting both the time available for civilian aircraft to be in the exercise area and presenting a concern should aircraft mechanical problems arise.
- Scheduling civilian vessels or aircraft to coincide with training events would impact training effectiveness, since exercise event timetables cannot be precisely fixed and are instead based on the free-flow development of tactical situations. Waiting for civilian aircraft or vessels to complete surveys, refuel, or be on station would slow the unceasing progress of the exercise and impact the effectiveness of the military readiness activity.
- Multiple simultaneous training events continue for extended periods. There are not enough qualified third-party personnel to accomplish the monitoring task.

- Reducing or securing power during the following conditions.
  - Low-visibility / night training: ASW can require a significant amount of time to develop the "tactical picture," or an understanding of the battle space such as area searched or unsearched, identifying false contacts, understanding the water conditions, etc. Reducing or securing power in low-visibility conditions would affect a commander's ability to develop this tactical picture and would not provide realistic training.
  - Strong surface duct: The complexity of ASW requires the most realistic training possible for the effectiveness and safety of the sailors. Reducing power in strong surface duct conditions would not provide this training realism because the unit would be operating differently than it would in a combat scenario, reducing training effectiveness and the crew's ability. Additionally, water conditions may change rapidly, resulting in continually changing mitigation requirements, resulting in a focus on mitigation versus training.

- Vessel speed: Establish and implement a set vessel speed.
    - Navy personnel are required to use caution and operate at a slow, safe speed consistent with mission and safety. Ships and submarines need to be able to react to changing tactical situations in training as they would in actual combat. Placing arbitrary speed restrictions would not allow them to properly react to these situations, resulting in decreased training effectiveness and reduction the crew proficiency.
- Increasing power down and shut down zones:
    - The current power down zones of 457 and 914 m (500 and 1,000 yd), as well as the 183 m (200 yd) shut down zone were developed to minimize exposing marine mammals to sound levels that could cause temporary threshold shift (TTS) or permanent threshold shift (PTS), levels that are supported by the scientific community. Implementation of the safety zones discussed above will prevent exposure to sound levels greater than 195 dB re 1μPa for animals sighted. The safety range the Navy has developed is also within a range sailors can realistically maintain situational awareness and achieve visually during most conditions at sea.
    - Although the three action alternatives were developed using marine mammal density data and areas believed to provide habitat features conducive to marine mammals, not all such areas could be avoided. ASW requires large areas of ocean space to provide realistic and meaningful training to the sailors. These areas were considered to the maximum extent practicable while ensuring Navy's ability to properly train its forces in accordance with federal law. Avoiding any area that has the potential for marine mammal populations is impractical and would impact the effectiveness of the military readiness activity.
- Using active sonar with output levels as low as possible consistent with mission requirements and use of active sonar only when necessary.
    - Operators of sonar equipment are always cognizant of the environmental variables affecting sound propagation. In this regard, the sonar equipment power levels are always set consistent with mission requirements.

      Active sonar is only used when required by the mission since it has the potential to alert opposing forces to the sonar platform's presence. Passive sonar and all other sensors are used in concert with active sonar to the maximum extent practicable when available and when required by the mission.

5.9 SEA BIRDS

Avoidance of seabirds and their nesting and roosting habitats provides the greatest degree of protective measure from potential impacts within the SOCAl Range Complex. Currently, the majority of aircraft operations that might affect seabirds are concentrated at the Naval Auxilary Landing Field (NALF) on SCI, and the potential for bird aircraft strikes exists. Pursuant to Navy instruction, measures to evaluate and reduce of eliminate this hazard to aircraft, aircrews, and birds are implemented. Additionally, guidance involving land or water detonations contains instructions to personnel to observe the surrounding area within 600 yds (585 m) for 30 minutes prior to detonation. If birds (or marine mammals or sea turtles) are seen, the operation must be relocated to an unoccupied area or postponed until animals leave the area. Monitoring of seabird populations and colonies by conservation groups and researchers is conducted intermittently within coastal areas and offshore islands with limited support from various military commands.

5.10 TERRESTRIAL BIOLOGICAL RESOURCES

As noted in section 3.11.1.3, the Navy implements measures to avoid, minimize, or compensate for its effects on biological resources including listed species on SCI. Key management and monitoring activities include completion and implementation of the SCI Wildland Fire Management Plan; continued monitoring and management activities for all endangered species but with particular attention to San Clemente loggerhead shrike, San Clemente sage sparrow, island fox, and six federally-listed plant species; invasive species monitoring and control efforts; continued operation of the on-island nursery and restoration efforts being conducted by nursery staff; vegetation condition and trend assessment; and continued implementation of the SCI Integrated Natural Resources Management Plan (INRMP). The Navy proposes to continue these measures. Further, as noted in section 3.11.4, the Navy proposes to implement additional measures to mitigate the environmental effects of its activities. The following is a comprehensive list of current and proposed mitigation measures intended to reduce effects of military activities on biological resources of SCI:

5.10.1 General Measures

- **G-M-1.** Continue to control invasive exotic plant species on an island-wide scale, with an emphasis on the AVMC, the IOA, TARs, and other operations insertion areas such as West Cove, Wilson Cove and the airfield. A pretreatment survey to identify areas needing treatment, one treatment cycle, and a retreatment cycle (when necessary) will be planned each year to minimize the distribution of invasive species. The focus of the invasive exotic plant control program will continue to be the control of highly invasive exotic plants that have the potential to adversely impact habitat for federally listed species in known locations, and the early detection and eradication of new occurrences of such species. Where feasible, include future construction sites in a treatment and retreatment cycle prior to construction.
- **G-M-2.** Continue feral cat and rat control efforts and monitoring level of feral cat and rat population (would benefit all endangered and threatened wildlife on SCI as well as the island fox). To reduce human-induced increases in the feral cat and rat populations, the Navy will ensure that personnel do not feed cats and that all trash, food waste, and training refuse are disposed of properly in animal proof containers.
- **G-M-3.** Continue implementation of INRMP per funding availability, with review and revision per Navy directives addressing management of natural resources.
- **G-M-4.** Continue to review and coordinate the dissemination of environmental conservation measures to island users. Conservation measures will be distributed to island military and civilian staff in accordance with commander's guidelines, and with Fleet operations.
- **G-M-5.** Conduct any necessary Explosive Ordnance Disposal (EOD) ordnance detonations in or near endangered or threatened species habitat in a manner that minimizes the potential for wildfire without compromising personnel safety.
- **G-M-6.** Coordinate range access to achieve optimal flexibility between training operations and NRO activities, according to range use instructions and with priority given to military training.
- **G-M-7.** Locate SHOBA heavy ordnance targets with regard to proximity to sensitive resources, including San Clemente loggerhead shrike, sensitive plants (e.g., away from Horse Beach Canyon), and coastal salt marsh, to the extent feasible while meeting operational needs.

- **G-M-8.** Conduct monitoring and control activities for non-native predators outside the impact area boundaries. Monitoring and control activities would include China Point Road between Impact Areas I and II. Monitoring and control activities may be intensified as needed to prevent elevated predation on listed species outside the Impact Area boundaries attributable to predator populations within the Impact Area boundaries. Access to conduct control efforts would not be limited within SHOBA outside the Impact Area I and II boundaries. (See also related measure **G-M-2)**.
- **G-M-9.** Conduct monitoring and control activities for invasive non-native plant species outside of the impact area boundaries. Monitoring and control activities would include the China Point Road between Impact Areas I and II. Monitoring and control activities may be intensified as needed to prevent spread of invasive species and effects on listed species outside the Impact Area boundaries attributable to invasive species populations within the Impact Area boundaries. Access to conduct control efforts would not be limited within SHOBA outside the Impact Area I and II boundaries. (See also related measure G-M-1).

5.10.2 AVMC, AVMR, AVMA, AFPs, AMPs, IOA, and Amphibious Landing Sites

- **AVMC-M-1.** Complete survey for federally listed and sensitive plant species within the AVMC (including AVMAs, AFP-1, AFP-6, AMPs) and IOA. This survey was initiated in 2005 and was completed in 2007.
- **AVMC-M-2.** Conduct periodic monitoring of the AVMC (AVMAs, AMPs, AFPs, AVMR) and IOA as part of vegetation/habitat and sensitive species survey updates for the INRMP.
- **AVMC-M-3.** Develop an erosion control plan. Finalize AVMA, AMP, and AFP areas based on field review with soil erosion experts and military personnel, such that operational areas minimize inclusion of steep slopes and drainage heads. Develop, apply and maintain BMPs for erosion/sedimentation where appropriate, and provide for regular monitoring and control of invasive species.
- **AVMC-M-4.** Military units will be briefed on maneuver area boundaries prior to conducting operations in these areas.
- **AVMC-M-5.** Tracked vehicle travel or maneuvering will not be conducted outside the boundaries of the AVMC (including AFPs, AMPs, AVMAs, AVMR).
- **AVMC-M-6.** Develop and implement a project to monitor for erosion, dust generation, and deposition of dust in adjacent habitats.
- **AVMC-M-7.** Prior to coming to SCI, military and non-military personnel will be asked to conduct a brief check for visible plant material, dirt, or mud on equipment and shoes. Any visible plant material, dirt or mud should be removed before leaving for SCI. Wash tactical ground vehicles for invasive species prior to embarkation for SCI. Additional washing is not required for amphibious vehicles after 15 minutes of self-propelled travel through salt water prior to coming ashore on SCI.
- **AVMC-M-8.** Continue to enforce the existing 35 mph speed limit on Ridge Road for shore installation and administrative traffic. Post signs, continue public awareness programs; mow roadside vegetation; and monitor roadways for kills of protected or conservation agreement species including San Clemente loggerhead shrike, San Clemente sage sparrow, and island fox.

- **AVMC-M-9.** Tracked and wheeled vehicles will continue to use the existing route for ingress and egress to/from the beach at West Cove.
- **AVMC-M-10.** For Horse Beach Cove Amphibious Landing and Embarkation Area at TAR 21, vehicles will use an ingress/egress route that avoids impact on wetlands and minimizes impacts on coastal dune scrub. This involves driving amphibious vehicles westward on the unvegetated beach and egressing from beach west of the mouth of Horse Beach Canyon.

5.10.3 Training Areas and Ranges (TARs)

- **TAR-M-1.** Develop and implement a five-year monitoring plan with annual surveys for Threatened and Endangered plant species when they are known to occur within or adjacent to TARs outside of Impact Areas I and II.

5.10.4 Additional Species-Specific Measures

San Clemente sage sparrow

- **SCSS-M-1.** Continue surveys and population analysis for the San Clemente sage sparrow including the populations within TARs 4, 10, and 17. This survey effort includes monitoring transects and breeding plots along the west shore and marine terraces between February through June of each year.
- **SCSS-M-2.** Develop a sage sparrow management plan that includes objectives and management actions for the conservation of the sage sparrow on San Clemente Island. The goal of the management plan would be to provide for the long-term survival of the species on SCI in a manner that supports delisting from protection under the ESA while enabling military training requirements on San Clemente Island to be met.

San Clemente Loggerhead Shrike

- **SCLS-M-1.** ontinue the currently successful program of habitat restoration, predator management, monitoring, captive breeding, and re-introduction to benefit the San Clemente loggerhead shrike until such time that recovery objectives are identified and achieved.
- **SCLS-M-2.** Evaluate nest success data for SCLS in sites nearest AFP-6, including those in Eagle and Cave Canyons, and compare it to other sites in and out of SHOBA with the objective of determining whether or not success rates are typical for the species.

Island Night Lizard

- **INL-M-1.** Continue population monitoring at 3-year intervals and annual habitat evaluations while the delisting petition is being evaluated by USFWS.

California brown pelican

- **CBP-M-1.** Ensure that California brown pelicans are not in proximity to over-blast pressure prior to underwater demolition activities.

Western Snowy Plover

- **WSP-M-1.** Continue annual breeding and non-breeding season surveys for the western snowy plover at West Cove and Northwest Harbor.

Island Fox

- **IF-M-1.** Continue educational work with on-Island civilian and military personnel to prevent feeding, handling of foxes.
- **IF-M-2.** Continue feral cat control and education and enforcement of prohibitions concerning on-Island civilian and military personnel feeding, keeping, or otherwise encouraging the persistence of cats on SCI.
- **IF-M-3.** Continue posting signs, mowing road verges, and education to help minimize the potential for vehicular collisions with foxes.

Santa Cruz Island Rock-Cress

- **RC-M-1**. Investigate feasibility of establishing additional colonies in suitable habitat farther away from the IOA and AFP--1 using the on-island nursery to propagate from local seed.

5.11 CULTURAL RESOURCES

Section 3.12.1 details protective measures implemented with regard to cultural resources on SCI. (submerged cultural resources in ocean areas are unaffected by Navy activities.) As noted, the Navy has developed a draft Programmatic Agreement (PA) pursuant to 36 (C.F.R.) § 800.14 (the regulation implementing the National Historic Preservation Act). NHPA Section 106 compliance on SCI will be governed by a PA. The Draft PA stipulates qualifications of personnel, development of an Integrated Cultural Resources Management Plan (ICRMP), determination of an Area of Potential Effects, evaluation of resources to ensure that authorizations for ground-disturbing activities include appropriate measures to protect archaeological resources, emergency procedures, and annual reporting.

The PA identifies Impact Areas I and II in the southern portion of SCI as areas exempt from compliance with Section 106 due to their degree of disturbance and the safety risk to personnel that would be required to survey these areas. The PA defines dispersed pedestrian troop movements as having no potential for affecting cultural resources.

To ensure that cultural resources are managed in a planned and coordinated manner, the Navy is preparing an ICRMP for SCI. There are 18 elements of the ICRMP, as noted in Section 3.12.1.2. Several of these elements already have been addressed in the current Cultural Resources Management Plan for SCI, and some are being addressed in this EIS/ OEIS. All required elements will be addressed in the ICRMP, which will provide for overall management of cultural resources.

Avoidance of adverse effect is the preferred treatment for cultural resources. There are several existing cultural resource measures for site avoidance in place as standard operating procedures at SCI. These measures include:

- All proposed actions except those on existing ranges are reviewed by the NRO for potential effects on cultural resources;
- Ongoing mitigation focuses on treating adverse effects;
- Vehicles are required to stay on established roads or within the AVMC;

- Unauthorized collection of archaeological material is not allowed;
- No digging is permitted;
- Archaeological sites in areas of high use are posted with archaeological site protection signs; and

The Navy uses environmental planning, and project design and redesign to avoid or minimize impacts on resources. When avoidance is not feasible, however, eligible resources must receive appropriate mitigation. For archaeological sites considered important for their potential to provide information, this usually involves data recovery. Mitigating impacts on built resources typically involves Historic American Building Survey/Historic American Engineering Record documentation. The character of treatment is determined through consultation with the California State Historic Preservation Office (SHPO) and Advisory Council on Historic Preservation on adverse effect under 36 C.F.R. § 800.

5.12 TRAFFIC

The Navy strives to ensure that it retains access to ocean training areas and special use airspace (SUA) as necessary to accomplish its mission, while facilitating joint military-civilian use of such areas to the extent practicable and consistent with safety. These goals of military access, joint use, and safety are promoted through various coordination and outreach measures, including:

- Publication of NOTAM advising of the status and nature of activities being conducted in W-291 and other components of SUA in the EIS Study Area.
- Return of SUA to civilian Federal Aviation Administration (FAA) control when not in use for military activities. To accommodate the joint use of SUA, a Letter of Agreement is in place between Los Angeles Air Traffic Control Center (ARTCC) and Fleet Area Control and Surveillance Facility (FACSFAC) San Diego (Navy). The LOA defines the conditions and procedures to ensure safe and efficient joint use of waning areas.
- Publication of NOTMAR and other outreach. The Navy provides information about potentially hazardous activities planned for the SOCAL OPAREA, for publication by the U.S. Coast Guard in NOTMAR. Most such activities occur in the vicinity of SCI. To ensure the broadest dissemination of information about hazards to commercial and recreational vessels, the Navy provides detailed schedules of its activities planned near SCI on a dedicated website.

5.13 SOCIOECONOMICS

Given the nature and location of Navy activities addressed in this EIS/OEIS, mitigation and protective measures are unnecessary with respect to socioeconomic considerations.

5.14 ENVIRONMENTAL JUSTICE AND PROTECTION OF CHILDREN

Given the nature and location of Navy activities addressed in this EIS/OEIS, mitigation and protective measures are unnecessary with respect to socioeconomic considerations.

5.15 PUBLIC SAFETY

Navy activities in the SOCAL Range Complex comply with numerous established safety procedures to ensure the safety of participants and the public. FACSFAC and Navy range managers have published safety procedures for activities on the offshore and nearshore areas. These guidelines are directive for range users. They provide, among other measures, that:

- Commanders are responsible for ensuring that impact areas and targets are clear prior to commencing activities that are hazardous.

- Aircraft or vessels expending ordnance shall not commence firing without permission of the scheduling authority for their specific range area.
- Firing units and targets must remain in their assigned areas, and units must fire in accordance with current safety instructions.
- Except for SCI, ships are authorized to fire their weapons only in offshore areas and at specific distances from land, depending on the caliber and range of the weapons fired. The larger the caliber, the farther offshore that the firing must take place.
- The use of pyrotechnic or illumination devices and marine markers such as smoke or dye markers will be allowed only in the assigned areas, to avoid the launch of Search and Rescue forces when not required. Aircraft carrying ordnance to or from ranges shall avoid populated areas to the maximum extent possible.
- Aircrews operating in W-291 are aware that non-participating aircraft are not precluded from entering the area and may not comply with a NOTAM or radio warning that hazardous activities are scheduled or occurring. Aircrews are required to maintain a continuous lookout for non-participating aircraft while operating under visual flight rules in W-291.

In addition to the FACSFAC and SCORE procedures, the Navy has instituted the following SOPs for use of the SOCAL Range Complex:

5.15.1.1 Aviation Safety

Aircraft in W-291 fly under visual flight rules (VFR) and under visual meteorological conditions. This means that the commanders of military aircraft are responsible for the safe conduct of their flight. Prior to releasing any weapons or ordnance, the impact area must be clear of non-participating vessels, people, or aircraft. The OCE is ultimately responsible for the safe conduct of range training. A qualified Safety Officer is assigned to each training event or exercises and can terminate activities if unsafe conditions exist. Aircraft entering the SCI Air Traffic Area are required to be in radio contact with military air traffic control.

5.15.1.2 Submarine Safety

Vertical separation of at least 100 ft (30.5 m) is required between the top of a submarine's sail and the depth of a surface ship's keel. If a submarine (or submarine simulated target, the MK-30) is at periscope depth, at least a 1,500-yard (yd) (1,372-m) horizontal separation from other vessels must be maintained.

5.15.1.3 Surface Ship Safety

During training events, surface ships maintain radio contact with range control. Prior to launching a weapon, ships are required to obtain a "Green Range," which indicates that all safety criteria have been satisfied, and that the weapons and target recovery conditions and recovery helicopters and boats are ready to be employed.

5.15.1.4 Missile Exercise Safety

Safety is the top priority and paramount concern during missile exercises. These exercises can be surface-to-surface, subsurface-to-surface, surface-to-air, or air-to-air. A Missile Exercise (MISSILEX) Letter of Instruction is prepared prior to any missile firing exercise. This instruction establishes precise ground rules for the safe and successful execution of the exercise. Any MISSILEX participant who observes an unsafe situation can communicate a "Red Range" order over any voice communication systems. Range control is in radio contact with participants at all times during a MISSILEX.

San Clemente Island Xantus's murrelet population makes any mortality a substantial impact to the island population. Nesting sites near Seal Rock have some level of protection from operations since no live-fire activities would occur in that area, and only recently has the SWTR expanded the nearshore extension to include the shoreline near Seal Cove. Nesting sites near China Cove and Seal Cove are not specifically identified by location, and were estimated only by night time mist net captures and vocalizations documented by researchers performing population estimates in adjacent nearshore waters (Carter et al. 1992). Considering the species' high susceptibility to predation from introduced species, and the fact that no nests have been documented in the last two decades on SCI or Santa Catalina Island, it is possible that Xantus's murrelets only actively nest on remote isolated sea cliffs in this area.

China Cove is located in SHOBA Impact Area II, and is regularly targeted by ordnance launched from aviation and ocean platforms. Any explosion near (distance depends on size of the ordnance) nesting sites during breeding season could cause mortality or nest abandonment. Low-elevation aircraft transiting the area of Seal Cove or China Cove are not likely to have adverse effects on Xantus's murrelets unless the described aircraft hovers nearby for an extended period or emits bright lights at night.

Ocean or aviation operations have a low chance of directly or indirectly affecting breeding populations due to the species' habits, low elevation foraging, and the Navy's infrequent use of training areas adjacent to potential nesting sites. Impacts of ocean or aviation operations taking place in offshore waters used by foraging Xantus's murrelets would probably not occur due to the sheer size of potential foraging habitat and the bird's ability to avoid such disturbance. SOCAL Range Complex operations would have no effect on the Xantus's murrelet.

Californian Brown Pelican (*Pelecanus occidentalis californicus*)

Californian brown pelicans (*Pelecanus occidentalis californicus*) use SOCAL Range Complex for breeding, roosting and foraging. Documented breeding colonies in SOCAL Range Complex, occur only at SBI, a conservation management zone, thus, operations conducted within the Range Complex would likely have no effect on California brown pelican breeding colonies. Brown pelicans roosting or foraging within Range Complex boundaries use rocky headlands and nearshore waters at SCI, San Nicolas Island, SBI, and Santa Catalina Island; no previously displayed adverse effects from range operations have been documented. Any disturbance impacts during foraging or roosting away from the breeding colony would be insufficient to affect breeding success.

Summary

The Navy's proposed activities would have minimal effects on seabird populations, in general, and on special-status seabirds. Breeding areas would not be affected. Therefore, the proposed activities would maintain biological productivity as it pertains to seabirds.

