Update # 2 To:

REQUEST FOR LETTER OF AUTHORIZATION FOR THE INCIDENTAL HARASSMENT OF MARINE MAMMALS RESULTING FROM NAVY TRAINING OPERATIONS CONDUCTED WITHIN THE SOUTHERN CALIFORNIA RANGE COMPLEX

Submitted to:

Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, Maryland 20910-3226

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1. DESCRIPTION OF ACTIVITIES

There are no changes to Chapter 1 as described under the April 2008 Request for Letter of Authorization.

2. DURATION AND LOCATION OF ACTIVITIES

There are no changes to Chapter 2 as described under the April 2008 Request for Letter of Authorization.

3. MARINE MAMMAL SPECIES AND NUMBERS

There are no changes to Chapter 3 as described under the April 2008 Request for Letter of Authorization.

4. AFFECTED SPECIES STATUS AND DISTRIBUTION

There are no changes to Chapter 4 as described under the April 2008 Request for Letter of Authorization.

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5. HARASSMENT AUTHORIZATION REQUESTED

Replace Chapter 5 of the April 2008 Request for Letter of Authorization with the following updated material:

The Navy maintains its request for a Letter of Authorization (LOA) for the incidental harassment of marine mammals pursuant to Section 101 (a)(5)(A) of the Marine Mammal Protection Act (MMPA) as submitted in April 2008. The authorization requested is for the incidental harassment of marine mammals under the MMPA due to Level A and Level B harassment. However, it is understood that an LOA is applicable for up to 5 years, and is appropriate where authorization for serious injury or mortality of marine mammals is requested.

The request is for exercises and training events conducted within the Southern California (SOCAL) Range Complex. These include operations that use active mid-frequency and high frequency sonar or involve underwater detonations. The request is for a 5-year period commencing in January 1, 2009.

The training events analyzed are not new and have taken place in the SOCAL Range Complex over the past 40 years, and with no significant changes in the equipment being used in the last 30 years. Although there may be many hours of active ASW sonar events, the actual “pings” of the sonar signal may only occur several times a minute, as it is necessary for the ASW operators to listen for the return echo of the sonar ping. As a result of scientific advances in acoustic exposure effects analysis modeling on marine mammals, the extent of acoustic exposure on marine mammals can be estimated.

The acoustic modeling approach taken in the SOCAL Range Complex Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) and this LOA Request attempts to quantify potential exposures to marine mammals resulting from operation of mid-frequency active sonar and underwater detonations. Results from this conservative modeling approach provide an overestimation of exposures and are presented without consideration of mitigation measures employed per Navy standard operating procedures. For example, securing or turning off an active sonar when an animal approaches closer than a specified distance reduces potential exposure since the sonar is no longer transmitting and range clearance procedures and safety requirements having long set-up times for events using explosives make it very unlikely any marine mammals will be in the vicinity undetected.

It is estimated that 123,422 marine mammals will exhibit behavioral responses NMFS will classify as Level B harassment (this total includes 10,873 TTS and 112,549 Risk Function based on modeling results and analysis) as a result of MFA/HFA sonar use.

Modeling results predict that for this LOA request, seven species could be exposed to sonar in excess of the onset permanent threshold shift (PTS) threshold indicative of Level A injury without consideration of mitigation measures. Given the likely detection of animals at the short distances involved for PTS to occur and the prominent detection cues from gray whales or species such as common dolphins that travel in large pods, it is very unlikely these exposures will occur.

In addition, the modeling indicates 1,499 annual exposures to pressure or acoustics from underwater detonations that could result in a sub-TTS behavioral response (threshold of 177 db re 1µPa^2-s) and 1128 that could cause TTS (threshold of 182 db re 1µPa^2-s or 23 psi). The total number of exposures from explosives that NMFS would classify as Level B harassment would be 2,627. Modeling indicates 34 exposures from underwater detonations that could cause slight injury, resulting in Level A harassment and 11 that could cause mortality.