3.3.2.1.2.3.5 Marine Mammals

Baseline Description of the Resource

Cetaceans

Twenty-seven species of cetaceans could be encountered in the SOCAL OPAREAs (Table 3-3), not including species considered to be extralimital in the SOCAL OPAREAs. They include both toothed whales (odontocetes) and baleen whales (mysticetes). At least ten species generally can be found in the SOCAL OPAREAs in moderate or high numbers, either year-round or during annual migrations into or through the area. Other species are represented by either small numbers, moderate numbers during part of the year, occasional sightings, or strandings. Five species of endangered or threatened cetaceans occur in the SOCAL OPAREAs. The blue whale

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(*Balaenoptera musculus*), fin whale (*B. physalus*), humpback whale (*Megaptera novaeangliae*), sei whale (*B. borealis*), and sperm whale (*Physeter macrocephalus*) are listed as endangered species and are protected under the ESA.

A comparison of cetacean abundance in 1979-1980 with abundance in 1991 indicated that numbers of mysticetes and odontocetes increased in offshore California waters during that period. The status of cetacean stocks and their abundance estimates for California are summarized in Table 3-5 from marine mammal stock assessments prepared by Barlow et al. (1997), Forney et al. (2000), and Carretta et al. (2001 and 2004). The life histories of the cetaceans found in SOCAL Range Complex are described in Section 3.9 of the SOCAL Range Complex Draft EIS/OEIS.

Table 3-5: Marine Mammal Species Found in Southern California Waters

Common Name Species Name	Abundance in Southern California (number)	Stock (SAR)	ESA/ MMPA Status	Population Trend
Blue whale *Balaenoptera musculus*	842	Eastern North Pacific	E, D, S	May be increasing
Fin whale *Balaenoptera physalus*	359	California, Oregon, & Washington	E, D, S	May be increasing
Humpback whale *Megaptera novaeangliae*	36	California, Oregon, & Washington	E, D, S	Increasing 6-7%
Sei whale *Balaenoptera borealis*	0 (7 Bryde's or Sei)[3]	Eastern North Pacific	E, D, S	May be increasing
Sperm whale *Physeter macrocephalus*	607	California, Oregon, & Washington	E, D, S	Unknown
Guadalupe fur seal *Arctocephalus townsendi*	San Miguel Is. is in southern California, but is outside of the SOCAL Range Complex	Mexico	T, D, S	Increasing 13.7%
Southern Sea Otter *Enhydra lutris*	~29 (ground surveys)	California	T, D	Increasing
Bryde's whale *Balaenoptera edeni*	0 (7 Bryde's or Sei)[3]	California		Unknown
Gray whale *Eschrichtius robustus*	Population migrates through SOCAL Range Complex	Eastern North Pacific		Increasing ~ 2.5%
Minke whale *Balaenoptera acutorostrata*	226	California, Oregon, & Washington		Unknown
Baird's beaked whale *Berardius bairdii*	127	California, Oregon, & Washington		Unknown
Bottlenose dolphin coastal *Tursiops truncatus*	323	California Coastal		Stable
Bottlenose dolphin offshore *Tursiops truncatus*	1,831	California Offshore		Unknown
Cuvier's beaked whale *Ziphius cavirostris*	911	California, Oregon, & Washington		Unknown
Dall's porpoise *Phocoenoides dalli*	727	California, Oregon, & Washington		Unknown
Dwarf sperm whale *Kogia sima*	0	California, Oregon, & Washington		Unknown
False killer whale *Pseudorca crassidens*	Unknown	Eastern Tropical Pacific		Unknown
Killer whale offshore *Orcinus orca*	30	Eastern North Pacific		Unknown
Killer whale transient *Orcinus orca*	Unknown	Eastern North Pacific		Unknown
Long-beaked common dolphin *Delphinus capensis*	17,530	California		Unknown – seasonal

Table 3-5: Marine Mammal Species Found in Southern California Waters (continued)

Common Name Species Name	Abundance in Southern California (number)	Stock (SAR)	ESA/ MMPA Status	Population Trend
Mesoplodont beaked whales *Mesoplodon spp.*	132	California, Oregon, & Washington		Unknown
Northern right whale dolphin *Lissodelphis borealis*	1,172	California, Oregon, & Washington		No Trend
Pacific white-sided dolphin *Lagenorhynchus obliguidens*	2,196	California, Oregon, & Washington		No Trend
Pantropical spotted dolphin *Stenella attenuate*	Unknown	Eastern Tropical Pacific		Unknown
Pygmy sperm whale *Kogia breviceps*	0	California, Oregon, & Washington		Unknown
Risso's Dolphin *Grampus griseus*	3,418	California, Oregon, & Washington		No Trend
Rough-toothed dolphin *Steno bredanensis*	Unknown	Tropical and warm temperate		Unknown
Short-beaked common dolphin *Delphinus delphis*	165,400	California, Oregon, & Washington		Unknown – seasonal
Short-finned pilot whale *Globicephala macrorhynchus*	118	California, Oregon, & Washington		Unknown
Spinner dolphin *Stenella longirostris*	Unknown	Tropical and warm temperate		Unknown
Striped dolphin *Stenella coeruleoalba*	12,529	California, Oregon, & Washington		No Trend
Harbor seal *Phoca vitulina*	5,271 (All age classes from aerial counts)	California		Stable
Northern elephant seal *Mirounga angustirostris*	SNI 9,794 pups in 2000. SCI up to 16 through 2000	California		Increasing
California sea lion *Zalophus californianus*	All pupping occurs in southern California	U.S. Stock		Increasing 6.1%
Northern fur seal *Callorhinus ursinus*	7,784	San Miguel Island		Increasing 8.3%

Stock or population abundance estimates and the associated correlation of variance (CV) from NMFS Stock Assessment Reports (SAR), their status under the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA), the population trend, and relative abundance in each range area. E=Endangered under the ESA; D = Depleted under the MMPA; and S=Strategic Stock under the MMPA. Due to lack of information, several of the Mesoplodont beaked whales have been grouped together.

Of the 27 species of cetaceans expected to be present in the SOCAL Range Complex areas, only one (bottlenose dolphin) is expected to be regularly present in the CZ (see Table 3-6). Another two species (gray whale, long-beaked common dolphin) are expected to be present in the CZ occasionally, either seasonally for the gray whale, or periodically during foraging or regular movement for long-beaked common dolphin.

After a review of published scientific literature, it was determined that the other 24 cetaceans within Southern California water are more typically open ocean species not normally found in or near the CZ (Forney et al. 1995, Forney and Barlow 1998, Carretta et al. 2000, Soldevilla et al. 2006, Barlow and Forney 2007). Many of these species also have seasonal occurrence within the offshore waters of SOCAL and may not be present during certain times of the year (Forney and Barlow 1998, Barlow and Forney 2007). Because these species are not found in the CZ on a regular or cyclical basis, they are not coastal resources and will not be considered further in this analysis [See 40 C.F.R. § 930.11(b)]. No ESA-listed cetaceans are expected to be present in or near the CZ within the area of the proposed activities.

Pinnipeds

Five species of pinnipeds (northern fur seal, Guadalupe fur seal, California sea lion, Pacific harbor seal, northern elephant seal) may occur in the offshore waters of the SOCAL Range Complex. While all five species may be considered common to occasional in the CZ, only four species potentially use CZ resources within SOCAL Range Complex (California sea lion, Guadalupe fur seal, northern elephant seal, and Pacific harbor seal). The only southern California breeding area for northern fur seals is at San Miguel Island in the northern Channel Islands, which is outside of SOCAL Range Complex; any effects of SOCAL Range Complex activities on this species would be temporary and, due to distance, would not result in effects felt within the Coastal Zone .

Table 3-6: Southern California Marine Mammal Species Occurrences in Coastal Zone

Common Name Species Name	SOCAL Range Complex Occurrence	Seasonal Occurrence		Coastal Zone Occurrence (√)	
		May-Oct (warm)	Nov-Apr (cold)	Resident	Occasional
Gray whale *Eschrichtius robustus*	Transient during seasonal migrations	NO	YES		√
Bottlenose dolphin coastal *Tursiops truncatus*	Limited, small population within one km of shore	YES	YES	√	
Long-beaked common dolphin *Delphinus capensis*	Common; more inshore distribution	YES	YES		√
Harbor seal *Phoca vitulina*	Common; Channel Islands haul-outs including SCI	YES	YES	√	
Northern elephant seal *Mirounga angustirostris*	Common; Channel Island haul-outs of different age classes; including SCI Dec-Mar and Apr-Aug; spend 8-10 months at sea	YES	YES	√	
California sea lion *Zalophus californianus*	Common; most common pinniped, Channel Islands breeding sites in summer	YES	YES	√	
Guadalupe fur seal *Arctocephalus townsendi*	Rare; Occasional visitor to northern Channel Islands; mainly breeds on Guadalupe Is., Mexico, May-Jul	UNK	UNK		√
Southern Sea Otter *Enhydra lutris*	Main distribution at San Nicolas Island on the northern end of the SOCAL Range Complex is translocated population of approximately 29 animals, is experimental population not considered endangered	YES	YES	√ At SNI	

Note: UNK - unknown

The California sea lion (*Zalophus californianus*), is abundant in the Southern California Bight. A small rookery is located on Santa Barbara Island (SBI). Guadalupe Island, just south of the SOCAL OPAREAs, is a major haul-out site (DoN 2005). Large colonies of California sea lions are found on San Nicolas Island (SNI) and San Miguel Island (SMI). Harbor seals (*Phoca vitulina*) and northern elephant seals (*Mirounga angustirostris*) haul out regularly in small numbers, and occasionally pup on SCI. The harbor seal occupies haul-out sites on mainland beaches and all of the Channel Islands, including SBI, Santa Catalina, and SNI (DoN 2005). Small colonies of northern elephant seals breed and haul out on SBI with large colonies on SNI and SMI (DoN 2005). The Guadalupe fur seal (*Arctocephalus townsendi*) also is found, rarely, in the SOCAL OPAREAs. This species is listed as threatened under the ESA, and is considered to be depleted and strategic under the MMPA.

The overall abundance of pinnipeds increased rapidly on the Channel Islands between the end of commercial exploitation in the 1920s and the mid-1980s. The growth rates of populations of some species appear to have declined after the mid-1980s, and some survey data suggested that local populations of some species were declining. The populations may have declined from interspecific competition or from populations exceeding the carrying capacity of the environment (Stewart et al. 1993; Hanan 1996). More recently, most populations are increasing (Carretta et al. 2004). In some cases, seals have recently occupied new rookeries and haul-out areas.

Fissipeds (Southern Sea Otter)

The southern sea otter is listed as threatened under the ESA. Sea otters once ranged throughout the northern Pacific Coastal region, from Russia and Alaska to Mexico (Kenyon 1969). The southern sea otter's current range is restricted to coastal central California, from Point Año Nuevo to south of Point Conception (Orr and Helm 1989; USFWS 1996, 2005), plus a small, trans-located population at SNI.

Sea otters are rarely sighted in SOCAL Range Complex except for the experimental population around San Nicolas Island. Only three sea otter sightings have been reported near SCI (Leatherwood et al. 1978). All of those sightings were about 3 mi (5 km) from SCI during the NMFS/SWFSC 1998–1999 surveys (Carretta et al. 2000). Except for the small SNI population, this species is not expected to be significantly present within the SOCAL Range Complex. Therefore density information cannot meaningfully be calculated, and thus sea otters are not included in subsequent underwater effects modeling. As described in Section 1.2.3, the only activities included in this CD for the Point Mugu Sea Range (PMSR), which includes the area around San Nicolas Island, are the mid frequency active sonar operations conducted during major exercises. Other Navy activities are addressed in a previous CD and associated EIS.

Approach to Analysis of Acoustic Effects

Analytical Framework for Assessing Marine Mammal Response to Sonar

Conceptual Framework

Marine mammals respond to various types of man-made sounds introduced in the ocean environment. Responses are typically subtle, and can include shorter surfacings, shorter dives, fewer blows per surfacing, longer intervals between blows (breaths), ceasing or increasing vocalizations, shortening or lengthening vocalizations, and changing frequency or intensity of vocalizations (NRC 2005). However, it is not known how these responses relate to significant effects (e.g., long-term effects or population consequences) (NRC 2005). Assessing whether a sound may disturb or injure a marine mammal involves understanding the characteristics of the acoustic sources, the marine mammals that may be present in the vicinity of the sound, and the effects that sound may have on the physiology and behavior of those marine mammals. Although it is known that sound is important for marine mammal communication, navigation and foraging (NAS 2003; NRC 2005), there are many unknowns in assessing the effects and significance of marine mammals responses to sound exposures. For this reason, the Navy enlisted the expertise of National Marine Fisheries Service (NMFS) as the cooperating agency. NMFS's input assisted the Navy in developing a conceptual analytical framework for evaluating what sound levels marine mammals might receive as a result of Navy training actions, whether marine mammals might respond to these exposures, and whether that response might have a mode of action on the biology or ecology of marine mammals such that the response should be considered a potential harassment. From this framework of evaluating the potential for harassment incidents to occur, an assessment of whether acoustic sources might impact populations, stocks or species of marine mammals can be conducted.

The conceptual analytical framework (Figure 3-1) presents an overview of how the mid-frequency active sonar sources used during training are assessed to evaluate the potential for marine mammals to be exposed to an acoustic source, the potential for that exposure to result in a physiological effect or behavioral response by an animal.

The first step in the conceptual model is to estimate the potential for marine mammals to be exposed to a Navy acoustic source.

- What action will occur? Identify all acoustic sources that would be used in the exercises and the specific outputs of those sources (this information is provided in Appendix F of the SOCAL Range Complex Draft EIS/OEIS [DoN 2008]).
- Where / when will the action occur? Species occurrence and density data determine the subset of marine mammals that may be present when an acoustic source is operational.
- What underwater acoustic environment will be encountered? The acoustic environment here refers to environmental factors that influence the propagation of underwater sound. Acoustic parameters influenced by the place, season, and time are described in Appendix F of the SOCAL Range Complex Draft EIS/OEIS [DoN 2008]).
- How many marine mammals would be exposed to sound from the acoustic sources? Sound propagation models are used to predict the received exposure level from an acoustic source, and these are coupled with species distribution and density data to estimate the accumulated received energy and sound pressure level that might be received at a level that could be harmful or affect behavior. The acoustic modeling is described in Appendix F of the SOCAL Range Complex Draft EIS/OEIS [DoN 2008]).

The next steps in the analytical framework evaluate whether the sound exposures predicted by the acoustic model might cause a response in a marine mammal, and if that response might injure an animal or affect its behavior. To analyze the potential impacts of sound in the water relative to CCC enforceable policies, categories of physical and behavioral responses of marine mammals to sound must be defined and correlated with quantitative levels of underwater sound. In this CD, the Marine Mammal Protective Act (MMPA) measures of Level A Harassment, which correlates with potential injury, and Level B Harassment, which correlates with behavioral effects, will be used to support this analysis. The MMPA measures of Level A and Level B Harassment are designed to evaluate effects on individual animals, however, so the results of this quantitative analysis must then be generalized to the entire local population of each affected species.

The response assessment portion of the analytical framework examines the following question: Which potential acoustic exposures might result in harassment of marine mammals?

The predicted acoustic exposures are first considered within the context of the species biology (e.g., can a marine mammal detect the sound, and is that mammal likely to respond to that sound?). If a response is predicted, is that response potentially 'harassment' in accordance with the definitions presented above? For example, if a response to the acoustic exposure has a mode of action that results in a consequence for an individual, such as interruption of feeding, that response or repeated occurrence of that response could be a significant alteration of natural behavioral patterns, and therefore would be Level B harassment.

The flow chart below (Figure 3-1) represents the general analytical framework used in applying the thresholds discussed in this section. The flow chart is organized from left to right, and is compartmentalized according to the phenomena that occur within each. These phenomena include:

- the physics of sound propagation (Physics),
- the potential physiological processes associated with sound exposure (Physiology),

- the potential behavioral processes that might be affected as a function of sound exposure (Behavior), and
- the immediate effects these changes may have on functions the animal is engaged in at the time of exposure (Life Function – Proximate).

These compartmentalized effects are extended to longer-term life functions and into population-level and species-level effects. In the flow chart, dotted and solid lines connect related events. Solid lines designate those effects that "will" happen; dotted lines designate those that "might" happen but must be considered (including those hypothesized to occur but for which there is no direct evidence).

Some boxes on the flow chart are colored according to how they relate to the definitions of harassment. Red boxes correspond to events that are injurious (Level A harassment). Yellow boxes correspond to events that qualify as Level B harassment; the onset of TTS is Level B harassment. Boxes that are shaded from red to yellow have the potential for injury and behavioral disturbance. The analytical framework outlined in the flow chart acknowledges that physiological responses must always precede behavioral responses (i.e., there can be no behavioral response without first some physiological effect of the sound). Each functional block only occurs once, and all relevant inputs and outputs flow to or from a single instance.

Physiology

Potential auditory effects are assessed by considering the characteristics of the received sound (e.g., amplitude, frequency, duration) and the sensitivity of the exposed animals. Some of these assessments are numerical (e.g., TTS, permanent threshold shift [PTS], perception). Others are necessarily qualitative, due to lack of information, or will need to be extrapolated from other species for which information exists. Potential physiological responses to sound are ranked in descending order, with the most severe impact (auditory trauma) at the top and the least severe impact at the bottom (the sound is not perceived).

- Auditory trauma represents direct mechanical injury to auditory structures, including tympanic membrane rupture, disarticulation of the middle ear ossicles, and trauma to the inner ear structures. Auditory trauma is always injurious but could be temporary and not result in PTS. Auditory trauma is always assumed to result in a stress response.
- Sounds with sufficient amplitude and duration to be distinguished from background ambient noise are considered to be perceived. This category includes sounds from the threshold of audibility through the normal dynamic range of hearing. To determine whether an animal perceives the sound, the received level, frequency, and duration of the sound are compared to what is known of the species' hearing sensitivity.

Audible sounds may interfere with an animal's ability to detect other sounds at the same time, so perceived sounds can cause auditory masking. Unlike auditory fatigue, which always results in a stress response, masking may or may not result in a stress response, depending on the degree and duration of the masking effect. Masking may also cause an animal's ability to detect other sounds to be compromised without the animal's knowledge. This could result in sensory impairment and subsequent behavior change; in this case, the change in behavior is the *lack of a response* that would normally be made if sensory impairment did not occur. For this reason, masking also may lead directly to behavior change without first causing a stress response.

The features of perceived sound (e.g., amplitude, duration, temporal pattern) are also used to judge whether the sound exposure is capable of producing a stress response. Factors to consider in this decision include the probability of the animal being naïve or experienced with the sound (i.e., what are the known/unknown consequences of the exposure).

Potential impacts on tissues other than those of the auditory system are assessed by considering the characteristics of the sound (e.g., amplitude, frequency, duration) and the known or estimated response characteristics of non auditory tissues. Some of these assessments can be numerical (e.g., exposure required for rectified diffusion). Others will be necessarily qualitative, due to lack of information. Each of the potential responses may or may not result in a stress response.

- Direct tissue effects – Direct tissue responses to sound stimulation may range from tissue shearing (injury) to mechanical vibration with no resulting injury. Any tissue injury would produce a stress response, whereas non-injurious stimulation may or may not.

Indirect tissue effects – Based on the amplitude, frequency, and duration of the sound, it must be assessed whether exposure is sufficient to indirectly affect tissues. The probability of any other indirect tissue effect will necessarily be based on what is known about the specific process involved. No tissue effects – the received sound is insufficient to cause either direct mechanical or indirect effects on tissues. No stress response occurs.

Stress Response

The acoustic source is considered a potential stressor if, by its action on the animal, via auditory or non auditory means, it may produce a stress response in the animal. With respect to the later discussions of allostasis and allostatic loading, stress response will mean an increase in energy expenditures that result from exposure to the stressor, and which are characterized by either the stimulation of the sympathetic nervous system (SNS) or the hypothalamic-pituitary-adrenal (HPA) axis (Reeder and Kramer 2005). The SNS response to a stressor is immediate and acute, and results in a release of specific hormones. These hormones elevate heart and respiration rates, increase awareness, and increase the availability of glucose and lipids. The HPA response is ultimately defined by increases in secretion of glucocorticoid steroid hormones, predominantly cortisol in mammals. The amount of this increase above baseline may indicate the overall severity of a stress response (Hennessy et al. 1979).

The presence and magnitude of a stress response in an animal depends on several factors, such as the animal's life history stage, environmental conditions, reproductive or developmental state, and experience with the stressor. These factors will be subject to individual variation, and will also vary within an individual over time.

The stress response may or may not result in a behavioral change, depending on the characteristics of the exposed animal. However, if a stress response occurs, then a contribution is made to the animal's allostatic load. Allostasis is the ability of an animal to maintain stability through change by adjusting its physiology in response to predictable or unpredictable events (McEwen and Wingfield 2003). The hormones associated with the stress response vary naturally over an animal's life, supporting particular life events (e.g., pregnancy) and predictable environmental conditions (e.g., seasonal changes). The allostatic load is the cumulative cost of allostasis to an animal, and is characterized by an animal's energetic expenditures. Perturbations in an animal that may occur with the presence of a stressor, either biological (e.g., predator) or anthropogenic (e.g., construction), can contribute to the allostatic load (McEwen and Wingfield 2003). Additional costs are cumulative, and additions to the allostatic load over time may reduce the probability of achieving ultimate life history functions (e.g., survival, maturation, reproductive effort, and success) by producing pathophysiological states. The contribution to the allostatic load from a stressor requires estimating the magnitude and duration of the stress response, as well as any secondary contributions that might result from a change in behavior.