Therefore, it is estimated that in total, 126,049 marine mammals will exhibit behavioral responses NMFS will classify as Level B harassment. This includes 10,873 TTS and 112,549 risk function exposures as a result of MFA/HFA sonar use in addition to 2,627 exposures (1,499 sub-TTS exposures and 1,128 TTS exposures) to underwater detonations. It is extimated that there could be 53 exposures that would be classified as Level A harassments (PTS; tympanic membrande or slight lung injury (19 from MFA/HFA sonar and 34 from underwater detonations). Modeling estimates 11 exposures to underwater detonations that could mortality.

Without consideration of mitigation measures for underwater detonations, the modeling results from the SOCAL Range Complex analysis predicts 11 exposures that could cause mortality. However, given range clearance procedures with long set-up times, standard mitigation measures presented in Chapter 11, and the increased likelihood that long and short beaked common dolphins and California sea lions can be readily detected, Level A exposures and mortality are unlikely to occur.

To reiterate an important point, the history of Navy activities in the Southern California and analysis in this document indicate that military readiness activities are not expected to result in any sonar–induced Level A injury or mortalities to marine mammals.

Evidence from five beaked whale strandings, all of which have taken place outside or the SOCAL Range Complex, and have occurred over approximately a decade, suggests that the exposure of beaked whales to mid-frequency sonar in the presence of certain conditions (e.g., multiple units using tactical sonar, steep bathymetry, constricted channels, strong surface ducts, etc.) may result in strandings, potentially leading to mortality. Although these physical factors believed to contribute to the likelihood of beaked whale strandings are not present, in their aggregate, in SOCAL, scientific uncertainty exists regarding what other factors, or combination of factors, may contribute to beaked whale strandings.

Neither NMFS nor the Navy anticipates that marine mammal strandings or mortality will result from the operation of mid-frequency sonar during Navy exercises within the SOCAL Range Complex. However, to allow for scientific uncertainty regarding the strandings of beaked whales and the exact mechanisms of the physical effects, the Navy will request authorization for take, by mortality, of the beaked whale species present in the SOCAL Range Complex despite the decades long history of these same training operations with the same basic equipment having had no know effect on beaked whales or any other marine mammals. As a conservative approach within the scope of this Request for Letter of Application (5 years), this request will include take by Mortality for a total of ten (10) beaked whales of the Ziphidae family to include any combination of Baird's beaked whales, Cuvier's beaked whales, and *Mesoplodon* spp.

The MMPA prohibits any person subject to the Act from taking a marine mammal within U.S. waters or on the high seas, without authorization from NMFS. The Navy determined that its activities occurring in U.S. waters and on the high seas may result in incidental takings of marine mammals by harassment. For that reason, the Navy is applying for authorization from NMFS for such takings.

6. NUMBER AND SPECIES EXPOSED

Summary of Updated Material: This Update # 2 revises Chapter 6 of the April 2008 Request for Letter of Authorization as follows:

- Adds new material to existing Section 6.18.3 of the April 2008 Request for Letter of Authorization.
- Adds new material to exisiting Section 6.24 of the April 2008 Request for Letter of Authorization (text updating Sections 6.24.1 and 6.24.2)
- Replaces tables in Section 6.24, as follows:
    - Update Table 6-16a replaces the corresponding Table 6-16 of the April 2008 Request for Letter of Authorization.
    - Update Table 6-17a replaces the corresponding Table 6-17 of the April 2008 Request for Letter of Authorization.
    - Update Table 6-18a replaces the corresponding Table 6-18 of the April 2008 Request for Letter of Authorization.
    - Update Table 6-19a replaces the corresponding Table 6-19 of the April 2008 Request for Letter of Authorization.
    - Update Table 6-20a replaces the corresponding Table 6-20 of the April 2008 Request for Letter of Authorization.
    - Update Table 6-21a replaces the corresponding Table 6-21 of the April 2008 Request for Letter of Authorization.
- Provides material replacing the species-specific effects analysis in Section 6.24.3, beginning on page 320 through page 337 of the April 2008 Request for Letter of Authorization.