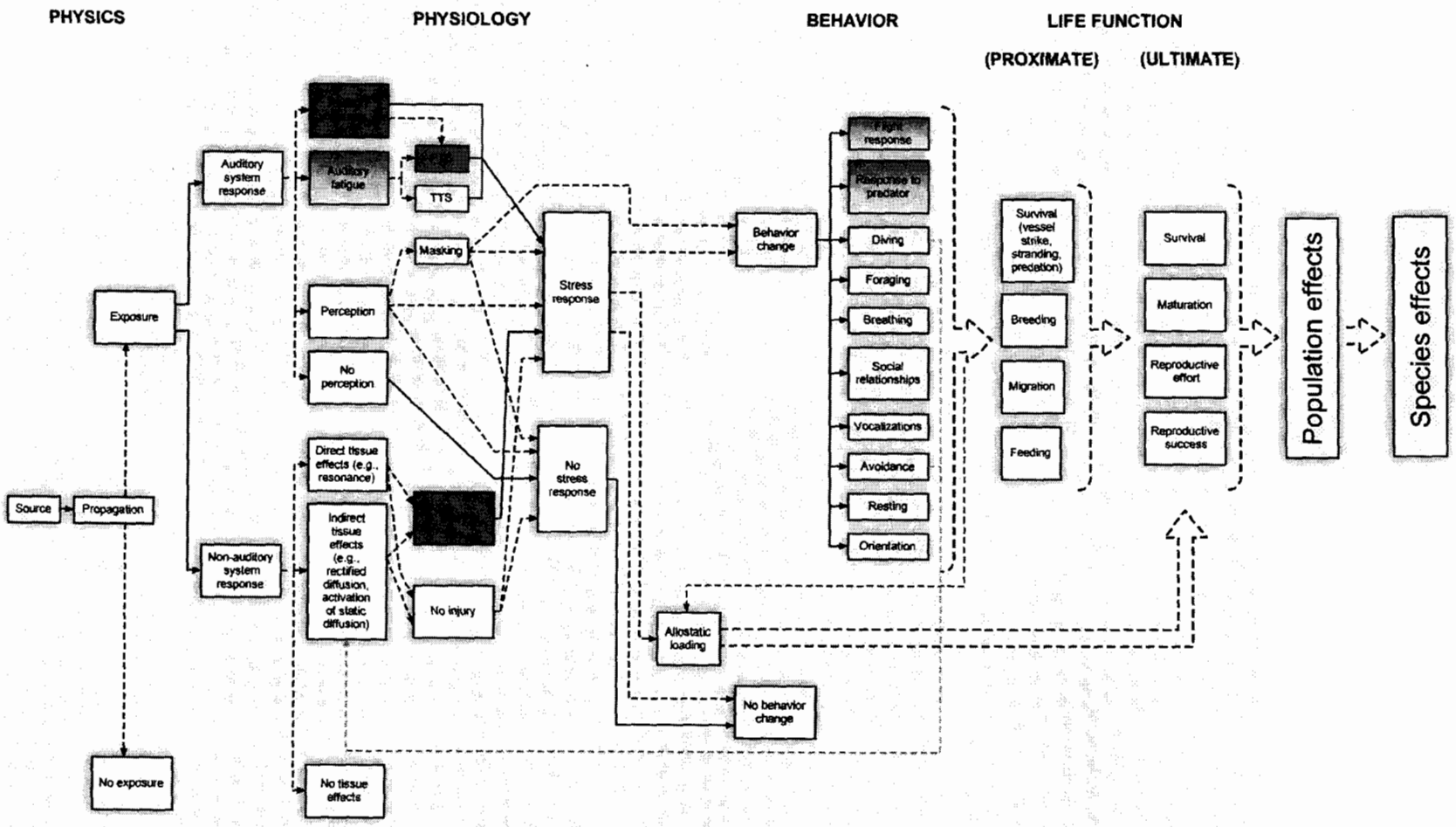


Figure 3-1: Conceptual Model for Assessing Effects of MFA Sonar Exposures on Marine Mammals.

If the acoustic source does not produce tissue effects, is not perceived by the animal, or does not produce a stress response by any other means, then the exposure does not contribute to the allostatic load. Additionally, without a stress response or auditory masking, there can be no behavioral change. Conversely, any immediate effect of exposure that produces an injury is assumed to also produce a stress response and contribute to the allostatic load.

Behavior

Acute stress responses may or may not cause a behavioral reaction. However, all changes in behavior are expected to result from an acute stress response. Some sort of physiological trigger must exist to change any behavior that is already being performed. The exception to this rule is masking. The presence of a masking sound may not produce a stress response, but may interfere with the animal's ability to detect and discriminate biologically relevant signals. The inability to detect and discriminate biologically relevant signals hinders the potential for normal behavioral responses to auditory cues and is thus considered a behavioral change.

Numerous behavioral changes can result from a stress response. For each potential behavioral change, the magnitude of the change and the severity of the response need to be estimated. Conditions such as stampeding (flight response) or fleeing a predator might result in injury. Such an event would be considered a Level A harassment. Each altered behavior may also disrupt biologically significant events (e.g., breeding or nursing), and may be a Level B harassment. All behavioral disruptions can contribute to the allostatic load. This secondary potential is signified by the feedback from the collective behaviors to allostatic loading.

Special considerations are given to the potential for avoidance and disrupted diving patterns. Due to past incidents of beaked whale strandings associated with sonar operations, feedback paths are provided between avoidance and diving and indirect tissue effects. This feedback accounts for the hypothesis that variations in diving behavior or avoidance responses can result in nitrogen tissue supersaturation and nitrogen off-gassing, and possibly deleterious vascular bubble formation. Although hypothetical, this hypothesis is currently popular and hotly debated.

Life Function

PROXIMATE LIFE FUNCTIONS. Proximate life history functions are the functions that the animal is engaged in at the time of acoustic exposure. The disruption of these functions, and the magnitude of the disruption, is something that must be considered in determining how the ultimate life history functions are affected. Consideration of the magnitude of the effect to each of the proximate life history functions is dependent upon the life stage of the animal.

ULTIMATE LIFE FUNCTIONS. Ultimate life functions enable an animal to contribute to the population (or stock, or species, etc.). The impact on ultimate life functions will depend on the nature and magnitude of the perturbation to proximate life history functions. Depending on the severity of the response to the stressor, acute perturbations may have nominal to profound impacts on ultimate life functions. Assessment of the magnitude of the stress response from the chronic perturbation would require an understanding of how and whether animals acclimate to a specific, repeated stressor and whether chronic elevations in the stress response (e.g., cortisol levels) produce fitness deficits.

The proximate life functions are loosely ordered in decreasing severity of impact. Mortality (survival) has an immediate effect, in that no future reproductive success is feasible and there is no further addition to the population resulting from reproduction. Severe injuries may also lead to reduced survivorship (longevity) and prolonged alterations in behavior. The latter may further affect an animal's overall reproductive success and reproductive effort. Disruptions of breeding have an immediate impact on reproductive effort and may impact reproductive success. The magnitude of the effect will depend on the duration of the disruption and the type of behavior change that was provoked. Disruptions to feeding and migration can affect all of the ultimate life

functions; however, the impacts to reproductive effort and success are not likely to be as severe or immediate as those incurred by mortality and breeding disruptions.

Physiological Effects

TTS in Marine Mammals

A number of investigators have measured TTS in marine mammals. These studies measured hearing thresholds in trained marine mammals before and after exposure to intense sounds. Some of the more important data obtained from these studies are onset-TTS levels – exposure levels sufficient to cause a just-measurable amount of TTS, often defined as 6 dB of TTS (for example, Schlundt et al. 2000). The existing cetacean and pinniped TTS data for underwater exposure are summarized in Appendix F of the SOCAL Range Complex Draft EIS/OEIS [DoN 2008]). The existing TTS data show that, for the species studied and sounds (non- impulsive) of interest, the following is true:

- The growth and recovery of TTS are analogous to those in land mammals. Marine mammal TSs depend on the amplitude, duration, frequency content, and temporal pattern of the sound exposure. Threshold shifts will generally increase with the amplitude and duration of sound exposure. For continuous sounds, exposures of equal energy will lead to approximately equal effects (Ward 1997). For intermittent sounds, less TS will occur than from a continuous exposure with the same energy (Kryter et al. 1965; Ward 1997).
- SPL is not a good predictor of onset-TTS; TTS depends on both SPL and duration.
- Exposure Level (EL) is correlated with the amount of TTS, and is a good predictor for onset-TTS for single, continuous exposures with different durations.
- An energy flux density level of 195 dB re 1 μPa^2-s is the most appropriate predictor for onset-TTS from a single, continuous exposure.

Relationship Between TTS and PTS

Marine mammal PTS data do not exist, so onset-PTS levels for these animals are estimated from TTS data and relationships between TTS and PTS. Much of the early human TTS work was directed at relating TTS after 8 hours of sound exposure to PTS after years of daily exposures (e.g., Kryter et al. 1966). It is now known that susceptibility to PTS cannot be reliably predicted from TTS measurements, but TTS data do provide insight into the amount of TS that may be induced with no PTS. Experimental studies of the growth of TTS may also be used to relate changes in exposure level to changes in the amount of TTS induced. Onset-PTS exposure levels may therefore be predicted by:

- Estimating the largest amount of TTS that may be induced without PTS. Exposures causing a TS greater than this value are assumed to cause PTS.
- Estimating the additional exposure, above the onset-TTS exposure, necessary to reach the maximum allowable amount of TTS that, again, may be induced without PTS.

Experimentally induced TTSs, from short-duration sounds (1-8 seconds) in the range of 3.5-20 kHz, in marine mammals have generally been limited to around 2 to 10 dB, well below TSs that result in some PTS. Experiments with terrestrial mammals have used much larger TSs and provide more guidance on how high a TS may rise before some PTS results. Early human TTS studies reported complete recovery of TTSs as high as 50 dB after exposure to broadband sound (Ward 1960; Ward et al. 1958, 1959). These data indicate that TSs up to 40 to 50 dB may be induced without PTS, and that 40 dB is a reasonable upper limit for TS to prevent PTS.

The small amounts of TTS produced in marine mammal studies also limit the applicability of these data to estimates of the growth rate of TTS. Fortunately, data do exist for the growth of

TTS in terrestrial mammals. For moderate exposure durations (a few minutes to hours), TTS2 (TTS measured 2 minutes after exposure) varies with the logarithm of exposure time (Ward et al. 1958, 1959; Quaranta et al. 1998). For shorter exposure durations, the growth of TTS with exposure time appears to be less rapid (Miller 1974; Keeler 1976). For very long-duration exposures, increasing the exposure time may not produce any additional TTS.

Ward et al. (1958, 1959) provided detailed information on the growth of TTS in humans. Ward et al. presented the amount of TTS measured after exposure to specific SPLs and durations of broadband sound. Since the relationships among EL, SPL, and duration are known, these data could be presented in terms of the amount of TTS produced by exposures with different ELs.

An estimate of 1.6 dB TTS2 per dB increase in exposure EL is the upper range of values from Ward et al. (1958, 1959), and gives the most conservative estimate – it predicts a larger amount of TTS from the same exposure compared to the lines with smaller slopes. The difference between onset-TTS (6 dB) and the upper limit of TTS before PTS (40 dB) is 34 dB. To move from onset-TTS to onset-PTS, therefore, requires an increase in EL of 34 dB divided by 1.6 dB/dB, or approximately 21 dB. An estimate of 20 dB between exposures sufficient to cause onset-TTS and those capable of causing onset-PTS is a reasonable approximation.

To summarize:

- In the absence of marine mammal PTS data, onset-PTS exposure levels may be estimated from marine mammal TTS data and PTS/TTS relationships observed in terrestrial mammals. This involves:
    - Estimating the largest amount of TTS that may be induced without PTS. Exposures causing a TS greater than this value are assumed to cause PTS.
    - Estimating the growth rate of TTS – how much additional TTS is produced by an increase in exposure level.
- A variety of terrestrial mammal data sources point at 40 dB as a reasonable estimate of the largest amount of TS that may be induced without PTS. A conservative estimate is that continuous-type exposures producing TSs of 40 dB or more always result in some PTS.
- Data from Ward et al. (1958, 1959) reveal a linear relationship between TTS2 and exposure EL. A value of 1.6 dB TTS2 per dB increase in EL is a conservative estimate of how much additional TTS is produced by an increase in exposure level for continuous- type sounds.
- There is a 34 dB TS difference between onset-TTS (6 dB) and onset-PTS (40 dB). The additional exposure above onset-TTS required to reach PTS is 34 dB divided by 1.6 dB/dB, or approximately 21 dB.

Exposures with ELs 20 dB above those producing TTS may be assumed to produce a PTS. This number is used as a conservative simplification of the 21 dB number derived above.

Use of Exposure Levels to Determine Physiological Effects

Effect thresholds are expressed in terms of total received EL. Energy flux density (EFD) is a measure of the flow of sound energy through an area. Marine and terrestrial mammal data show that, for continuous-type sounds of interest, TTS and PTS are more closely related to the energy in the sound exposure than to the exposure SPL.

The EL for each individual ping is calculated from the following equation:

$$EL = SPL + 10log10(duration)$$

The EL includes both the ping SPL and duration. Longer-duration pings and/or higher-SPL pings will have a higher EL.

If an animal is exposed to multiple pings, the energy flux density in each individual ping is summed to calculate the total EL. Since mammalian TS data show less effect from intermittent exposures compared to continuous exposures with the same energy (Ward 1997), basing the effect thresholds on the total received EL is a conservative approach for treating multiple pings; in reality, some recovery will occur between pings and lessen the effect of a particular exposure. Therefore, estimates are conservative because recovery is not taken into account – intermittent exposures are considered comparable to continuous exposures.

The total EL depends on the SPL, duration, and number of pings received. The TTS and PTS thresholds do not imply any specific SPL, duration, or number of pings. The SPL and duration of each received ping are used to calculate the total EL and determine whether the received EL meets or exceeds the effect thresholds.

Cetaceans predicted to receive a sound exposure with EL of 215 dB re 1 μPa^2-s or greater are assumed to experience PTS and are counted as Level A harassment. Cetaceans predicted to receive a sound exposure with EL greater than or equal to 195 dB re 1 μPa^2-s but less than 215 dB re 1 μPa^2-s are assumed to experience TTS and are counted as Level B harassment.

Unlike cetaceans, the TTS and PTS thresholds used for pinnipeds vary with species. Otariids have thresholds of 206 dB re 1 μPa^2-s for TTS and 226 dB re 1 μPa^2-s for PTS. Northern elephant seals are similar to otariids (TTS = 204 dB re 1 μPa^2-s, PTS = 224 dB re 1 μPa^2-s) but are lower for harbor seals (TTS = 183 dB re 1 μPa^2-s, PTS = 203 dB re 1 μPa^2-s).

Summary of Physiological Effects Thresholds

PTS and TTS are the criteria for physiological effects resulting in injury (Level A harassment) and disturbance (Level B harassment), respectively. Sound exposure thresholds for TTS and PTS are 195 dB re 1 μPa^2-s received EL for TTS and 215 dB re 1 μPa^2-s received EL for PTS. The TTS threshold is primarily based on cetacean TTS data from Schlundt et al. (2000). Since these tests used short-duration tones similar to sonar pings, they are the most directly relevant data. The PTS threshold is based on a 20-dB increase in exposure EL over that required for onset-TTS. The 20-dB value is based on extrapolations from terrestrial mammal data indicating that PTS occurs at 40 dB or more of TS, and that TS growth occurring at a rate of approximately 1.6 dB/dB increase in exposure EL.

Table 3-7 Physiological Effects Thresholds for TTS and PTS: Cetaceans and Pinnipeds

Physiological Effects			
Animal	**Criteria**	**Threshold (re 1μPa^2-s)**	**MMPA Effect**
Cetacean	TTS	195	Level B Harassment
	PTS	215	Level A Harassment
Pinnipeds			
Northern Elephant Seal	TTS	204	Level B Harassment
	PTS	224	Level A Harassment
Pacific Harbor Seal	TTS	183	Level B Harassment
	PTS	203	Level A Harassment
California Sea Lion	TTS	206	Level B Harassment
	PTS	226	Level A Harassment
Guadalupe Fur Seal	TTS	226	Level B Harassment
	PTS	206	Level A Harassment
Northern Fur Seal	TTS	206	Level B Harassment
	PTS	226	Level A Harassment

Behavioral Effects

Based on available evidence, marine animals may exhibit any of a suite of potential behavioral responses or combinations of behavioral responses upon exposure to sonar transmissions. Potential behavioral responses include, but are not limited to: avoiding exposure or continued exposure; behavioral disturbance (including distress or disruption of social or foraging activity); habituation to the sound; becoming sensitized to the sound; or not responding to the sound.

Existing studies of behavioral effects of human-made sounds in marine environments remain inconclusive, partly because many of those studies have lacked adequate controls, applied only to certain kinds of exposures (which are often different from the exposures being analyzed in the study), and had limited ability to detect behavioral changes that may be significant to the biology of the animals that were being observed. These studies are further complicated by the wide variety of behavioral responses that marine mammals exhibit, and the fact that those responses can vary significantly by species, individuals, and the context of an exposure. In some circumstances, some individuals will continue normal behavioral activities in the presence of high levels of human-made noise. In other circumstances, the same individual or other individuals may avoid an acoustic source at much lower received levels (Richardson et al. 1995; Wartzok et al. 2003). These differences within and between individuals appear to result from a complex interaction of experience, motivation, and learning that are difficult to quantify and predict.

NMFS and other commentators recommended an alternate methodology to evaluate when sound exposures might result in behavioral effects without corresponding physiological effects. Therefore, the Navy and NMFS have developed the Risk-Function approach to estimate potential behavioral effects from mid frequency active sonar. The behavioral response exposures presented below were estimated using the risk function methodology described below.

Development of the Risk Function

The Navy and NMFS developed a dose methodology to assess the probability of Level B behavioral harassment from the effects of MFA and high-frequency active (HFA) sonar on marine mammals. NMFS presented two methodologies to six scientists (marine mammalogists and acousticians from within and outside the federal government) for an independent review (NMFS 2008). Two scientists, including one from the NMFS Office of Science and Technology, then synthesized the reviews from the six scientists and developed a recommendation.

One of the methods was a normal curve fit to a "mean of means" calculated from the mean of: (1) the mean of the lowest received levels from the 3 kHz data that the Navy classified as altered behavior from Finneran and Schlundt (2004); (2) the estimated mean received level produced by the reconstruction of the USS SHOUP event of May 2003 in which killer whales were exposed to MFA sonar (DoN 2004); and (3) the mean of the five maximum received levels at which Nowacek et al. (2004) observed significantly different responses of right whales to an alert stimuli.

The second method was a derivation of a mathematical function used for assessing the percentage of a marine mammal population experiencing the risk of harassment under the MMPA associated with the Navy's use of the Surveillance Towed Array Sensor System Low-Frequency Active (SURTASS LFA) sonar (DoN 2001). This function is appropriate for instances with limited data (Feller 1968), and this method is subsequently identified as "the risk function" in this document.

NMFS decided to use the risk function and applicable input parameters to estimate the risk of behavioral harassment associated with exposure to MFA sonar. This determination was based on the recommendation of the two NMFS scientists, consideration of the independent reviews from six scientists, and NMFS MMPA regulations affecting the Navy's use of SURTASS LFA sonar (Federal Register [FR] 67:48145-48154, 2002; FR 72: 46846-46893, 2007).

Applying the Risk Function Methodology

To assess the potential effects on marine mammals associated with active sonar used during training activities, the Navy and NMFS investigated mathematical models and methods that estimate the number of times individuals of the different species of marine mammals might be exposed to MFA sonar at different received levels. The Navy effects analyses assumed that the potential consequences of exposure to MFA sonar on individual animals would be a function of the received sound pressure level (decibels re 1 micropascal [dB re 1 μPa]). These analyses assume that MFA sonar poses no risk, that is, does not constitute harassment to marine mammals if they are exposed to sound pressure levels from the MFA sonar below a certain basement value.

The second step of the assessment procedure required the Navy and NMFS to identify how marine mammals are likely to respond when they are exposed to active sonar. Marine mammals can experience a variety of responses to sound including sensory impairment (permanent and temporary threshold shifts and acoustic masking), physiological responses (particular stress responses), behavioral responses, social responses that might result in reducing the fitness of individual marine mammals and social responses that would not result in reducing the fitness of individual marine mammals.

Previously, the Navy and NMFS used acoustic thresholds to identify the number of marine mammals that might experience hearing losses (temporary or permanent) or behavioral harassment upon being exposed to MFA sonar. These acoustic thresholds were represented by either sound exposure level (related to sound energy, abbreviated as SEL), sound pressure level (SPL), or other metrics, such as peak pressure level and acoustic impulse. The general approach was to apply these threshold functions so that a marine mammal is counted as behaviorally harassed or experiencing hearing loss when exposed to received sound levels above a certain threshold, and not counted as behaviorally harassed or experiencing hearing loss when exposed to received levels below that threshold. The left panel in Figure 3-2 illustrates a typical step-function or threshold that might relate a sonar exposure to the probability of a response. As this figure illustrates, past Navy/NMFS acoustic thresholds assumed that every marine mammal above a particular received level would exhibit identical responses to a sonar exposure. The responses of marine mammals were assumed not to be affected by differences in acoustic conditions; differences between species and populations: differences in gender, age, reproductive status, or social behavior; or the prior experience of the individuals.

In this figure, for the typical step function (left panel) the probability of a response is depicted on the y-axis and received exposure on the x-axis. The right panel illustrates a typical risk continuum-function using the same axes.

The Navy and NMFS agree that the studies of marine mammals in the wild and in experimental settings do not support these assumptions—different species of marine mammals and different individuals of the same species respond differently to sonar exposure. Additionally, there are specific geographic/bathymetric conditions that dictate the response of marine mammals to sonar that suggest that different populations may respond differently to sonar exposure. Further, studies of animal physiology suggest that gender, age, reproductive status, and social behavior, among other variables, probably affect how marine mammals respond to sonar exposures (Wartzok et al. 2003; Southall et al. 2007).

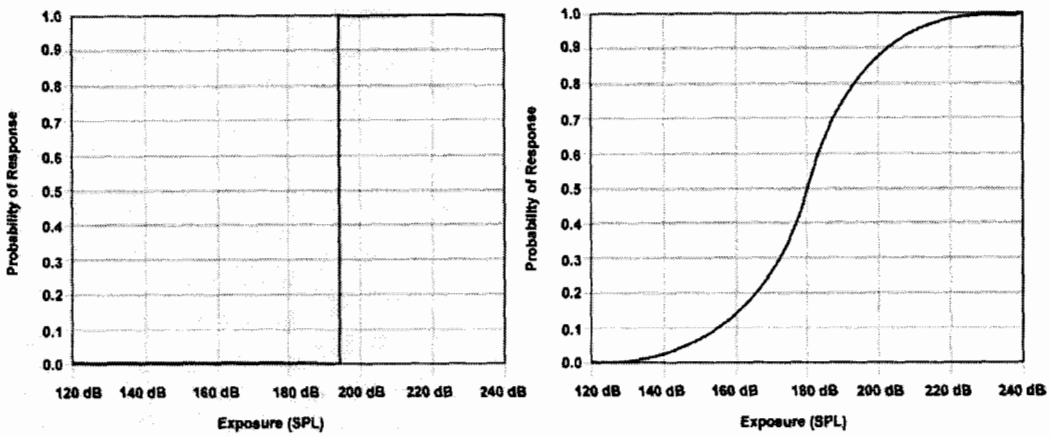


Figure 3-2: Typical step function (left) and typical risk continuum-function (right).

Over the past several years, the Navy and NMFS have developed an MFA sonar acoustic risk function to replace the acoustic thresholds used in the past to estimate the probability of marine mammals being behaviorally harassed by received levels of MFA sonar. The Navy and NMFS will continue to use acoustic thresholds to estimate temporary or permanent threshold shifts using SEL as the appropriate metric. Unlike acoustic thresholds, acoustic risk continuum functions assume that the probability of a response depends first on the "dose" (in this case, the received level of sound), and that the probability of a response increases as the "dose" increases. The probabilities associated with acoustic risk functions do not represent an individual's probability of responding. Rather, the probabilities identify the proportion of an exposed population that is likely to respond to an exposure.

The right panel in Figure 3-2 illustrates a typical acoustic risk function that might relate an exposure to the probability of a response. As the exposure receive level increases, the probability of a response increases as well, but the relationship between an exposure and a response is "linear" only in the center of the curve. In the "tails" of an acoustic risk function curve, unit increases in exposure produce smaller increases in the probability of a response. Based on observations of various animals, including humans, the relationship represented by an acoustic risk function is a more robust predictor of the probable behavioral responses of marine mammals to sonar and other acoustic sources.

The Navy and NMFS previously used the acoustic risk function to estimate the probable responses of marine mammals to acoustic exposures for other training and research programs. Examples include the Navy Final EISs on the SURTASS LFA sonar (DoN 2001); the North Pacific Acoustic Laboratory experiments conducted off the Island of Kauai (Office of Naval Research 2001), and the Supplemental EIS for SURTASS LFA sonar (DoN 2007a).

The Navy and NMFS used two metrics to estimate the number of marine mammals that could be subject to Level B harassment (behavioral harassment and TTS) during training exercises. The agencies used acoustic risk functions with the metric of received SPL (dB re 1 μPa) to estimate the number of marine mammals that might be at risk for Level B behavioral harassment as a result of being exposed to MFA sonar. The agencies will continue to use acoustic thresholds ("step-functions") with the metric of SEL (dB re 1 μPa^2-s) to estimate the number of marine mammals that might be "taken" through sensory impairment (i.e., Level A – PTS and Level B – TTS) as a result of being exposed to MFA sonar.

The particular acoustic risk function developed by the Navy and NMFS estimates the probability of behavioral responses that NMFS would classify as harassment, given exposure to specific

received levels of MFA sonar. The mathematical function is derived from a solution in Feller (1968) as defined in the SURTASS LFA Sonar Final OEIS/EIS (DoN 2001), and relied on in the Supplemental SURTASS LFA Sonar EIS (DoN 2007a) for the probability of MFA sonar risk for Level B behavioral harassment with input parameters modified by NMFS for MFA sonar for mysticetes, odontocetes, and pinnipeds.

To represent a probability of risk, the function should have a value near zero at very low exposures, and a value near one for very high exposures. One class of functions that satisfies this criterion is cumulative probability distributions, a type of cumulative distribution function. In selecting a particular functional expression for risk, several criteria were identified:

- The function must use parameters to focus discussion on areas of uncertainty;
- The function should contain a limited number of parameters;
- The function should be capable of accurately fitting experimental data; and
- The function should be reasonably convenient for algebraic manipulations.

As described in U.S. Department of the Navy (2001), the mathematical function below is adapted from a solution in Feller (1968).

$$R = \frac{1 - \left(\frac{L-B}{K}\right)^{-A}}{1 - \left(\frac{L-B}{K}\right)^{-2A}}$$

Where: R = risk (0 – 1.0);

L = Received Level (RL) in dB;

B = basement RL in dB; (120 dB);

K = the RL increment above basement in dB at which there is 50 percent risk;

A = risk transition sharpness parameter (10) (explained in 3.1.5.3).

To use this function, the values of the three parameters (B, K, and A) need to be established. The values used in this CD analysis are based on three sources of data: TTS experiments conducted at SSC and documented in Finneran, et al. (2001, 2003, and 2005; Finneran and Schlundt, 2004); reconstruction of sound fields produced by the USS SHOUP associated with the behavioral responses of killer whales observed in Haro Strait and documented in Department of Commerce NMFS (2005); DoN (2004); and Fromm (2004a, 2004b); and observations of the behavioral response of North Atlantic right whales exposed to alert stimuli containing mid-frequency components documented in Nowacek et al. (2004). The input parameters, as defined by NMFS, are based on very limited data that represent the best available science at this time. These data sources are described in detail in Appendix F of the SOCAL Range Complex Draft EIS/OEIS [DoN 2008]).

Input Parameters for the Risk Function

The values of B, K, and A need to be specified to use the risk function. The risk continuum function approximates the dose-response function in a manner analogous to pharmacological risk assessment (DoN 2001). In this case, the risk function is combined with the distribution of sound exposure levels to estimate aggregate impact on an exposed population.

BASEMENT VALUE FOR RISK—THE B PARAMETER. The B parameter defines the basement value for risk, below which the risk is so low that calculations are impractical. This

120 dB level is taken as the estimate received level (RL) below which the risk of significant change in a biologically important behavior approaches zero for the MFA sonar risk assessment. This level is based on a broad overview of the levels at which multiple species have been reported responding to a variety of sound sources, both mid-frequency and other, was recommended by the scientists, and has been used in other publications. The Navy recognizes that for actual risk of changes in behavior to be zero, the signal-to-noise ratio of the animal must also be zero. However, the present convention of ending the risk calculation at 120 dB for MFA sonar has a negligible impact on the subsequent calculations, because the risk function does not attain appreciable values at received levels that low.

THE K PARAMETER. NMFS and the Navy used the mean of the following values to define the midpoint of the function: (1) the mean of the lowest received levels (185.3 dB) at which individuals responded with altered behavior to 3 kHz tones in the SSC data set; (2) the estimated mean received level value of 169.3 dB produced by the reconstruction of the USS SHOUP incident in which killer whales exposed to MFA sonar (range modeled possible received levels: 150 to 180 dB); and (3) the mean of the 5 maximum received levels at which Nowacek et al. (2004) observed significantly altered responses of right whales to the alert stimuli than to the control (no input signal) is 139.2 dB SPL. The arithmetic mean of these three mean values is 165 dB SPL. The value of K is the difference between the value of B (120 dB SPL) and the 50 percent value of 165 dB SPL; therefore, K=45.

RISK TRANSITION—THE A PARAMETER. The A parameter controls how rapidly risk transitions from low to high values with increasing receive level. As A increases, the slope of the risk function increases. For very large values of A, the risk function can approximate a threshold response or step function. NMFS has recommended that Navy use A=10 as the value for odontocetes, and pinnipeds (Figure 3-3) (NMFS 2008). This is the same value of A that was used for the SURTASS LFA sonar analysis. As stated in the SURTASS LFA Sonar Final OEIS/EIS (DoN 2001), the value of A=10 produces a curve that has a more gradual transition than the curves developed by the analyses of migratory gray whale studies (Malme et al. 1984). The choice of a more gradual slope than the empirical data was consistent with other decisions for the SURTASS LFA Sonar Final OEIS/EIS to make conservative assumptions when extrapolating from other data sets (see Subchapter 1.43 and Appendix D of the SURTASS LFA Sonar EIS [NMFS 2008]).

Based on NMFS' direction, the Navy used a value of A=8 for mysticetes to allow for greater consideration of potential harassment at the lower received levels based on Nowacek et al., 2004 (Figure 3-4) (NMFS 2008).

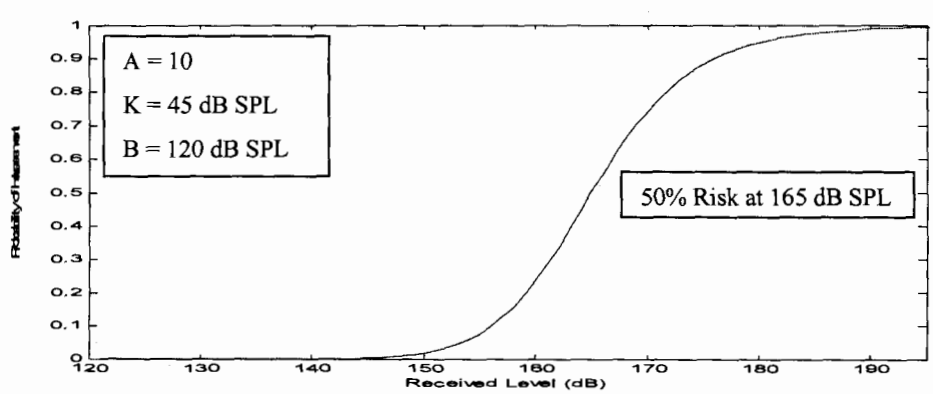


Figure 3-3: Risk Function Curve for Odontocetes (Toothed Whales) and Pinnipeds

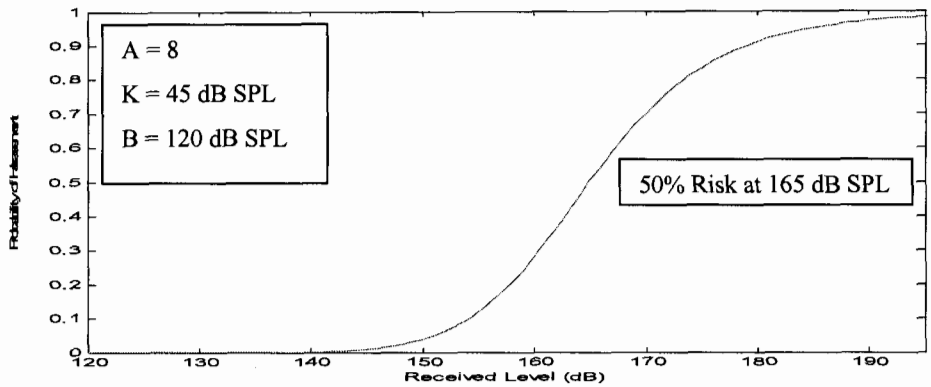


Figure 3-4: Risk Function Curve for Mysticetes (Baleen Whales)

Application of the Risk Function

The risk function is used to estimate the percentage of an exposed population that is likely to exhibit behaviors that would qualify as harassment at a given received level of sound. For example, at 165 dB SPL (dB re: 1μPa rms), the risk (or probability) of harassment is defined according to this function as 50 percent, and Navy/NMFS applies that by estimating that 50 percent of the individuals exposed at that received level are likely to respond by exhibiting behavior that NMFS would classify as behavioral harassment. The risk function is not applied to individual animals, only to exposed populations.

The data used to produce the risk function were compiled from four species that had been exposed to sound sources in a variety of different circumstances. As a result, the risk function represents a general relationship between acoustic exposures and behavioral responses that is then applied to specific circumstances. That is, the risk function represents a relationship that is deemed to be generally true, based on the limited, best-available science, but may not be true in specific circumstances. In particular, the risk function, as currently derived, treats the received level as the only variable that is relevant to a marine mammal's behavioral response. However, we know that many other variables—the marine mammal's gender, age, and prior experience; the activity it is engaged in during an exposure event, its distance from a sound source, the number of sound sources, and whether the sound sources are approaching or moving away from the animal—can be critically important in determining whether and how a marine mammal will respond to a sound source (Southall et al. 2007). The data that are currently available do not allow for incorporation of these other variables in the current risk functions; however, the risk function represents the best use of the data that are available.

As more specific and applicable data become available, the Navy can use these data to modify the outputs generated by the risk function to make them more realistic. If data become available that suggest animals are less likely to respond to certain levels beyond certain distances, or that they are more likely to respond at certain closer distances, the Navy will re-evaluate the risk function to incorporate any additional variables into the "take" estimates.

The Navy and NMFS would expect an animal exposed to the levels at the bottom of the risk function to exhibit behavioral responses that are less likely to adversely affect the longevity, survival, or reproductive success of the animals that might be exposed, based on received level, and the fact that the exposures will occur in the absence of some of the other contextual variables that would likely be associated with increased severity of effects, such as the proximity of the sound source(s) or the proximity of other vessels, aircraft, submarines, etc. maneuvering in the vicinity of the exercise. NMFS will consider all available information (other variables, etc.), but

all else being equal, takes that result from exposure to lower received levels and at greater distances from the exercises would be less likely to contribute to population level effects.

Navy Protocols for Acoustic Modeling Analysis of Marine Mammal Exposures

For this CD, the acoustic modeling results include additional analysis to account for the model's overestimation of potential effects. The model overestimated effects because:

- Acoustic footprints for sonar sources near land are not reduced to account for the land mass where marine mammals would not occur.
- Acoustic footprints for sonar sources were added independently and, therefore, did not account for overlap they would have with other sonar systems used during the same active sonar activity. As a consequence, the area of the total acoustic footprint was larger than the actual acoustic footprint when multiple ships are operating together.
- Acoustic exposures do not reflect implementation of mitigation measures, such as reducing sonar source levels when marine mammals are present.
- Marine mammal densities were averaged across specific active sonar activity areas and, therefore, are evenly distributed without consideration for animal grouping or patchiness.
- Acoustic modeling did not account for limitations of the NMFS-defined refresh rate of 24 hours or less depending on the exercise or activity. This time period represents the amount of time in which individual marine mammals can be harasses no more than once.

Table 3-8 provides a summary of the modeling protocols used in the analysis. Additional detailed information about the methods applied to estimate acoustic effects of Navy activities on marine mammals in SOCAL Range Complex is provided in Appendix F of the SOCAL Range Complex Draft EIS/OEIS [DoN 2008]).

Table 3-8: Navy Protocols Providing for Modeling Quantification of Marine Mammal Exposures

Historical Data	Sonar Positional Reporting System (SPORTS)	Annual active sonar usage data will be obtained from the SPORTS database to determine the number of active sonar hours and the geographic location of those hours for modeling purposes.
Acoustic Parameters	AN/SQS-53 and AN/SQS-56	Model the AN/SQS-53 and the AN/SQS-56 active sonar sources separately to account for the differences in source level, frequency, and exposure effects.
	Submarine Sonar	Submarine active sonar use will be included in effects analysis calculations using the SPORTS database.
Post Modeling Analysis	Land Shadow	For sound sources within the acoustic footprint of land, subtract the land area from the marine mammal exposure calculation.
	Multiple Ships	Correction factors will be used to address overestimates of exposures to marine mammals resulting from multiple counting when more than one ship is operating in the vicinity.
	Multiple Exposures	The following refresh rates for SOCAL Range Complex training events will be included to account for multiple exposures: • Unit-level Training, Coordinated Events, and Maintenance – 4 hours • Integrated Anti-submarine Warfare (ASW) Course- – 16 hours • Major Exercises / Major Range Events– 12 hours • Sustainment Training Exercises – 12 hours.

Acoustic Sources

The Southern California (SOCAL) acoustic sources are categorized as either broadband (producing sound over a wide frequency band) or narrowband (producing sound over a frequency band that that is small in comparison to the center frequency). In general, the narrowband sources in this exercise are ASW sonars and the broadband sources are explosives. This delineation of source types has a couple of implications. First, the transmission loss used to determine the impact ranges of narrowband ASW sonars can be adequately characterized by model estimates at a single frequency. Broadband explosives, on the other hand, produce significant acoustic energy across several frequency decades of bandwidth. Propagation loss is sufficiently sensitive to frequency as to require model estimates at several frequencies over such a wide band.

Second, the types of sources have different sets of harassment metrics and thresholds. Energy metrics are defined for both types. However, explosives are impulsive sources that produce a shock wave that dictates additional pressure-related metrics (peak pressure and positive impulse). Detailed descriptions of both types of sources are provided in the following subsections.

To estimate impacts of mid- and high-frequency sonar, five types of narrowband sonars representative of those used in activities in SOCAL Range Complex were modeled. Exposure estimates are calculated for each sonar according to the manner in which it operates. For example, the SQS-53C is a hull-mounted, surface ship sonar that emits brief pings, widely spaced for short time periods over a total duration of up to potentially many hours at a time so it is most useful to calculate and report SQS-53C exposures per hour of operation. The SQS-56C is a hull-mounted, surface ship sonar (not as powerful as the SQS-53C) that operates for many hours at a time, so it is most useful to calculate and report SQS-56C exposures per hour of operation. The AQS-22 is a helicopter-deployed sonar, which is lowered into the water, pings a number of times, and then moves to a new location. For the AQS-22, it is most helpful to calculate and report exposures per dip. Table 3-9 presents the deploying platform, frequency class, and the reporting metric for each sonar.

Note that the MK-48 source described here is the active torpedo sonar; the explosive source of the detonating torpedo is described in the next subsection.

Table 3-9: Active Sonars Employed in SOCAL Range Complex

Sonar	Description	Frequency Class	Exposures Reported
MK-48	Torpedo sonar	High frequency	Per torpedo
AN/SQS-53C	Surface ship sonar	Mid-frequency	Per hour
AN/SQS-56C	Surface ship sonar	Mid-frequency	Per hour
AN/SSQ-62	Sonobuoy sonar	Mid-frequency	Per sonobuoy
AN/AQS-22	Helicopter-dipping sonar	Mid-frequency	Per dip

The acoustic modeling that is necessary to support the exposure estimates for each of these sonars relies upon a generalized description of the manner of the sonar's operating modes. This description includes the following:

- "Effective" energy source level – The total energy across the band of the source, scaled by the pulse length (10 $\log_{10}$ [pulse length]), and corrected for source beam width so that it reflects the energy in the direction of the main lobe. The beam pattern correction consists of two terms:
    - Horizontal directivity correction: 10 $\log_{10}$(360 / horizontal beam width)

- Vertical directivity correction: $10 \log_{10} (2 / [\sin(\theta_1) - \sin(\theta_2)])$, where θ_1 and θ_2 are the 3-dB down points on the main lobe.

- Source depth – Depth of the source in meters.
- Nominal frequency – Typically the center band of the source emission. These are frequencies that have been reported in open literature and are used to avoid classification issues. Differences between these nominal values and actual source frequencies are small enough to be of little consequence to the output impact volumes.
- Source directivity – The source beam is modeled as the product of a horizontal beam pattern and a vertical beam pattern. Two parameters define the horizontal beam pattern:
  - Horizontal beam width – Width of the source beam (degrees) in the horizontal plane (assumed constant for all horizontal steer directions).
  - Horizontal steer direction – Direction in the horizontal in which the beam is steered relative to the direction in which the platform is heading

  The horizontal beam is rectangular with constant response across the width of the beam and with flat, 20-dB down sidelobes. (Note that steer directions ϕ, $-\phi$, $180^\circ - \phi$, and $180^\circ + \phi$ all produce equal impact volumes.)

  Similarly, two parameters define the vertical beam pattern:
  - Vertical beam width – Width of the source beam (degrees) in the vertical plane measured at the 3-dB down point. (The width is that of the beam steered towards broadside and not the width of the beam at the specified vertical steer direction.)
  - Vertical steer direction – Direction in the vertical plane that the beam is steered relative to the horizontal (upward looking angles are positive).

  To avoid sharp transitions that a rectangular beam might introduce, the power response at vertical angle θ is

$$\max \{ \sin^2 [n(\theta_s - \theta)] / [n \sin (\theta_s - \theta)]^2,\ 0.01 \}$$

  where $n = 180^\circ / \theta_w$ is the number of half-wavelength-spaced elements in a line array that produces a main lobe with a beam width of θ_w. θ_s is the vertical beam steer direction.

- Ping spacing – Distance between pings. For most sources this is generally just the product of the speed of advance of the platform and the repetition rate of the sonar. Animal motion is generally of no consequence as the source motion is modeled to be greater than the speed of the animal. For stationary (or nearly stationary) sources such as sonobuoys, the source "moves" in that different buoys are pinged as the target moves through the sonobuoy pattern. In the case of both moving and stationary sources, the animals are assumed to be stationary.