6.18.3 Explosives

Sub-TTS Exposures for Underwater Detonations

There may be rare occasions when multiple successive explosives (MSE) are part of a static location event such as during MINEX, MISSILEX, BOMBEX, SINKEX, GUNEX, and NSFS (when using other than inert weapons). For these events, the Churchill FEIS approach was extended to cover MSE events occurring at the same static location. For MSE exposures, accumulated energy over the entire training time is the natural extension for energy thresholds since energy accumulates with each subsequent shot; this is consistent with the treatment of multiple arrivals in Churchill. For positive impulse, it is consistent with Churchill FEIS to use the maximum value over all impulses received.

For MSE, the acoustic criterion for sub-TTS behavioral disturbance is used to account for behavioral effects significant enough to be judged as harassment, but occurring at lower sound energy levels than those that may cause TTS. The sub-TTS threshold is derived following the approach of the Churchill FEIS for the energy-based TTS threshold.

The research on pure-tone exposures reported in Schlundt et al. (2000) and Finneran and Schlundt (2004) provided a threshold of 192 dB re 1 μPa2-s as the lowest TTS value. This value for pure-tone exposures is modified for explosives by (a) interpreting it as an energy metric, (b) reducing it by 10 dB to account for the time constant of the mammal ear, and (c) measuring the energy in 1/3 octave bands, the natural filter band of the ear. The resulting TTS threshold for explosives is 182 dB re 1 μPa^2-s in any 1/3 octave band. As reported by Schlundt et al. (2000) and Finneran and Schlundt (2004), instances of altered behavior in the pure-tone research generally began five dB lower than those causing TTS. The sub-TTS threshold is therefore derived by subtracting five dB from the 182 dB re 1 μPa^2-s in any 1/3 octave band threshold, resulting in a 177 dB re 1 μPa^2-s (EL) sub-TTS behavioral disturbance threshold for MSE.

Preliminary modeling undertaken for other Navy compliance documents using the sub-TTS threshold of 177 dB has demonstrated that for events involving MSE using small (NEW) explosives (MINEX, GUNEX, NSFS, and underwater detonation), the footprint of the threshold for explosives onset TTS criteria based on the 23 psi pressure component dominates and supersedes any exposures at a received level involving the 177 dB EL threshold. Restated in another manner, modeling for the sub-TTS threshold should not result in any estimated impacts that are not already quantified under the larger footprint of the 23 psi criteria for small MSE. Given that modeling for sub-TTS should not, therefore, result in any additional harassment takes for MINEX, GUNEX, NSFS, and underwater detonation, analysis of potential for behavioral disturbance using the sub-TTS criteria was not undertaken for these events (MINEX, GUNEX, NSFS, and underwater detonation).

For the remainder of the MSE events (BOMBEX, SINKEX, and MISSILEX) where the sub-TTS exposures may need to be considered, these potential behavioral disturbances were estimated by extrapolation from the acoustic modeling results for the explosives TTS threshold (182 dB re 1 mPa^2-s in any 1/3 octave band). To account for the 5 dB lower sub-TTS threshold, a factor of 3.17 was applied to the TTS modeled numbers in order to extrapolate the number of sub-TTS exposures estimated for MSE events. This multiplication factor is used calculate the increased area represented by the difference between the 177 dB sub-TTS threshold and the modeled 182 dB threshold. The factor is based on the increased range 5 dB would propagate (assuming spherical spreading), where the range increases by approximately 1.78 times, resulting in a circular area increase of approximately 3.17 times that of the modeled results at 182 dB.

Potential overlap of exposures from multiple explosive events within a 24-hour period was not taken into consideration in the modeling resulting in the potential for some double counting of exposures. However, because an animal would generally move away from the area following the first explosion, the overlap is likely to be minimal.

It should be emphasized that there is a lead time for set up and clearance of any area before an event using explosives takes place (this may be 30 minutes for an underwater detonation to several hours for a SINKEX). There will, therefore, be a long period of rather intense activity before the event occurs when the area is under observation and before any detonation or live fire occurs. Ordnance cannot be released until the target area is determined clear. In addition, the event is immediately halted if sea turtles are observed within the target area and the training is delayed until the animal clears the area. These mitigation factors to determine if the area is clear, serve to minimize the risk of harming sea turtles and marine mammals.