Analytical Framework for Assessing Marine Mammal Response to Underwater Detonations

Criteria

The criterion for mortality for marine mammals used in the CHURCHILL Final EIS (DoN 2001) is "onset of severe lung injury." This is conservative in that it corresponds to a 1 percent chance of mortal injury, and yet any animal experiencing onset severe lung injury is counted as a lethal exposure. The threshold is stated in terms of the Goertner (1982) modified positive impulse with value "indexed to 31 psi-ms.'" Since the Goertner approach depends on propagation, source /

animal depths, and animal mass in a complex way, the actual impulse value corresponding to the 31-psi-ms index is a complicated calculation. Again, to be conservative, CHURCHILL used the mass of a calf dolphin (at 12.2 kg), so that the threshold index is 30.5 psi-ms (Table 3-10).

Table 3-10: Effects Analysis Criteria for Underwater Detonations

	Criterion	Metric	Threshold	Comments	Source
Mortality & Injury	Mortality Onset of extensive lung hemorrhage	Shock Wave Goertner modified positive impulse	30.5 psi-msec*	All marine mammals (dolphin calf)	Goertner 1982
	Slight Injury Onset of slight lung hemorrhage	Shock Wave Goertner modified positive impulse	13.0 psi-msec*	All marine mammals (dolphin calf)	Goertner 1982
	Slight Injury 50% TM Rupture	Shock Wave Energy Flux Density (EFD) for *any single exposure*	205 dB re:1μPa^2-sec	All marine mammals	DoN 2001
Harassment	Temporary Auditory Effects TTS	Noise Exposure greatest EFD in any 1/3-octave band *over all exposures*	182 dB re:1μPa^2-sec	For odontocetes greatest EFD for frequencies ≥100 Hz and for mysticetes ≥10 Hz	NMFS 2005, NMFS 2006a
	Temporary Auditory Effects TTS	Noise Exposure Peak Pressure for *any single exposure*	23 psi	All marine mammals	DoN 2001
Behavioral	Behavioral Modification (sequential detonations only)	Noise Exposure greatest EFD in any 1/3-octave band *over all exposures*	177 dB re:1μPa^2-sec	For odontocetes greatest EFD for frequencies ≥100 Hz and for mysticetes ≥10 Hz	NMFS

Notes: (For explosives < 2000 lbs Net Explosive Weight (NEW), based on CHURCHILL FEIS (DON 2001) and Eglin Air Force Base IHA (NMFS 2005h) and LOA (NMFS 2006a).

Goertner, J.F. 1982. Prediction of underwater explosion safe ranges for sea mammals. Naval Surface Weapons Center, White Oak Laboratory, Silver Spring, MD. NSWC/WOL TR-82-188. 25 pp.

DoN. 2001. USS Churchill Shock Trail FEIS- February 2001.

NMFS 2005. Notice of Issuance of an Incidental Harassment Authorization, Incidental to Conducting the Precisions Strike Weapon (PSW) Testing and Training by Eglin Air Force Base in the Gulf of Mexico. Federal Register,70:48675-48691.

NMFS 2006. Incidental Takes of Marine Mammals Incidental to Specified Activities; Naval Explosive Ordnance Disposal School Training Operations at Eglin Air Force Base, Florida, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. Federal Register 71(199):60693-60697

NMFS. Briefed to NMFS for VAST-IMPASS; U.S. Air Force uses 176 dB for permit applications at Eglin Gulf Test and Training Range (EGTTR)

EFD = Energy Flux Density

Two criteria are used for injury: onset of slight lung hemorrhage and 50 percent eardrum rupture (tympanic membrane [TM] rupture). These criteria are indicative of the onset of injury.

The threshold for onset of slight lung injury is calculated for a small animal (a dolphin calf weighing 27 lb), and is given in terms of the "Goertner modified positive impulse," indexed to 13 psi-ms in the (DoN 2001a). This threshold is conservative since the positive impulse needed to cause injury is proportional to animal mass, and therefore, larger animals require a higher impulse to cause the onset of injury.

- The threshold for TM rupture corresponds to a 50 percent rate of rupture (i.e., 50 percent of animals exposed to the level are expected to suffer TM rupture); this is stated in terms of an EL value of 205 dB re 1 μPa^2-s. The criterion reflects the fact that TM rupture is not necessarily a serious or life-threatening injury, but is a useful index of possible injury that is well correlated with measures of permanent hearing impairment (e.g., Ketten 1998 indicates a 30 percent incidence of permanent threshold shift [PTS] at the same threshold).

The following criterion is considered for non-injurious harassment temporary threshold shift (TTS), which is a temporary, recoverable, loss of hearing sensitivity (NMFS 2001; DoN 2001a).

- A threshold of 12 pounds per square inch (psi) peak pressure was developed for 10,000 pound charges as part of the CHURCHILL Final EIS (DoN 2001a, [FR70/160, 19 Aug 05; FR 71/226, 24 Nov 06]). It was introduced to provide a more conservative safety zone for TTS when the explosive or the animal approaches the sea surface (for which case the explosive energy is reduced but the peak pressure is not). Navy policy is to use a 23 psi criterion for explosive charges less than 2,000 lb and the 12 psi criterion for explosive charges larger than 2,000 lb. This is below the level of onset of TTS for an odontocete (Finneran et al. 2002). All explosives modeled for the SOCAL Range Complex CD are less than 1,500 lb.

Very Shallow Water Underwater Detonations

Measurements of pressure-wave propagation are available for detonations in deep and shallow water, but only fragmentary data exist for propagation in Very Shallow Water (VSW) near shorelines between the shoreline and 50-foot (ft) depth. The lack of data is due to the complicated nature of the VSW environment, as well as to substantial differences between different VSW sites. In VSW, surface- and bottom-boundary effects have more influence on propagation than in deeper water. At the point of detonation, the geometry of the short water column dictates that a charge must be close to one or both of these boundaries. More likely surface blowout can dissipate energy and diminish bubble formation with its attendant oscillation effects while detonations closer to the bottom may have considerable energy absorbed by the bottom as well. Further, as pressure waves propagate laterally through the VSW column, they reflect off surface and bottom boundaries more often over a given distance than in deeper waters and thus, VSW boundaries exert their influence relatively more frequently over that distance. Refraction of the pressure waves, determined by differences in sound velocity at different depths – i.e., the sound velocity profile (SVP) - acts as it does in deeper water, but thermal layering and mixing of layers that determine the SVP may be more complicated and dynamic in VSW. In summary, reliable prediction of pressure wave propagation in all situations requires knowledge of the charge size, type, and position as well as boundary and water column conditions, but in VSW, the relative contributions of these variables may differ considerably from those in deeper waters.

The best mathematical models of underwater explosive-pressure propagation take into account the variables just described. However, the lack of empirical validation data for VSW has allowed the use of less complete models with untested assumptions as well as more complete models with untested assumptions and extreme values of those variables. Occasionally, these practices produced extreme over- and underestimation of propagation and consequent effects on marine mammals, neither of which facilitate realistic, practical regulatory compliance policy. To address the variables of concern and garner an understanding of the affects of underwater detonations, the Navy collected and analyzed empirical data from underwater detonations conducted during training events. Because bottom conditions factor heavily into the amount energy propagating through the water column, explosive tests were conducted at actual ordnance training sites so that, in addition to providing basic data to test theoretical issues, the tests would also provide applied knowledge about the acoustic properties of specific beach approaches in which explosive training and tests are conducted.

The principle objectives of the tests were to measure the pressure waves at various distances seaward of single-charge underwater explosions in VSW and, subsequently evaluate the predictions of existing underwater explosion-propagation models. A model of particular interest is the Reflection and Refraction in Multi-Layered Ocean/Ocean Bottoms with Shear Wave Effects (REFMS), but the test results may be used to evaluate other models of underwater explosive propagation as well. A second objective was to record waveform propagation information for specific single-charge sizes on the specific beach approaches where underwater ordnance training is conducted by Navy Special Warfare (NSW) and Explosive Ordinance Disposal (EOD) personnel in routine underwater ordinance training. The report deals with single charges of up to 15 lb on those beach approaches. Additionally, two configurations of multiple larger charges are used on the SCI range for training of NSW personnel. As there are no standard models for multiple-charge detonations, the pressure waves at various distances seaward of these charges were measured. The multiple charge sizes, configurations, locations, empirical measurements, and analyses of these detonations are described in Appendix F of the SOCAL Range Complex Draft EIS/OEIS [DoN 2008]).

Effects of the Proposed Activities

This section discusses the potential environmental effects associated with the use of active sonar and other Navy activities within the SOCAL Range Complex. The methodology for analyzing potential effects from sonar and explosives is presented below and in further detail in Appendix F of the SOCAL Range Complex Draft EIS/OEIS [DoN 2008]), which explains the model process in detail, describes how the impact threshold derived from Navy-NMFS consultations are derived, and discusses relative potential impact based on species biology.

Model Results Explanation

Acoustic exposures are evaluated based on their potential direct effects on marine mammals, and these effects are then assessed in the context of the species biology and ecology to determine if there is a mode of action that may result in the acoustic exposure warranting consideration as a harassment level effect.

A large body of research on terrestrial animal and human response to airborne sound exists, but results from those studies are not readily extendible to the development of behavioral criteria and thresholds for marine mammals. At the present time there is no general scientifically accepted consensus on how to account for behavioral effects on marine mammals exposed to anthropogenic sounds, including military sonar and explosions (NRC 2003, NRC 2005). While the first three blocks in Figure 3-5 can be easily defined (source, propagation, receiver) the remaining two blocks (perception and behavior) are not well understood given the difficulties in studying marine mammals at sea (NRC 2005). NRC (2005) acknowledges "there is not one case in which data can be integrated into models to demonstrate that noise is causing adverse affects on a marine mammal population."

From: NRC. 2003. Ocean Noise And Marine Mammals. National Research Council of the National Academies. National Academies Press, Washington, DC.

Figure 3-5: Required Steps Needed to Understand Effects or Non-Effects of Underwater Sound on Marine Species

For predicting potential acoustic and explosive effects on marine mammals, the Navy uses an acoustic impact model process with numeric criteria agreed upon with NMFS. This process is

described in Appendix F of the SOCAL Range Complex Draft EIS/OEIS [DoN 2008]). Some caveats are necessary to put these exposures in context.

For instance, 1) significant scientific uncertainties are implied and carried forward in any analysis using marine mammal density data as a predictor for animal occurrence within a given geographic area; 2) there are limitations to the actual model process based on information available (animal densities, animal depth distributions, animal motion data, impact thresholds, and supporting statistical model); and 3) determination and understanding of what constitutes a significant behavioral effect is still unresolved.

The marine mammal densities used in the SOCAL CD are derived from NMFS broad scale West Coast Surveys. These shipboard surveys cover significant distances along the California coast to the extent of the U.S. EEZ. Although survey design includes statistical placement of survey tracks, however, the survey can only cover so much ocean area and post-survey statistics are used to calculate animal abundances and densities (Barlow and Forney 2007). There is often significant statistical variation inherit within the calculation of the final density values, depending on how many sightings were available during a survey.

Occurrence of marine mammals within any geographic area, including southern California, is highly variable and strongly correlated to oceanographic conditions, bathymetry, and ecosystem level patterns rather than changes in reproduction success and survival (Forney 2000, Ferguson and Barlow 2001, Benson et al. 2002, Moore et al. 2002, Tynan 2005, Redfern 2006). For some species, distribution may be even more highly influenced by relative small-scale features over both short and long-term time scales (Ballance et al. 2006, Etnoyer et al. 2006, Ferguson et al. 2006, Skov et al. 2007). Unfortunately, the scientific level of understanding of some large-scale and most small-scale processes thought to influence marine mammal distribution is incomplete.

Given the uncertainties in marine mammal density estimation and localized distributions, the Navy's acoustic impact models cannot be use to predict occurrence of marine mammals within specific regions of southern California. To resolve this issue and allow modeling to precede, animals are "artificially and uniformly distributed" within the modeling provinces described in Appendix F of the SOCAL Range Complex Draft EIS/OEIS [DoN 2008]). This process does not account for animals that move into or out of the region, based on foraging and migratory patterns, and adds a lot of variability to the model predictions.

Results from acoustic impact exposure models, therefore, should be regarded as exceedingly conservative estimates strongly influenced by limited biological data. While numbers generated allow establishment of predicted marine mammal exposures for consultation with NMFS, the short duration and limited geographic extent of most sonar and explosive events does not necessarily mean that these exposures will ever be realized.

Comparison with SOCAL Range Complex After Action Report Data

From exercise after-action reports of major SOCAL Range Complex exercises in 2007, marine mammal sightings ranged from 289 to 881 animals per event over four events. Approximately, 77 to 96 percent of these animals were dolphins. From all four exercises, only approximately 226 of 2,303 animals were observed during mid-frequency activities, and sonar was secured or powered down in all cases upon initial animal sighting and until the animal had departed the vicinity of the ship, or the ship moved from the vicinity of the animal. At no time were any of these animals potentially exposed to SEL of greater than 189 dB, with the exception of two groups of dolphins that closed with a ship to ride the bow wake while MFAS was in use, and one group of four whales observed at 50 yards during MFAS transmission and that could have been exposed to RL of 201 dB. Like other sighting, MFAS was secured when these marine mammals were first observed within 200 yards of the ship. Of interest in this evaluation, even accounting for marine mammals not detected visually, the numbers of animals potentially exposed during

2007, as reported in the after action reports provided to NMFS, are significantly below what was predicted by the SOCAL Range Complex Draft EIS/OEIS acoustic impact modeling.

Behavioral Responses

Behavioral responses to exposure from mid- and high-frequency active sonar and underwater detonations can range from no observable response to panic, flight, and possibly stranding (Figure 3-6). The intensity of the behavioral responses exhibited by marine mammals depends on a number of factors, including the age, reproductive condition, experience, behavior, species, received sound level, type of sound, and duration of sound (reviews by Richardson et al., 1995; Wartzok et al. 2004; Cox et al. 2006, Nowacek et al. 2007; Southall et al. 2007). Most behavioral responses are short-term and of little consequence for the animal, although certain responses may lead to a stranding or mother-offspring separation. Active sonar exposure is brief as the ship is constantly moving and the animal will likely be moving as well.

Generally the louder the sound source, the more intense the response, although duration is also very important (Southall et al. 2007). According to the Southall et al. (2007) response spectrum, responses from 0-3 are brief and minor, 4-6 have a higher potential to affect foraging, reproduction or survival and 7-9 are likely to affect foraging, reproduction and survival.

Mitigation measures would likely prevent animals from being exposed to the loudest sonar sounds that could cause PTS, TTS, and more intense behavioral reactions. There are few data on the consequences of sound exposure on vital rates of marine mammals. Several studies have shown the effects of chronic noise (either continuous or multiple pulses) on marine mammal presence in an area (e.g. Malme et al. 1984; McCauley et al. 1998; Nowacek et al. 2004).

Even for more cryptic species, such as beaked whales, the main determinant of causing a stranding appears to be exposure in a narrow channel with no egress thus animals are exposed for prolonged period rather than just several sonar pings over a several minutes (see Appendix F of the SOCAL Range Complex Draft EIS/OEIS [DoN 2008]). Such a narrow channel is defined as an area surrounded by land masses, separated by less than 35 nm and at least 10 nm in length, or an embayment, wherein activities involving multiple ships/subs ($\geq$ 3) employing mid-frequency active sonar near land may produce sound directed toward the channel or embayment that may cut off the lines of egress for marine mammals. There are no such narrow channels in the SOCAL Range Complex, so it is unlikely that mid-frequency active sonar would cause beaked whales to strand. In fact, no beaked whale strandings associated with MFAS have ever occurred in the SOCAL Range.

Ship Noise

Increased number of ships operating in the area will result in increased sound from vessel traffic. Marine mammals react to vessel-generated sounds in a variety of ways. Some respond negatively by retreating or engaging in antagonistic responses while other animals ignore the stimulus altogether (Watkins 1986; Terhune and Verboom 1999). Most studies have ascertained the short-term response to vessel sound and vessel traffic (Watkins et al. 1981; Baker et al. 1983; Magalhães et al. 2002); however, the long-term implications of ship sound on marine mammals is largely unknown (NMFS 2007). Anthropogenic sound, especially around regional commercial shipping hubs has increased in the marine environment over the past 50 years (Richardson, et al. 1995; Andrew et al. 2002; NRC 2003; Hildebrand 2004; NRC 2005). This sound increase can be attributed primarily to increases in vessel traffic, as well as sound from other human sources (Richardson, et al. 1995; NRC 2005). NRC (2005) has a thorough discussion of both human and natural underwater sound sources.

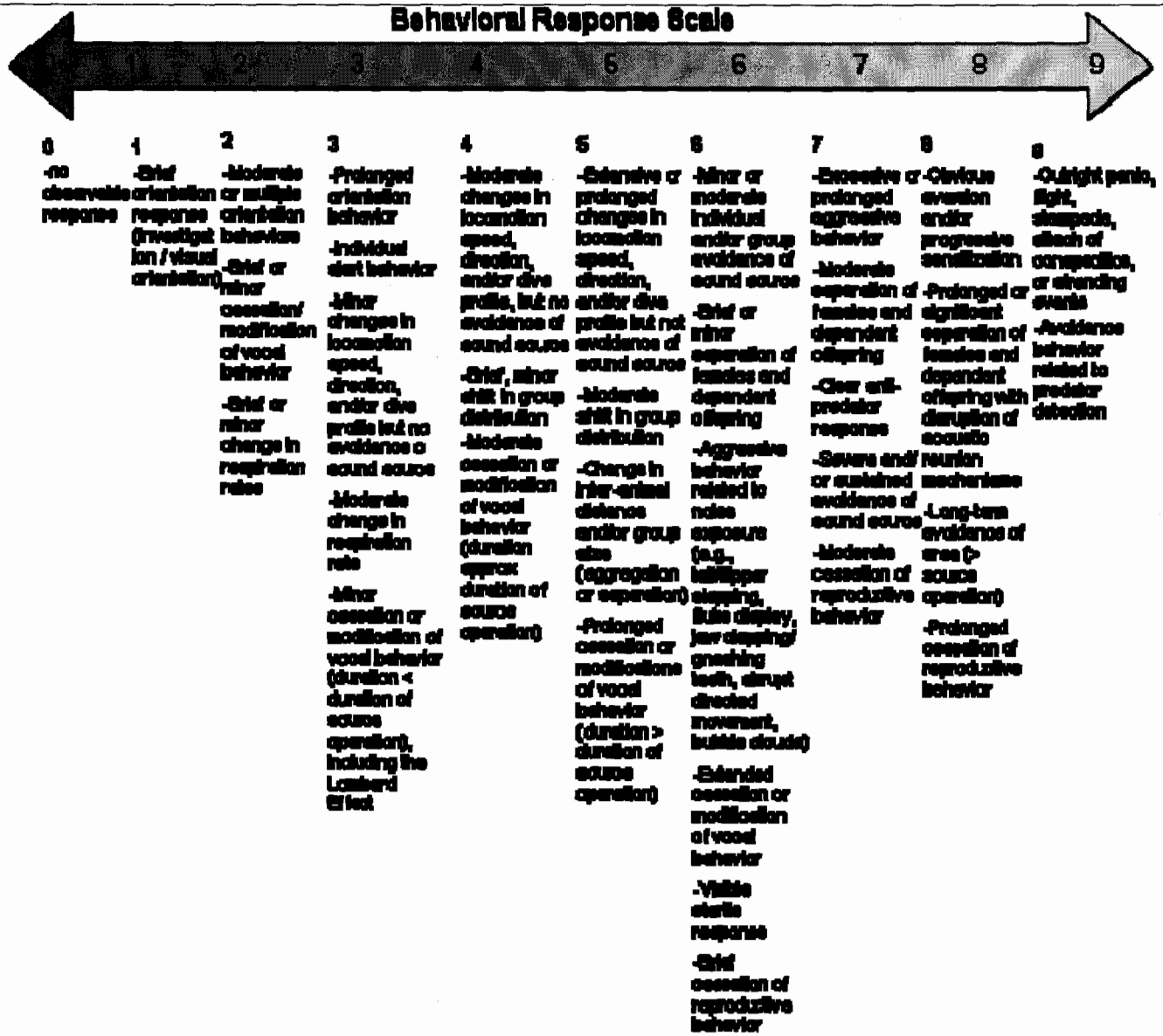


Figure 3-6: Numbered severity scale for ranking observed behaviors from Southall et al. 2007.

Given the current ambient sound levels in the southern California marine environment, the amount of sound contributed by the use of Navy vessels in the proposed exercises is very low. In addition, as opposed to commercial vessels, Navy ships are purposely designed and engineered for the lowest underwater acoustic signature possible given the limits of current naval shipbuilding technology. The goal with ship silencing technology is to limit the amount of sound a Navy vessel radiates that could be used by a potential adversary for detection. Given these factors, any marine mammals exposed may exhibit either no reactions or only short-term reactions, and would not suffer any long-term consequences from ship sound.

Potential Mid- and High Frequency Active Sonar Effects

Table 3-11 presents estimated marine mammal exposures for potential non-injurious (Level B) harassment, as well as potential onset of injury (Level A) to cetaceans and pinnipeds expected to be found in the CZ, or to migrate in and out of the CZ. Specifically, under this assessment for MFAS, the risk function methodology estimates 66,217 potential annual risk function exposures for coastal marine mammals in SOCAL OPAREAs as a whole that could result in behavioral sub-TTS (Level B Harassment). Approximately 82% of these 66,217 exposures are to California sea lions. The model estimates 5,546 annual potential exposures that could result in TTS (Level B Harassment). Approximately 82 percent of these 5,546 exposures are to Pacific harbor seals. The model estimates 11 annual potential exposures could result in injury as PTS (Level A Harassment). Approximately 82 percent of these 11 exposures are to Pacific harbor seals.

Table 3-11: Annual Sonar Exposures

SPECIES	SONAR EXPOSURES		
	Level B		Level A
	Risk Function	TTS	PTS
Gray whale	4,903	544	1
Bottlenose dolphin	1,257	191	0
Long beaked common dolphin	4,049	432	1
Northern elephant seal	833	5	0
Pacific harbor seal	1,014	4,559	9
California sea lion	54,346	3	0
Guadalupe fur seal	870	190	0
Total	67,272	5,924	11

NOTES:

1. TTS and PTS thresholds shown in Table 3-7.
2. Exposure values come from SOCAL LOA Supplement #2 submitted to NMFS in May 2008. This Supplement contained model revisions based on refined operational information and interpretation requested by NMFS.

These exposure modeling results are statistically derived estimates of potential marine mammal sonar exposures without consideration of standard mitigation and monitoring procedures. The caveats to interpretations of model results were explained previously, and are summarized briefly here.

When analyzing the results of the acoustic exposure modeling to provide an estimate of effects, there are limits to the ecological data (diving behavior, migration or movement patterns and population dynamics) used in the model, and the model results must be interpreted within the context of a given species' ecology. As described previously, this analysis assumes that short-term non-injurious sound exposure levels predicted to cause TTS or temporary behavioral disruptions qualify as Level B harassment. This approach is overestimating because there is no established scientific correlation between mid-frequency active sonar use and long-term abandonment or significant alteration of behavioral patterns in marine mammals. Because of the time delay between pings, and platform speed, an animal encountering the sonar will accumulate

energy for only a few sonar pings over the course of a few minutes. Therefore, exposure to sonar would be a short-term event, minimizing any single animal's exposure to sound levels approaching the harassment thresholds.

In addition, the majority of the non-physiological Level B exposures would occur well below 195 dB (see Figure 3-7). As the figure shows, the Level B exposures occurring between approximately 135 and 195 dB would be roughly normally distributed around a mean exposure level of about 165 dB.

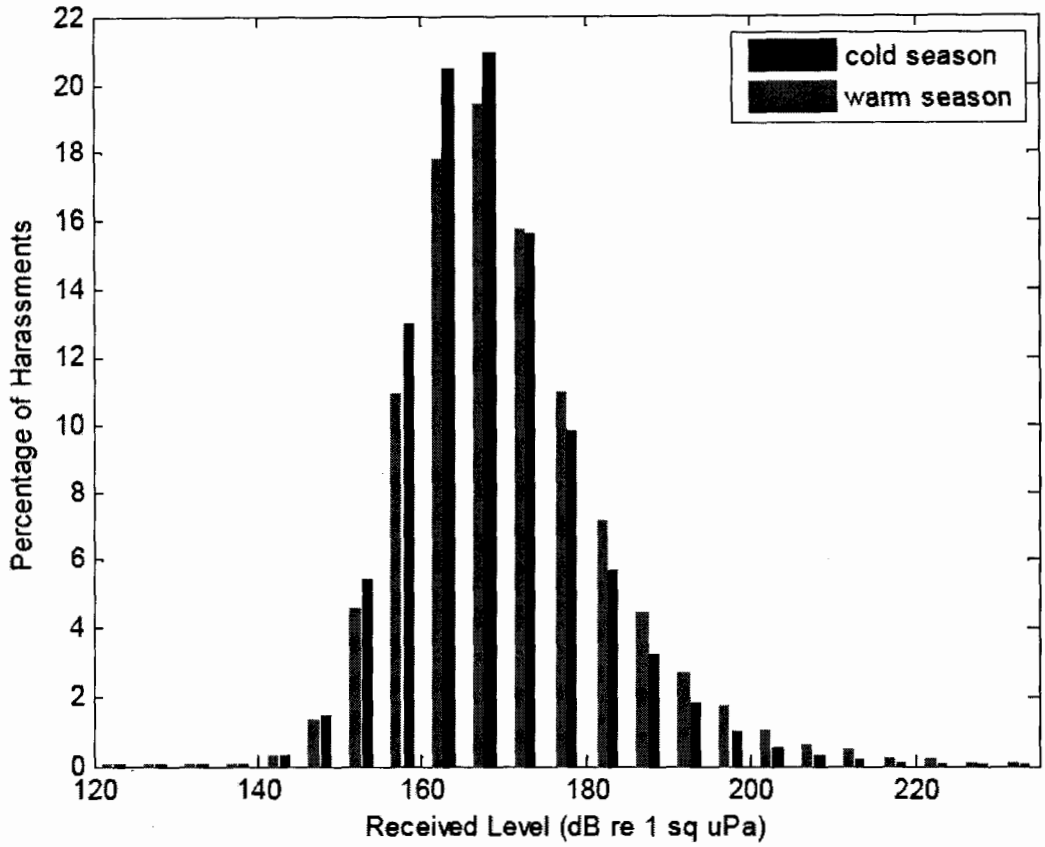


Figure 3-7: The Percentage of Behavioral Harassments Resulting from the Risk Function for Every 5 dB of Received Level

The implementation of the mitigation and monitoring procedures described in Section 2 will minimize the potential for marine mammal exposures to MFAS. When reviewing the acoustic exposure modeling results, it is also important to understand that the estimates of marine mammal sound exposures are presented without consideration of standard protective measure operating procedures. Section 2 presents details of the mitigation measures currently used for ASW activities, including detection of marine mammals and power-down procedures if marine mammals are detected within one of the safety zones.

Figure 3-8 demonstrates that the Navy's mitigation measures provide an adequate safety margin to marine mammals and allows for effective realistic ASW training. More restrictive power reduction and safety zone schemes, however, do not show appreciable further protection of exposure levels of marine mammals to MFAS but greatly reduce the ability of the sonar to detect

submarines. The Temporary Threshold Shift (195 dB) is a scientifically measured, peer-reviewed value that identifies a causal relationship between MFAS exposure level and a temporary harm to marine mammals. A temporary diminishment of hearing acuity is associated with a received underwater sound exposure level (SEL) of 195 dB. The mitigation procedures are not expected to expose marine mammals to more than 179 dB at 200 yards. For a 1 second pulse, this is just about 3% of the SEL associated with a temporary reduction in hearing acuity, meaning the mammal only receives 3% of the energy required to cause temporary harm. Therefore, the Navy's power-down mitigation measure includes a significant safety margin.

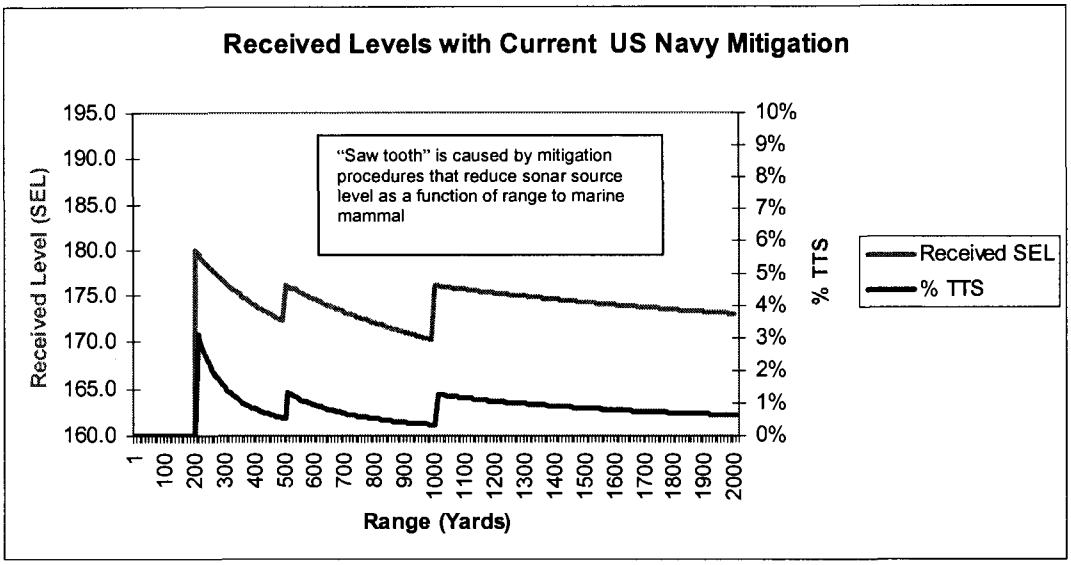


Figure 3-8: Received Levels with Current U.S. Navy Mitigation

Maximum received level (top line) to which a marine mammal would be exposed using the mitigation procedures is 179 dB. This occurs just outside the 200 yard shutdown range. The maximum received level just before 6 dB power down at 1000 yards is 175 dB and the maximum dB just before 10 dB power down at 500 yards is 175 dB. At the 500 and 200 yard points, the primary concern is not behavioral disturbance (because the animal is not likely being disturbed and may be drawn to the sonar ping), but the potential for injury due to exposure to MFA sonar or vessel strike. The 500 and 200 yard measures have a large safety margin to prevent injury. The Navy mitigation procedures allow a maximum single ping exposure of about 2.5% (or about 1/40) of the amount of energy (bottom line above) known to cause the onset of temporary diminished audio acuity in some marine mammals. Placed in perspective, the level to which the Navy already mitigates (169 dB when reducing 6dB at 1000 yards) is even lower than humpback whale's vocalization at 190 dB (.4 to 4.0 kHz frequency). Marine mammals are often exposed to higher sound levels in their own communications.

After action reports for recent exercises in SOCAL indicate that protective measures have resulted in the minimization of sonar exposure to detected marine mammals. There have been no known instances of marine mammals behaviorally reacting to the use of sonar during these exercises. The current measures are effective because the typical distances to a received sound energy level associated with temporary threshold shift (TTS) are typically within 200 m of the most powerful active sonar used in the SOCAL (the AN/SQS 53 MFA sonar); The current safety zone for implementation of power-down and shut-down procedures begins when marine mammals come within 1,000 yards of that sonar.

Underwater Detonation Effects

The modeled exposure harassment numbers for all training activities involving explosives are presented by species in Table 3-12. The model results indicate that 769 potential annual exposure for coastal marine mammals in the SOCAL Range Complex that could result in behavioral sub-TTS (Level B Harassment). Approximately 76 percent of these 769 exposures are to California sea lions. The model estimates 637 annual potential exposures that could result in TTS (Level B Harassment). Approximately 80 percent of these 637 exposures are to California sea lions. The model estimates 18 annual potential exposures could result in injury as 50 percent TM Rupture or Slight Lung Injury (Level A Harassment). Approximately 89 percent of these 18 exposures are to Pacific harbor seals. The model estimates 6 potential annual mortalities to California sea lions (Level A Harassment).

Training activities involving explosives include Mine Neutralization, Air to Surface Missile Exercise, Surface to Surface Missile Exercise, Bombing Exercise, Surface to Surface Gunnery exercise, and Naval Surface Fire Support. These exposure modeling results are estimates of marine mammal underwater detonation sound exposures without considering similar model limitations, as discussed in the summary of mid-frequency active sonar.

In the absence of mitigation, the predicted total harassments of bottlenose dolphins (assuming each exposure was of a different individual) from underwater detonations would affect approximately two percent of the local population. For the long-beaked common dolphin, the percentage would be 0.2 percent and, for the Pacific harbor seal, the percentage would be 0.5 percent. Although the local populations of gray whales, northern elephant seals, California sea lions, and Guadalupe fur seals are not known, the levels of harassment of these populations are expected to be similar. Such levels of harassment, most of which would consist of non-injurious behavioral disruptions, would have no population-level effects. Furthermore, the effects presented in Table 3-12 do not take into consideration the mitigation measures employed by the Navy. Implementation of the mitigation and monitoring procedures described in Section 2 will minimize the potential for individual marine mammal exposures to underwater detonations.

Table 3-12: Annual Underwater Detonation Exposures

SPECIES	EXPOSURES			
	Level B		Level A	
	Sub-TTS 177 dB re 1 μPa^2-s (Successive explosions)	TTS 182 dB/23 psi	50% TM Rupture 205 dB or Slight Lung Injury 13 psi-ms	Onset Massive Lung Injury or Mortality 31 psi-ms
Gray whale	6	7	0	0
Bottlenose dolphin	14	10	0	0
Long-beaked common dolphin	61	41	1	0
Northern elephant seal	76	41	0	0
Pacific harbor seal	26	26	1	0
California sea lion	584	510	16	6
Guadalupe fur seal	2	2	0	0
Total	**769**	**637**	**18**	**6**

NOTES: N/A: Not applicable – Based on a few historic observations, its habitat preference or overall distribution, a species may occur rarely in the SOCAL Range Complex, but no density estimates were available for modeling exposures

Effects by Species of Mid-Frequency Active Sonar and Underwater Detonations

Gray Whale

The most recent population estimate for gray whales is 26,635 animals (Anglis and Outlaw 2007). The potential MFAS risk function exposures of 4,903 animals represent 18 percent of that total, and the 544 TTS exposures represent 2 percent of that total. Potential underwater detonation exposure of 6 gray whales at sub-TTS Level B represents 0.02 percent of the total stock, and the potential exposure of 7 animals at TTS Level B represents 0.03 percent of the total stock.

Gray whale migration starts approximately in December, peaks in January (southbound), peaks again in March (northbound), and extends into May. There are two major migration routes, an inshore route along the mainland coast favored by mothers with calves, and an offshore route that extends in a straight line from Baja to Point Conception. SOCAL Range Complex is not a breeding or foraging area for gray whales, so the presence of an individual whale is limited to the duration of its travel through the area. At average migration swimming speeds of 3-5 knots, a gray whale is present in the offshore waters of SOCAL Range Complex for only hours or days.

As discussed previously, these exposure assessments also do not take into account the Navy's mitigation measures, which would further limit any potential exposure. Gray whales are large (up to 46 feet long), have a pronounced blow, and travel in groups of up to 16 animals (Leatherwood et al. 1982), so they are easily sighted - as determined by NMFS (Barlow 2003, 2006) - and it is very likely that lookouts would detect both individuals and groups of gray whales. Mitigation and monitoring are expected to avoid any Level A exposures.

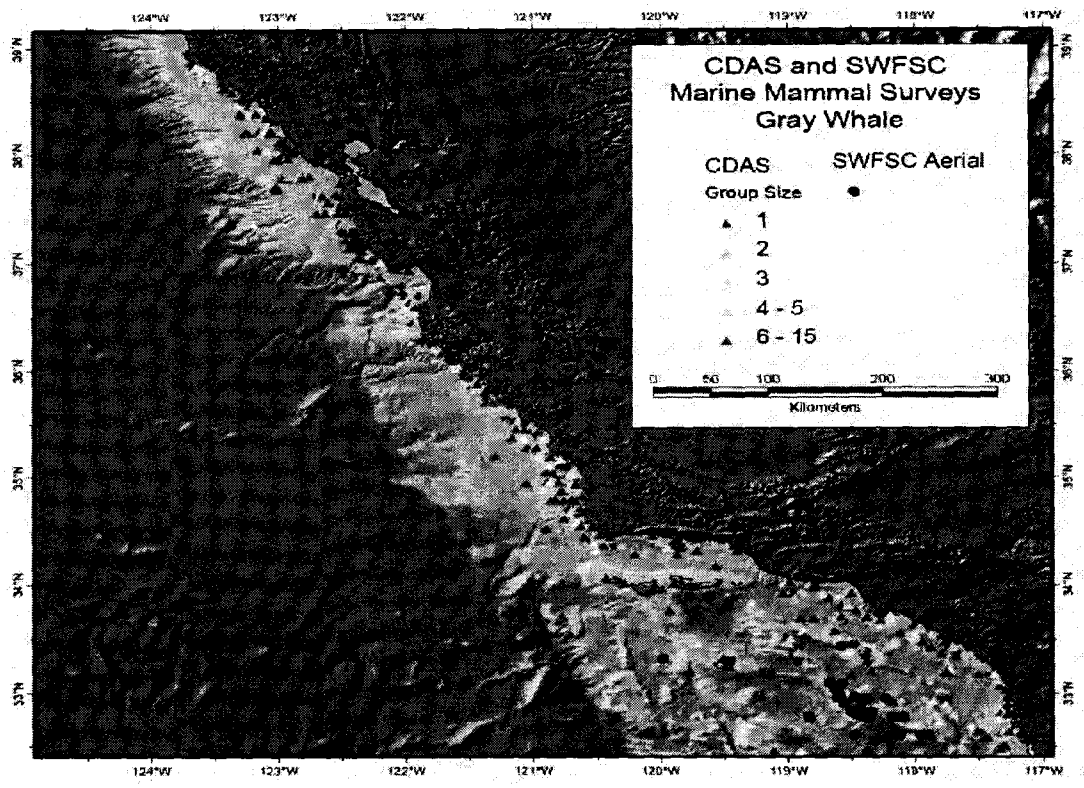
The remaining TTS and behavioral Level B exposures would only result in temporary effects to individual whales and would not result in any population level effects. Because most of these exposures would occur outside of the CZ, effects within the CZ would be insignificant. Further, there is no evidence of long term effects to the population as a result of these TTS and behavioral exposures in the long history of the Navy MFAS use in SOCAL Range Complex.

Figure 3-9 shows recent surveying of gray whales. Of note is that the thick cluster of aerial sightings in the lower right is surrounding San Clemente Island, whose nearby waters contain the instrumented undersea Navy ASW range. After four decades of operations, the whales continue to traverse waters frequently used for Navy sonar exercises and there have been no known stranding of gray whales associated with Navy activities in the SOCAL Range Complex.

Bottlenose Dolphin

The risk function and Navy post-modeling analysis estimates 1,257 bottlenose dolphins will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be 191 exposures to accumulated acoustic energy above 195 dB re 1 μPa2-s, which is the threshold established indicative of onset TTS. No bottlenose dolphins would be exposed to sound levels that could cause PTS.

Modeling indicates there would be 14 exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, 10 exposures to182 dB re 1 μPa2-s or 23 psi, which is the threshold indicative of onset TTS, and no exposures to impulsive sound or pressures from underwater detonations that would cause slight physical injury (Table 6-6).



Source: 2005 Biogeographic assessment of the Channel Islands National Marine Sanctuary: A Review of Boundary Expansion Concepts for NOAA's national Marine Sanctuary Program. NOAA National Centers for Coastal Ocean Science Biogeography team in cooperation with the National Marine Sanctuary Program. Silver Spring, MD. NOAA Technical Memorandum NOS NCCOS 21. 215 pp.

Figure 3-9: Gray Whale Survey

Given frequent surfacing, and aggregation of multiple animals (probability of trackline detection = 0.85 for small groups (<20) and 0.97 for large groups (>20); Barlow and Forney 2007), it is very likely that lookouts would detect a group of bottlenose dolphins at the surface. Additionally, mitigation measures call for continuous visual observation during operations with active sonar, therefore, bottlenose dolphins that migrate into the operating area would be detected by visual observers. Implementation of mitigation measures and probability of detecting bottlenose dolphins reduces the likelihood of exposure, such that effects would be discountable.

The remaining TTS and behavioral Level B exposures, which do not cause permanent physical damage to individual whales, are not expected to translate into behavior that could result in injury or mortality, and would not result in any population level effects. Further, there is no evidence of long term effects to the population as a result of these TTS and behavioral exposures in the long history of the Navy MFAS use in SOCAL Range Complex.

Long-Beaked Common Dolphin

Two species of common dolphin occur off California, the more coastal long-beaked dolphin and the more offshore short-beaked dolphin. The long-beaked common dolphin is less abundant, and only recently has been recognized as a separate species (Heyning and Perrin 1994). In general, the long-beaked common dolphin inhabits a narrow coastal band from Baja California (including the Gulf of California) northward to central California as well as the Channel Islands. Recent NMFS population estimates for the California Stock of long-beaked common dolphins is 17,530

individuals (CV=0.65) (Barlow and Forney, 2007). No information on trends in abundance are available for this stock because of high interannual variability in line-transect abundance estimates. Heyning and Perrin (1994) detected changes in the proportion of short-beaked to long-beaked common dolphins stranding along the California coast, with the short-beaked common dolphin stranding more frequently prior to the 1982-83 El Niño (which increased water temperatures off California), and the long-beaked common dolphin more commonly observed for several years afterwards. Thus, it appears that both relative and absolute abundance of these species off California may change with varying oceanographic conditions

Long-beaked common dolphins are usually found within 50 nm (92.5 km) of shore (Barlow et al. 1997, Bearzi 2005, 2006) and are generally not sighted further than 100 nm (185 km) from shore (Perrin et al. 1985; Barlow 1992 in Heyning et al. 1994).

Between the two common dolphin species, the short-beaked common dolphin is more abundant in the waters of the SOCAL Range Complex and the long-beaked common dolphin relatively less common, occurring mostly in the warm-water period. Long beaked common dolphins are found in the region throughout the year (Carretta et al. 2000), although abundance of common dolphins has been shown to change on both seasonal and inter-annual time scales in southern California (Dohl et al. 1986; Barlow 1995; Forney et al. 1995; Forney and Barlow 1998). The peak calving season thought to occur from spring and early summer (Forney 1994).

The risk function and Navy post-modeling analysis estimates 4,049 will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be 432 exposures to accumulated acoustic energy above 195 dB re 1 μPa2-s, which is the threshold established indicative of onset TTS. One long-beaked common dolphin would be exposed to sound levels that could cause PTS. The potential 4,049 MFAS risk function exposures for the offshore stock represents about 23 percent of the southern California population; the exposed coastal stock is expected to represent a similar portion of the overall population.

Modeling indicates there would be 61 exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, 41 exposures to 182 dB re 1 μPa2-s or 23 psi, which is the threshold indicative of onset TTS, and 1 exposure to impulsive sound or pressures from underwater detonations that would cause slight physical injury (Table 6-6). The potential TTS exposures are expected to be about 2.5 percent and PTS exposures are expected to be about 0.01. Underwater detonation activities are expected to expose 0.1 percent of the population to Level B and 0.01 percent of the coastal stock to Level A.