6.24 Sonar Exposure [and Underwater Detonation] Summary

6.24.1 Summary of Potential Mid-Frequency Active Sonar Effects

The sonar modeling input includes surface ship and submarine MFA tactical sonar, the associated DICASS sonobuoy, dipping sonar, and MK-48 torpedo sonar. Table 6-1 provides a summary of the total sonar exposures from all Alternative 3 ASW training that will be conducted over the course of a year. It is estimated that 123,422 marine mammals will exhibit responses NMFS will classify as behavioral harassment (Level B) as a result of MFA/HFA sonar use (112,549 using the Risk Function and 10,873 from TTS). Nineteen marine mammals will be exposed to sonar in excess of permanent threshold shift (PTS) threshold indicative of Level A injury. These exposure numbers are generated by the model without consideration of mitigation measures that would reduce the potential for marine mammal exposures to sonar.

The behavioral patterns and acoustic abilities for each species were analyzed in the SOCAL Range Complex DEIS/OEIS and Request for Letter of Authorization. Based on that analysis, results of past training, and the implementation of mitigation measures the Navy found that the SOCAL Range Complex training events would not result in any death or injury to any marine mammal species. The DEIS/OEIS and Request for Letter of Authorization also found that while the acoustic modeling results indicated MFA and HFA sonar may expose all species to acoustic energy levels resulting in temporary behavioral effects, these exposures would have negligible impact on annual survival, recruitment, and birth rates.

Table 6-16a. Summary of Annual Mid- and High-Frequnecy Active Sonar Exposures

Species	Level B Sonar Exposures		Level A Sonar Exposures
	Risk Function	TTS	PTS
ESA Species			
Blue whale	538	67	1
Fin whale	152	12	0
Humpback whale	13	2	0
Sei whale	0	0	0
Sperm whale	137	8	0
Guadalupe fur seal	870	190	0
Sea otter	0	0	0
Mysticetes			
Bryde's whale	0	0	0
Gray whale	4,903	544	1
Minke whale	110	16	0
Odontocetes			
Baird's beaked whale	12	1	0
Bottlenose dolphin	1,257	191	0
Cuvier's beaked whale	383	37	0
Dall's porpoise	530	88	0
Dwarf sperm whale	N/A	N/A	N/A
False killer whale	N/A	N/A	N/A
Killer whale	6	1	0
Long beaked common dolphin	4,049	432	1
Longman's beaked whale	N/A	N/A	N/A
Melon-headed whale	N/A	N/A	N/A
Mesoplodon spp.	115	13	0
Northern right whale dolphin	1,306	166	0
Pacific white-sided dolphin	1,150	189	0
Pantropical spotted dolphin	N/A	N/A	N/A
Pygmy killer whale	N/A	N/A	N/A
Pygmy sperm whale	141	16	0
Risso's dolphin	3,123	340	0
Rough-toothed dolphin	N/A	N/A	N/A
Short beaked common dolphin	34,795	3,727	6
Short-finned pilot whale	39	6	0
Spinner dolphin	N/A	N/A	N/A
Striped dolphin	1,569	249	1
Ziphiid whales	86	8	0
Pinnipeds			
Northern elephant seal	833	5	0
Pacific harbor seal	1,014	4,559	9
California sea lion	54,346	3	0
Northern fur seal	1,072	3	0
Total	**112,549**	**10,873**	**19**

Thresholds: Cetaceans TTS = 195 dB re 1 µPa^2-s; PTS = 215 dB, re 1 µPa^2-s, northern elephant seal TTS = 204 re 1 µPa^2-s, PTS = 224 re 1 µPa^2-s; harbor seal TTS = 183 re 1 µPa^2-s, PTS = 203; Otariids TTS = 206 re 1 µPa^2-s, PTS = 226 re 1 µPa^2-s.
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

Table 6-17a. Summary of ULT, Coordinated Events and Maintenance Annual Sonar Exposures

Species	Level B Sonar Exposures		Level A Sonar Exposures
	Risk Function	TTS	PTS
ESA Species			
Blue whale	213	21	0
Fin whale	73	4	0
Humpback whale	5	1	0
Sei whale	0	0	0
Sperm whale	61	3	0
Guadalupe fur seal	320	75	0
Sea otter	0	0	0
Mysticetes			
Bryde's whale	0	0	0
Gray whale	1,771	167	0
Minke whale	46	5	0
Odontocetes			
Baird's beaked whale	6	1	0
Bottlenose dolphin	590	60	0
Cuvier's beaked whale	164	13	0
Dall's porpoise	222	27	0
Dwarf sperm whale	N/A	N/A	N/A
False killer whale	N/A	N/A	N/A
Killer whale	3	1	0
Long beaked common dolphin	2,136	140	0
Longman's beaked whale	N/A	N/A	N/A
Melon-headed whale	N/A	N/A	N/A
Mesoplodon spp.	51	4	0
Northern right whale dolphin	652	52	0
Pacific white-sided dolphin	550	60	0
Pantropical spotted dolphin	N/A	N/A	N/A
Pygmy killer whale	N/A	N/A	N/A
Pygmy sperm whale	63	5	0
Risso's dolphin	1,550	110	0
Rough-toothed dolphin	N/A	N/A	N/A
Short beaked common dolphin	18,359	1,211	2
Short-finned pilot whale	16	2	0
Spinner dolphin	N/A	N/A	N/A
Striped dolphin	594	77	0
Ziphiid whales	37	3	0
Pinnipeds			
Northern elephant seal	534	3	0
Pacific harbor seal	560	2,530	5
California sea lion	23,242	2	0
Northern fur seal	535	1	0
Total	**52,353**	**4,576**	**7**

TTS and PTS Thresholds: Cetaceans TTS = 195 dB re 1 μPa^2-s; PTS = 215 dB, re 1 μPa^2-s; Northern elephant seal TTS = 204 re 1 μPa^2-s, PTS = 224 re 1 μPa^2-s; Harbor seal TTS = 183 re 1 μPa^2-s, PTS = 203 re 1 μPa^2-s; Otariids TTS = 206 re 1 μPa^2-s, PTS = 226 re 1 μPa^2-s.

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.

Table 6-18a. Summary of Major Exercises Annual Sonar Exposures

Species	Level B Sonar Exposures		Level A Sonar Exposures
	Risk Function	TTS	PTS
ESA Species			
Blue whale	229	35	1
Fin whale	57	6	0
Humpback whale	6	1	0
Sei whale	0	0	0
Sperm whale	55	4	0
Guadalupe fur seal	387	93	0
Sea otter	0	0	0
Mysticetes			
Bryde's whale	0	0	0
Gray whale	2,189	286	0
Minke whale	45	8	0
Odontocetes			
Baird's beaked whale	5	1	0
Bottlenose dolphin	463	99	0
Cuvier's beaked whale	155	18	0
Dall's porpoise	217	46	0
Dwarf sperm whale	N/A	N/A	N/A
False killer whale	N/A	N/A	N/A
Killer whale	2	1	0
Long beaked common dolphin	1,300	219	0
Longman's beaked whale	N/A	N/A	N/A
Melon-headed whale	N/A	N/A	N/A
Mesoplodon spp.	45	6	0
Northern right whale dolphin	449	86	0
Pacific white-sided dolphin	414	98	0
Pantropical spotted dolphin	N/A	N/A	N/A
Pygmy killer whale	N/A	N/A	N/A
Pygmy sperm whale	56	8	0
Risso's dolphin	1,093	171	0
Rough-toothed dolphin	N/A	N/A	N/A
Short beaked common dolphin	11,165	1,886	3
Short-finned pilot whale	18	3	0
Spinner dolphin	N/A	N/A	N/A
Striped dolphin	685	130	0
Ziphiid whales	35	4	0
Pinnipeds			
Northern elephant seal	224	2	0
Pacific harbor seal	286	1,395	3
California sea lion	23,546	1	0
Northern fur seal	369	2	0
Total	**43,495**	**4,609**	**7**

TTS and PTS Thresholds: Cetaceans TTS = 195 dB re 1 μPa^2-s; PTS = 215 dB, re 1 μPa^2-s; Northern elephant seal TTS = 204 re 1 μPa^2-s, PTS = 224 re 1 μPa^2-s; Harbor seal TTS = 183 re 1 μPa^2-s, PTS = 203 re 1 μPa^2-s; Otariids TTS = 206 re 1 μPa^2-s, PTS = 226 re 1 μPa^2-s.