As discussed previously, these exposure assessments also do not take into account the Navy's mitigation measures, which would further limit any potential exposure. Specifically the frequent surfacing and aggregation of multiple animals make it very likely that lookouts would detect a group of long-beaked common dolphins at the surface. Further, Level A exposures from underwater detonations would very likely be precluded by the pre-exercise clearance procedures.

Any remaining TTS and behavioral Level B exposures would only result in temporary effects to individual dolphins which do not cause permanent physical damage to individual whales, are not expected to translate into behavior that could result in injury or mortality, and would not result in any population level effects. Further, there is no evidence of long term effects to the population as a result of these TTS and behavioral exposures in the long history of the Navy MFAS use in SOCAL Range Complex.

Northern Elephant Seal

The total population of northern elephant seals is estimated at over 100,000 animals, and the estimated growth rate of the population is variously estimated at from about 9 to about 30 percent per year, or about 9,000 to 30,000 seals per year. The potential MFAS risk function exposures of 833 animals for the entire SOCAL Range Complex represent about 0.8 percent of the total population and the potential 5 TTS exposures represent about 0.003 percent of the estimated population.

Modeling indicates there would be 76 exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, and 41 exposures to 182 dB re 1 μPa2-s or 23 psi, which is the threshold indicative of onset TTS. Underwater detonation activities are expected to expose 0.1 percent of the population to Level B and 0.001 percent of the coastal stock to Level A.

Northern elephant seals spend little time near shore, traversing offshore waters four times per year (two round-trips) traveling between pupping and molting beaches in California and Mexico and their preferred feeding areas in the north Pacific Ocean. Bulls tend to spend about 250 days/year (68 percent of the year) at sea and females about 300 days/year (82 percent of the year) at sea, but little of it near land. While ashore (32 percent of the year for adult males and 18 percent of the year for females), northern elephant seals do not feed. Thus, the duration of an individual's presence in the marine waters of SOCAL Range Complex may be on the order of a few weeks per year. As discussed previously, these exposure assessments also do not take into account the Navy's mitigation measures, which would further limit any potential exposure.

The remaining TTS and behavioral Level B exposures would only result in temporary effects to individual northern elephant seals which do not cause permanent physical damage to individual whales, are not expected to translate into behavior that could result in injury or mortality, and would not result in any population level effects. Further, there is no evidence of long term effects to the population as a result of these TTS and behavioral exposures in the long history of the Navy MFAS use in SOCAL Range Complex.

Pacific Harbor Seal

The world population of harbor seals is estimated at 400,000 - 500,000, and the California population is estimated at about 20,000 seals. The estimated growth rate of the population is about 6 percent per year, or about 1,200 seals per year. The most recent southern California population estimate for the Pacific harbor seal is about 5,270 animals. Because of the lower critieria for harbor seals (see Tabel 3-7), the potential MFAS risk function exposures of 1,014 animals for the entire SOCAL Range Complex represent about 19 percent of that total, the potential 4,559 TTS exposures represent 87 percent of the estimated population, and the potential 9 PTS exposures represent about 0.2 percent. Total potential underwater detonation exposures for the entire SOCAL Range Complex of 52 harbor seals at Level B represents about 1.0 percent of the total stock, and the potential Level A exposures of 1 animal represents about 0.02 percent of the total stock.

As discussed previously, these exposure assessments also do not take into account the Navy's mitigation measures, which would further limit any potential exposure. In particular, Level A exposures from underwater detonations would very likely be precluded by the pre-exercise clearance procedures.

The remaining TTS and behavioral Level B exposures would only result in temporary effects to individual pacific harbor seals which do not cause permanent physical damage to individual

whales, are not expected to translate into behavior that could result in injury or mortality, and would not result in any population level effects. Further, there is no evidence of long term effects to the population as a result of these TTS and behavioral exposures in the long history of the Navy MFAS use in SOCAL Range Complex.

California Sea Lion

California sea lions are the second-most abundant marine mammal in California waters, with an estimated population of more than 200,000 animals. The percentage of this population inhabiting SOCAL Range Complex is not known. The potential MFAS risk function exposures of 54,346 animals for the entire SOCAL Range Complex represent about 27 percent of the entire California population, and the 3 TTS exposures represent 0.002 percent of the estimated population. Total potential underwater detonation exposures for the entire SOCAL Range Complex of 1,094 sea lions at Level B represents about 0.5 percent of the total California stock, and the potential Level A exposures of 16 animals represents 0.01 percent of the total stock.

As discussed previously, these exposure assessments do not take into account the Navy's mitigation measures, which would further limit any potential exposure. In particular, Level A exposures from underwater detonations - estimated at 16 animals per year - would very likely be precluded by the pre-exercise clearance procedures.

The remaining TTS and behavioral Level B exposures would only result in temporary effects to individual California sea lions harbor which do not cause permanent physical damage to individual whales, are not expected to translate into behavior that could result in injury or mortality, and would not result in any population level effects. Further, there is no evidence of long term effects to the population as a result of these TTS and behavioral exposures in the long history of the Navy MFAS use in SOCAL Range Complex.

Guadalupe Fur Seal

The most recent population estimate for the Guadalupe fur seal is about 7,000 animals. The potential MFAS risk function exposures of 870 animals for the entire SOCAL Range Complex represent about 12 percent of that total, and the 190 TTS exposures represent 3 percent of the estimated population. Total potential underwater detonation exposures for the entire SOCAL Range Complex of 4 fur seals at Level B represents about 0.06 percent of the total stock. No fur seals will experience Level A exposures.

This is a statistical comparison, however, that makes simplifying assumptions and does not factor in the all the biology of Guadalupe fur seals. For example, the model assumes a uniform density distribution, whereas the density of Guadalupe fur seals, which are non-migratory and breed only on Guadalupe Island, probably declines at a geometric rate with increasing distance from Guadalupe Island. As another example, the model assumes that pinnipeds are always in the water and capable of being exposed, whereas adult females with pups spend 9 - 13 days at sea feeding, followed by 5-6 days nursing their pups; thus, they are on land about one-third of the time.

As discussed previously, these exposure assessments also do not take into account the Navy's mitigation measures, which would further limit any potential exposure. In particular, Level A exposures from underwater detonations would very likely be precluded by the pre-exercise clearance procedures.

The remaining TTS and behavioral Level B exposures would only result in temporary effects to individual Guadalup fur seals harbor seals which do not cause permanent physical damage to individual whales, are not expected to translate into behavior that could result in injury or mortality, and would not result in any population level effects. Further, there is no evidence of

long term effects to the population as a result of these TTS and behavioral exposures in the long history of the Navy MFAS use in SOCAL Range Complex.

Summary

It is highly unlikely that a marine mammal would experience any long-term effects because, given the size of SOCAL Range Complex, repeated or prolonged exposures of individual animals to high-level sonar signals are unlikely. The SOCAL Range Complex has been the location of training and testing with MFAS for decades and there have been no known incidents of effects to individual marine mammals associated with these activities and no evidence of impacts to marine mammal populations. The extensive measures undertaken by the Navy to avoid or limit marine mammal exposure to active sonar, detailed in the Section 2 ASW discussion would reduce the number of PTS and TTS exposures below those presented in Table 3-11. The remaining TTS and behavorial exposures would cause only temporary effects to individual whales. Therefore, long term effects on individuals, populations, or stocks are unlikely.

While marine mammals may detect sonar emissions, underwater detonations, or ship noise from a distance, these exercises are intermittent and of short duration. Minor effects on individuals within a species and substantial effects on a few individuals of a species would have no substantial effect on regional populations of these species; takes are regulated under both the Endangered Species Act and Marine Mammal Protection Act specifically to avoid population-level effects. The proposed training activities will not affect the biological productivity of populations of marine mammals that are CZ resources. Specifically with regard to marine mammals, the proposed activities are consistent to the maximum extent practicable with Section 30230.

3.3.2.2 Section 30231, Biological Productivity

3.3.2.2.1 California Policy

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.

3.3.2.2.2 Coastal Zone Effects

The proposed activities are consistent to the maximum extent practicable with Section 30231. The proposed activities would include no waste water discharges, would use no ground water supplies, and would not interfere with surface water flows, except as needed for erosion control. Riparian habitats and streamside vegetation in the CZ would not be affected. The biological productivity of coastal waters and coastal water quality would be maintained, as discussed below.

Discussion

Two extensions of SOAR would be instrumented with transducer nodes and fiber optic cables to create a Shallow Water Training Range (SWTR). In addition, the Navy proposes to establish an offshore shallow water minefield on Tanner Banks. All equipment to be used for installation of the SWTR and the minefield would be properly maintained and monitored for leakage of fuel, oil, or other hazardous materials. Vessels and equipment used for cable deployment and installation would comply with regulatory requirements and best management practices for minimizing the inadvertent discharge of potential marine contaminants. Any effects on biological productivity would be temporary.

Installation of the nodes and cables would result in minor, temporary increases in turbidity from disturbances of bottom sediments. Disturbed sediments would rapidly disperse and settle back to the seabed. Cables would eventually become buried in bottom sediments. Cable materials (e.g., glass, plastic, nylon) would not leach contaminants into the water or sediments, but would - based on observations of existing cable arrays - become encrusted with benthic organisms. The nodes would have a total footprint of about 0.6 ac (0.24 ha) and the cable array would have a total footprint of about 11 ac (4.ha); their combined footprint would cover about 0.003 percent of the 500 nm^2 (926 km^2) SWTR. No substantial short-term or long-term effects on biological productivity would result from the installation of these new facilities.

Due to the temporary nature of these events, the lack of substantial food-chain effects, the absence of population-level effects, and the measures to protect threatened and endangered species (whose depleted populations could be affected by the loss of small numbers of individuals), the biological productivity of coastal waters will be maintained.

Summary

3.3.2.3 Section 30234.5 - Economic, Commercial, and Recreational Importance of Fishing

California Policy

The economic, commercial, and recreational importance of fishing activities shall be recognized and protected.

Coastal Zone Effects

Commercial fishing activities occur at various locations off the coast of southern California. Commercial fishing in the southern California area accounts for a substantial proportion of the fish and invertebrate catches in California, with an annual value of approximately $145 million (CDFG 2001). Sport fishing and tourism are important economic activities, supporting large numbers of charter operators and boaters in southern California.

Salt-water sport fishing is concentrated around the Channel Islands and in the shallower waters over the Cortes and Tanner Banks. Diving occurs year-round, although the number of trips to SCI and the Banks appears to peak during lobster season (October-March). Most boat trips originate from marinas and harbors along the southern California coast.

Potential effects of the proposed activities on economic, commercial, and recreational fishing have been evaluated by the Navy. The CZ around SCI accounts for a very small portion of the littoral waters available to commercial and recreational users and, as noted in Section 1, Navy training and testing activities under the proposed activities would not require exclusive use of the portions of the CZ along the mainland coast or those portions of the CZ surrounding other Channel Islands. The Navy's training and testing activities would not permanently modify the marine environment in the CZ such as would affect stocks of commercial or recreational fish species. Elements of the proposed activities that require exclusive use of an ocean area (e.g., those activities in which weapons are fired) could temporarily affect specific commercial and recreational fishing activities during the actual training event. Short-term adverse effects on individual commercial fishermen may result from temporary closures of specific ocean areas, but the overall regional commercial fishing industry would be unchanged.

Prior to conducting an at-sea training event with the potential to affect commercial or recreational fishing, NOTMARs and NOTAMs are issued, providing the public and commercial fishermen with sufficient notice of upcoming location and timing restrictions in specific training areas. In addition, SCORE maintains a public website depicting upcoming restrictions in designated Danger Zones around SCI. These notices provide details on the dates, durations, and locations of restricted access, so that commercial and recreational fishermen and divers can plan their

activities accordingly. The restricted times only extend through the duration of the training activity, allowing the public to shift its activities to alternate areas during these temporary closures. Thus, the proposed activities are consistent to the maximum extent practicable with Section 30234.5.

3.4 PROPOSED ACTIVITIES CONTAINED IN THE COASTAL CONSISTENCY DETERMINATION ARE CONSISTENT TO THE MAXIMUM EXTENT PRACTICABLE WITH THE CALIFORNIA COASTAL MANAGEMENT PROGRAM'S ENFORCEABLE POLICIES.

The Navy's mission, explained in section 1.1.1 earlier, is to organize, train, equip, and maintain combat-ready naval forces capable of winning wars, deterring aggression, and maintaining freedom of the seas. This mission is mandated by federal law (Title 10 U.S. Code § 5062), which charges the Chief of Naval Operations with responsibility for ensuring the readiness of the Nation's naval forces. In determining what activities to conduct in the SOCAL Range Complex, the Navy must consider the training requirements that are necessary to meet its Title 10 responsibilities. The waters and land-based training ranges of Southern California have been critical to the Navy's ability to train generations of Sailors and Marines, and to conduct Research, Development, Testing & Evaluation activities. Those activities, including the certification of Carrier and Expeditionary Strike Groups, enable the Navy to meet its congressionally mandated obligations.

Section 1.1.2.2, above, explains in detail the strategic importance of the SOCAL Range Complex. The Complex is proximate to the homeport of San Diego, one of the Navy's largest fleet concentration areas. The SOCAL Range Complex contains waters of varying bathymetry and weather conditions, a centrally located island that supports a broad range of Strike Group and Unit Level training, an established communications system, and aerial and subsurface tracking systems. The Complex is located near other southwest ranges, allowing more realistic and diverse training. With training available nearby, our Sailors, Marines, and Coastguardsmen can prepare for deployment and operational missions while not spending any more time away from their families than is necessary for training. Extended operational deployments already require extended family separations. From unit level training to graduate level certification exercises, the capability and capacity of the SOCAL Range Complex is required to support the entire training continuum and it must be available when and as needed to meet the Navy mission.

The Navy's SOCAL Range Complex activities are being analyzed in an Environmental Impact Statement and will be subject to the terms and conditions of terrestrial and marine Biological Opinions under the Endangered Species Act. Regarding marine mammals, the Navy's activities will be subject to the requirements of the Marine Mammal Protection Act, as reflected in a Final Rule and subsequent Letters of Authorization. Commander, Navy Region Southwest and its tenant commands' staffs provide full-time natural and cultural resource support to the Range Complex, as does the environmental staff of the U.S. Pacific Fleet.

The CZMA requires that federal actions must be consistent to the maximum extent practicable with the enforceable policies of approved state coastal management programs. As described in the preceding sections, the Navy expects that its proposed activities will not harm marine mammal populations and may result in only temporary effects on coastal uses or resources. The waters in which the Navy has trained with mid-frequency sonar for decades, without the current mitigation measures the Navy employs, continue to be some of the richest and most diverse in marine mammal populations. The Navy now employs mitigation measures, which are described in detail in section 2.2.2 above. It is noteworthy that not a single or multiple marine mammal stranding in SOCAL has ever been attributed to the Navy's use of sonar in those waters, even prior to the Navy implementing mitigation measures. More restrictive training measures,

exclusion zones, or seasonal restrictions could conflict with the Navy's ability to meet its training obligations under 10 U.S.C. § 5062. Moreover, additional mitigation measures are not necessary in light of the Navy's proven track record in SOCAL and the lack of any empirical data demonstrating that the Navy's MFA sonar training has harmed marine mammal populations in SOCAL. Therefore, considering these factors and the entirety of the Navy's analysis supporting this consistency determination and the Navy's related draft environmental impact statement, the Navy concludes that its proposed activities are consistent to the maximum extent practicable with the approved enforceable policies contained in Chapter 3 of the California Coastal Act.

4 CONCLUSION

The Navy's proposed activities will be undertaken in a manner that is consistent to the maximum extent practicable with the enforceable policies of the California Coastal Management Program.

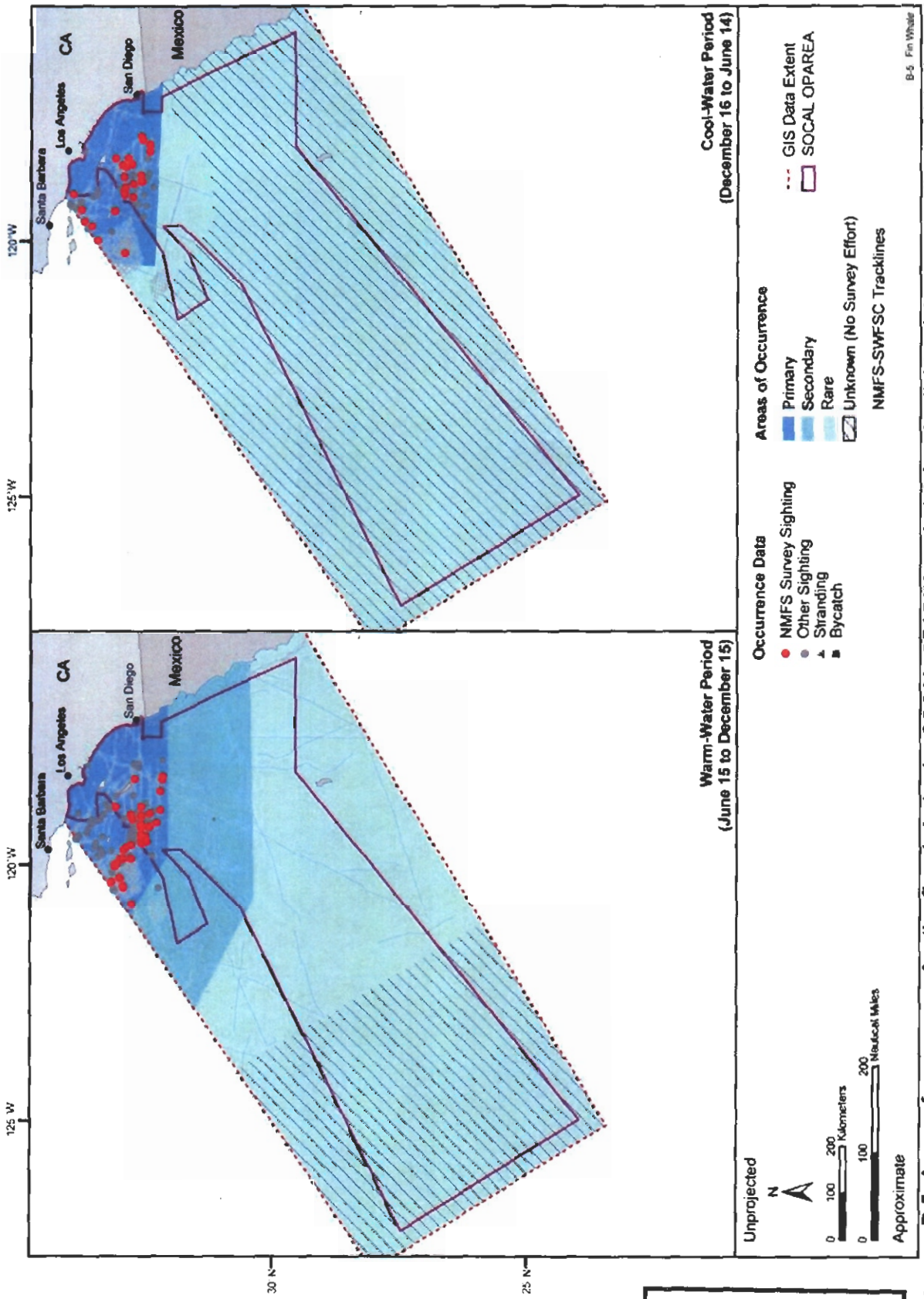


Figure B-5. Areas of occurrence for the fin whale in the SOCAL OPAREA and vicinity. Available sighting, stranding, and incidental fisheries bycatch records are represented by season. Sightings from NMFS-sponsored aerial and shipboard surveys are recorded along pre-determined tracklines, which are also depicted on the map. Source data: refer to Table A-1.

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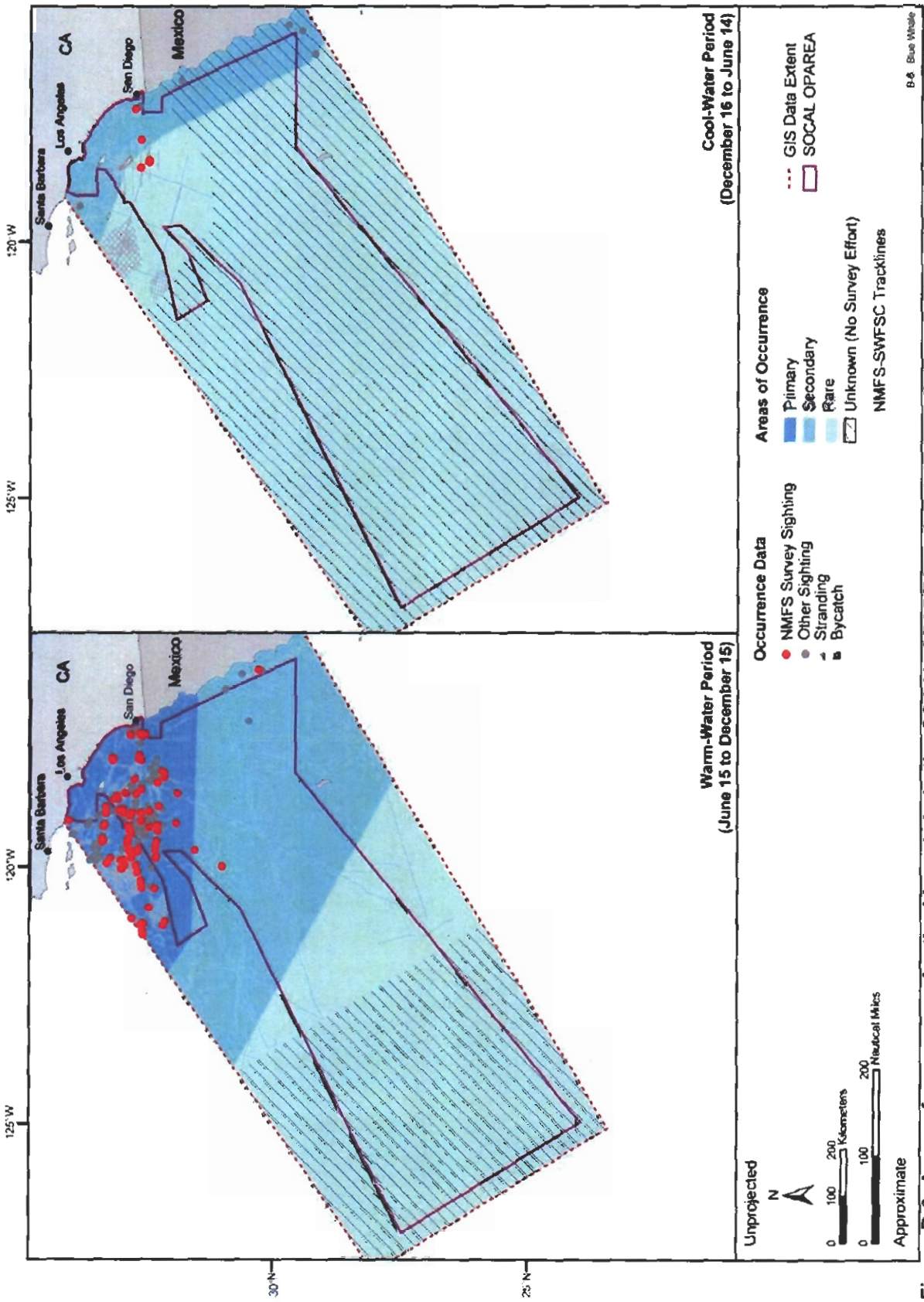


Figure B-6. Areas of occurrence for the blue whale in the SOCAL OPAREA and vicinity. Available sighting, stranding, and incidental fisheries bycatch records are represented by season. Sightings from NMFS-sponsored aerial and shipboard surveys are recorded along pre-determined tracklines, which are also depicted on the map. Source data: refer to Table A-1.