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.

Table 6-19a. Summary of IAC II Annual Sonar Exposures

Species	Level B Sonar Exposures		Level A Sonar Exposures
	Risk Function	**TTS**	**PTS**
ESA Species			
Blue whale	73	8	0
Fin whale	17	2	0
Humpback whale	2	0	0
Sei whale	0	0	0
Sperm whale	16	1	0
Guadalupe fur seal	126	16	0
Sea otter	0	0	0
Mysticetes			
Bryde's whale	0	0	0
Gray whale	731	68	0
Minke whale	15	2	0
Odontocetes			
Baird's beaked whale	1	0	0
Bottlenose dolphin	151	24	0
Cuvier's beaked whale	47	5	0
Dall's porpoise	69	11	0
Dwarf sperm whale	N/A	N/A	N/A
False killer whale	N/A	N/A	N/A
Killer whale	1	0	0
Long beaked common dolphin	449	55	0
Longman's beaked whale	N/A	N/A	N/A
Melon-headed whale	N/A	N/A	N/A
Mesoplodon spp.	15	2	0
Northern right whale dolphin	151	21	0
Pacific white-sided dolphin	139	23	0
Pantropical spotted dolphin	N/A	N/A	N/A
Pygmy killer whale	N/A	N/A	N/A
Pygmy sperm whale	17	2	0
Risso's dolphin	351	45	0
Rough-toothed dolphin	N/A	N/A	N/A
Short beaked common dolphin	3,856	472	1
Short-finned pilot whale	4	1	0
Spinner dolphin	N/A	N/A	N/A
Striped dolphin	223	31	0
Ziphiid whales	11	1	0
Pinnipeds			
Northern elephant seal	57	0	0
Pacific harbor seal	139	540	1
California sea lion	5,604	0	0
Northern fur seal	123	1	0
Total	**12,388**	**1,330**	**2**

TTS and PTS Thresholds: Cetaceans TTS = 195 dB re 1 μPa^2-s; PTS = 215 dB, re 1 μPa^2-s; Northern elephant seal TTS = 204 re 1 μPa^2-s, PTS = 224 re 1 μPa^2-s; Harbor seal TTS = 183 re 1 μPa^2-s, PTS = 203 re 1 μPa^2-s; Otariids TTS = 206 re 1 μPa^2-s, PTS = 226 re 1 μPa^2-s.

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.

Table 6-20a. Summary of Sustainment Annual Sonar Exposures

Species	Level B Sonar Exposures		Level A Sonar Exposures
	Risk Function	TTS	PTS
ESA Species			
Blue whale	23	3	0
Fin whale	5	0	0
Humpback whale	0	0	0
Sei whale	0	0	0
Sperm whale	5	0	0
Guadalupe fur seal	37	6	0
Sea otter	0	0	0
Mysticetes			
Bryde's whale	0	0	0
Gray whale	212	23	0
Minke whale	4	1	0
Odontocetes			
Baird's beaked whale	0	0	0
Bottlenose dolphin	53	8	0
Cuvier's beaked whale	17	1	0
Dall's porpoise	22	4	0
Dwarf sperm whale	N/A	N/A	N/A
False killer whale	N/A	N/A	N/A
Killer whale	0	0	0
Long beaked common dolphin	164	18	0
Longman's beaked whale	N/A	N/A	N/A
Melon-headed whale	N/A	N/A	N/A
Mesoplodon spp.	4	1	0
Northern right whale dolphin	54	7	0
Pacific white-sided dolphin	47	8	0
Pantropical spotted dolphin	N/A	N/A	N/A
Pygmy killer whale	N/A	N/A	N/A
Pygmy sperm whale	5	1	0
Risso's dolphin	129	14	0
Rough-toothed dolphin	N/A	N/A	N/A
Short beaked common dolphin	1,415	158	0
Short-finned pilot whale	1	0	0
Spinner dolphin	N/A	N/A	N/A
Striped dolphin	67	11	0
Ziphiid whales	3	0	0
Pinnipeds			
Northern elephant seal	18	0	0
Pacific harbor seal	29	94	0
California sea lion	1,954	0	0
Northern fur seal	45	0	0
Total	**4,313**	**358**	**0**