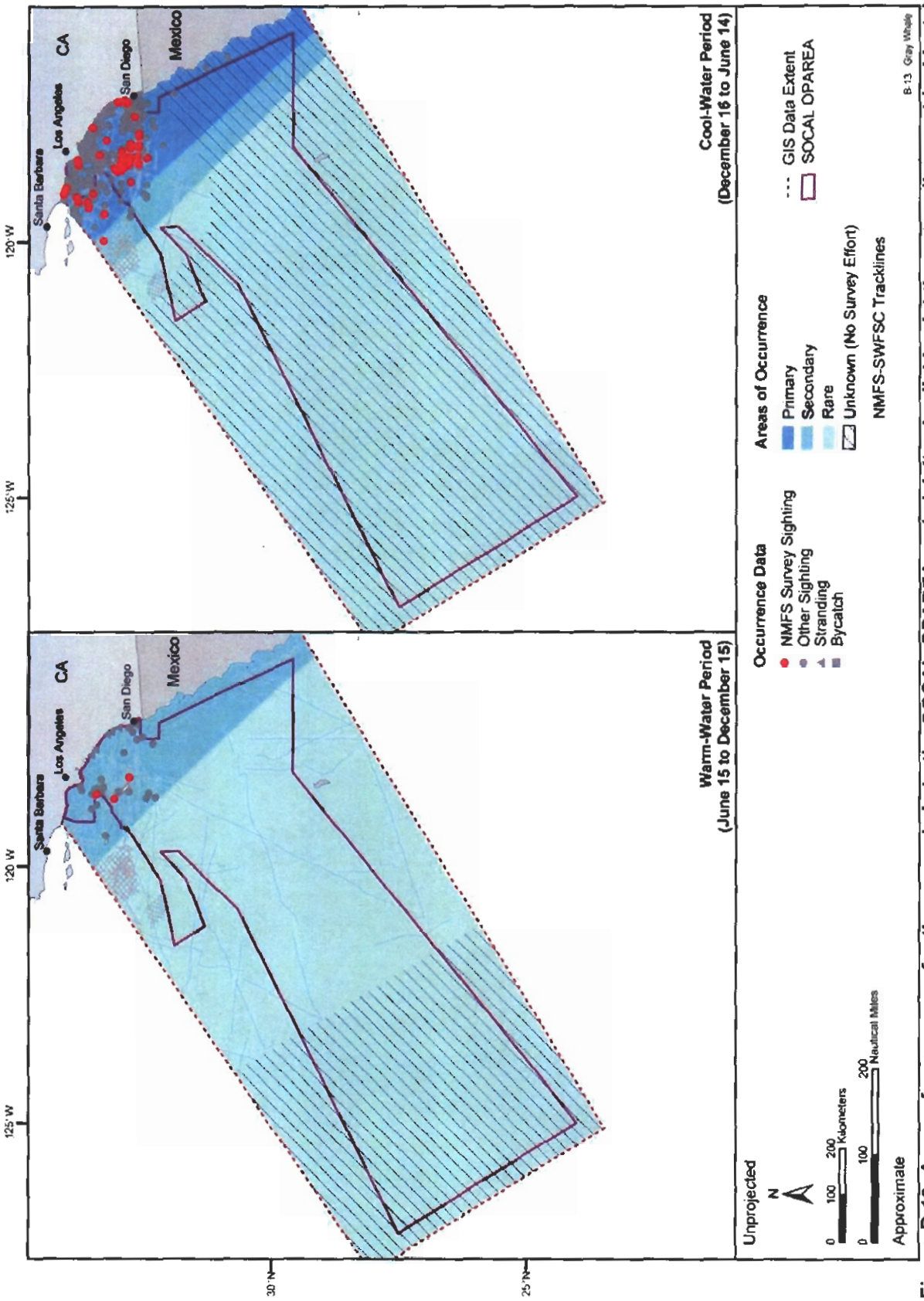


Figure B-13. Areas of occurrence for the gray whale in the SOCAL OPAREA and vicinity. Available sighting, stranding, and incidental fisheries bycatch records are represented by season. Sightings from NMFS-sponsored aerial and shipboard surveys are recorded along pre-determined tracklines, which are also depicted on the map. Source data: refer to Table A-1.

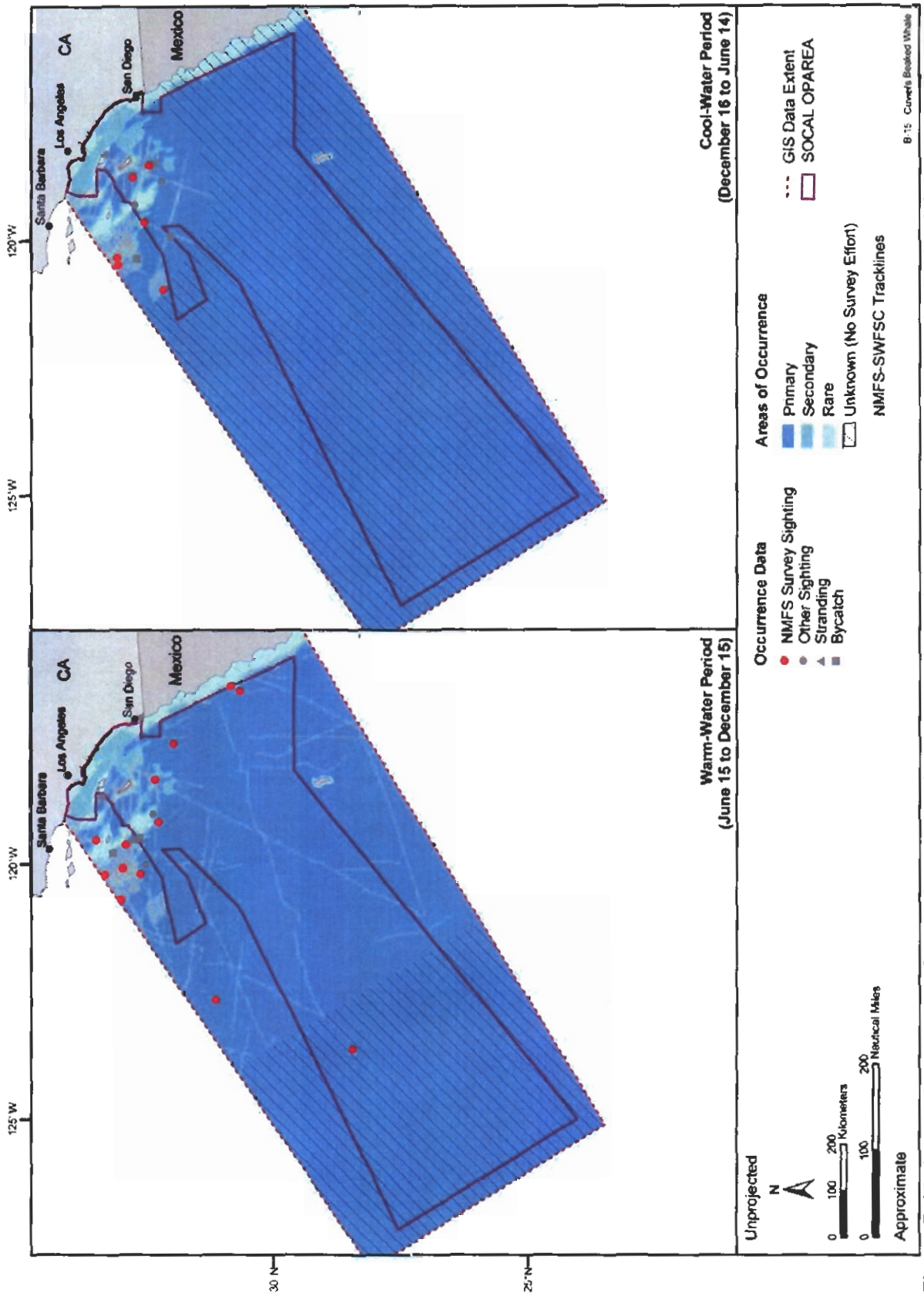


Figure B-15. Areas of occurrence for the Cuvier's beaked whale in the SOCAL OPAREA and vicinity. Available sighting, stranding, and incidental fisheries bycatch records are represented by season. Sightings from NMFS-sponsored aerial and shipboard surveys are recorded along pre-determined tracklines, which are also depicted on the map. Source data: refer to Table A-1.

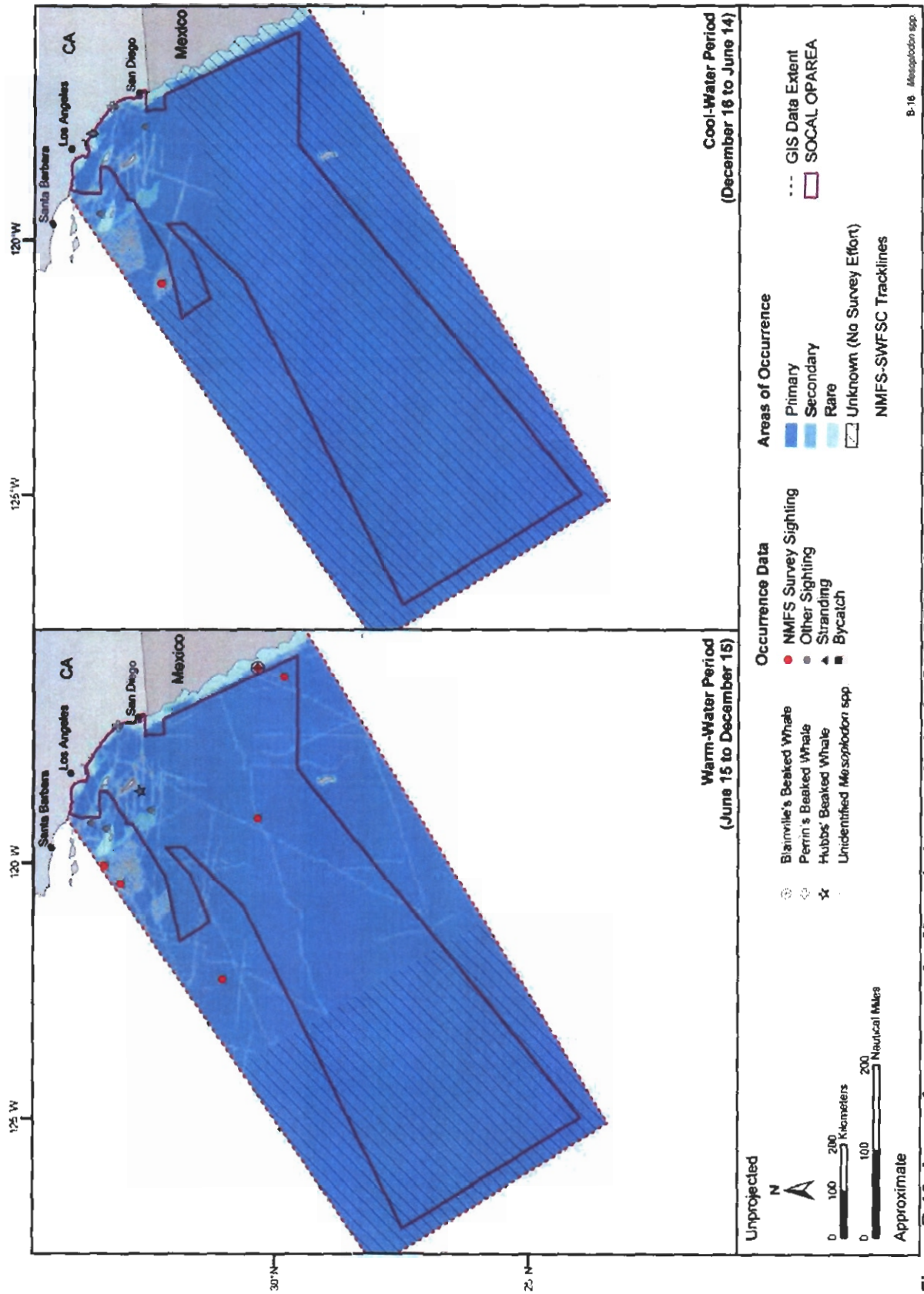
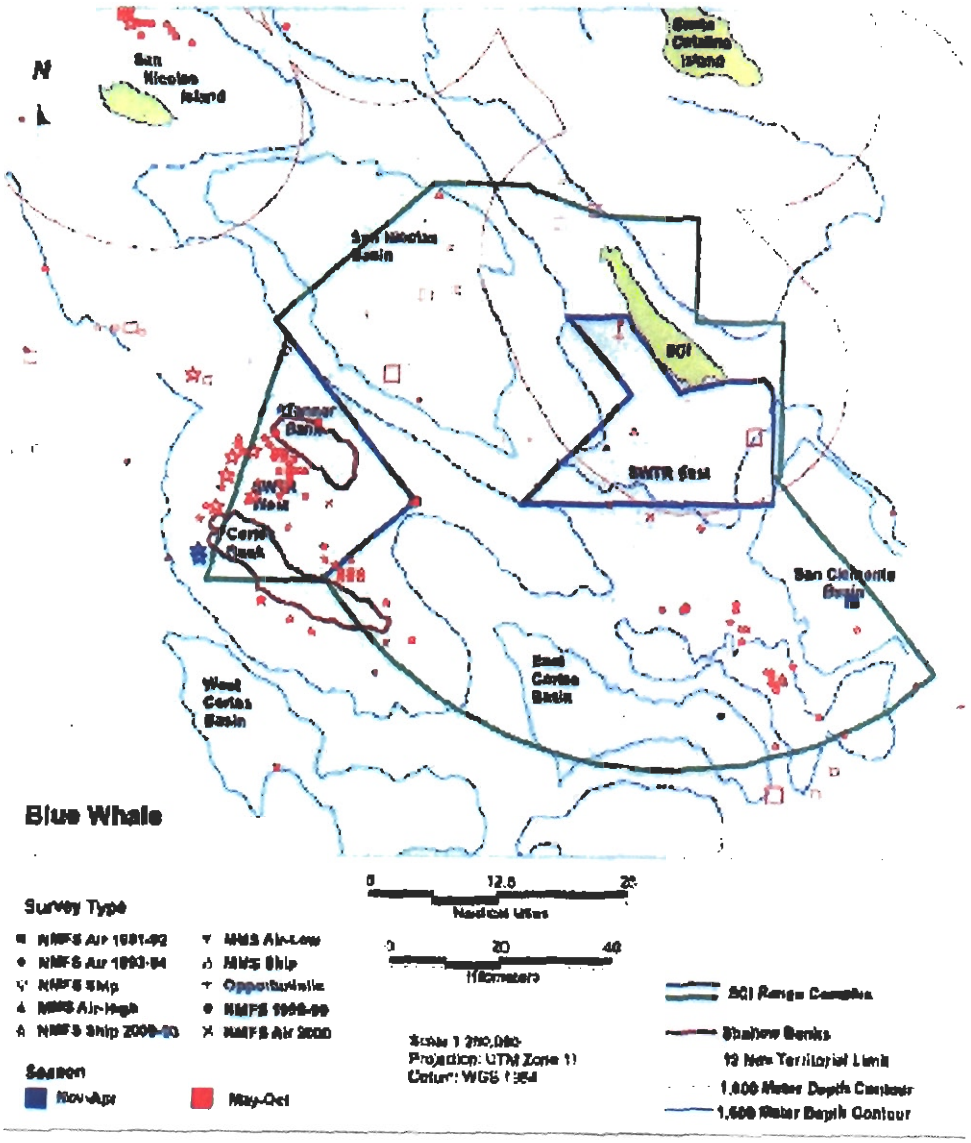


Figure B-16. Areas of occurrence for *Mesoplodon* spp. in the SOCAL OPAREA and vicinity. Available sighting, stranding, and incidental fisheries bycatch records are represented by season. Sightings from NMFS-sponsored aerial and shipboard surveys are recorded along pre-determined tracklines, which are also depicted on the map. Source data: refer to Table A-1.

Map 3a. Distribution of Blue Whales in portions of the Southern California Bight.



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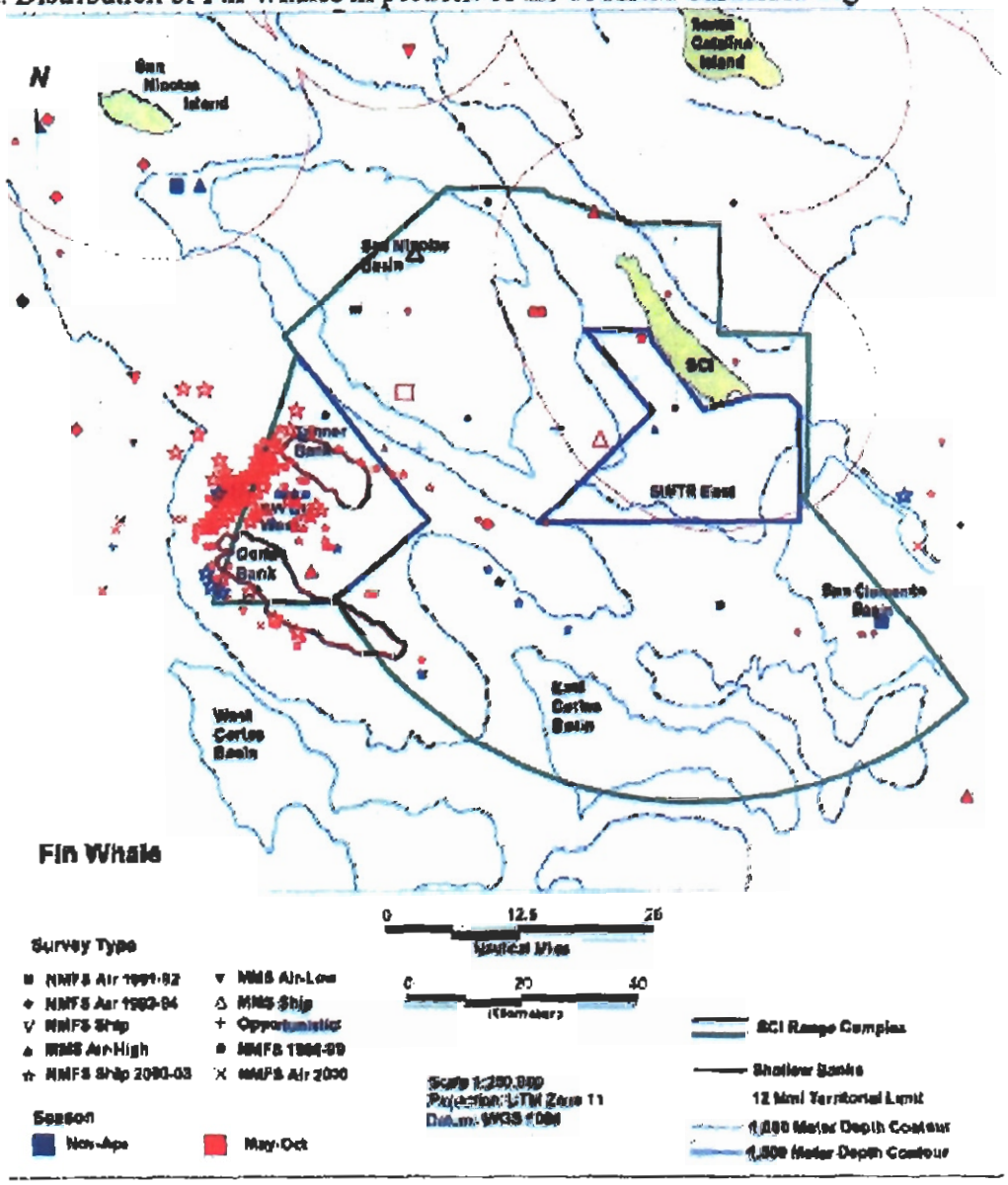
Map 4a. Distribution of Fin Whales in portions of the Southern California Bight.