TTS and PTS Thresholds: Cetaceans TTS = 195 dB re 1 μPa^2-s; PTS = 215 dB, re 1 μPa^2-s; Northern elephant seal TTS = 204 re 1 μPa^2-s, PTS = 224 re 1 μPa^2-s; Harbor seal TTS = 183 re 1 μPa^2-s, PTS = 203 re 1 μPa^2-s; Otariids TTS = 206 re 1 μPa^2-s, PTS = 226 re 1 μPa^2-s.

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.

6.24.2 Summary of Potential Underwater Detonation Effects

The explosive modeling input includes Mine Neutralization, MISSILEX, BOMBEX, SINKEX, Extended Echo Ranging and Improved Extended Echo Ranging (EER/IEER), GUNEX, and NSFS.

The (EER/IEER) Systems are airborne ASW systems used in conducting "large area" searches for submarines. These systems are made up of airborne avionics ASW acoustic processing and sonobuoy types that are deployed in pairs. The EER/IEER System's active sonobuoy component, the AN/SSQ-110A Sonobuoy, would generate a sonar "ping" (generated by a small explosive to create an acoustic wave "ping") and the passive AN/SSQ-101 ADAR Sonobuoy would "listen" for the return echo of the sonar ping that has been bounced off the surface of a submarine. These sonobuoys are designed to provide underwater acoustic data necessary for naval aircrews to quickly and accurately detect submerged submarines. The sonobuoy pairs are dropped from a fixed-wing aircraft into the ocean in a predetermined pattern with a few buoys covering a very large area. The AN/SSQ-110A Sonobuoy Series is an expendable and commandable sonobuoy. Upon command from the aircraft, the bottom payload is released to sink to a designated operating depth. A second command is required from the aircraft to cause the second payload to release and detonate generating a "ping". There is only one detonation in the pattern of buoys at a time.

The modeled explosive exposure harassment numbers by species are presented in Table 6-2. Estimates for the sub-TTS behavioral threshold (Level B) indicate there may be 1,499 exposures resulting in behavioral harassment (sub-TTS at 177 dB) from successive explosions in a single event involving underwater detonations. Given that successive multiple explosions are rare events and considering range clearance, it is extremely unlikely there would be any exposures exceeding the sub-TTS behavioral threshold. Without consideration of range clearance procedures, the table indicates the potential for non-injurious (Level B) harassment, as well as the onset of injury (Level A) harassment to cetaceans. The modeling indicates 1,128 annual exposures to pressure or acoustics from underwater detonations that could result in TTS. The total number of exposures NMFS would classify as Level B harassment would be 2,627 (Sub TTS and TTS exposures). Modeling indicates 34 exposures from underwater detonations that could cause slight injury (Threshold of 205 dB or 13 psi-ms), resulting in Level A harassment and 11 exposures that could cause mortality (threshold of 31 psi-ms). To reiterate, these exposure modeling results are estimates of marine mammal underwater detonation sound exposures without consideration of standard mitigation and monitoring procedures. Implementation of the mitigation and monitoring procedures presented in Chapter 5.0 of the EIS/OEIS and chapter 11 of the Request for Letter of Authorization will minimize the potential for marine mammal exposure and harassment through range clearance procedures.

Table 6-21a. Annual Underwater Detonation Exposures Summary.

Species	Level B Exposures		Level A	
	Sub-TTS 177 dB re 1 μPa^2-s	TTS 182 dB re 1 μPa^2-s /23 psi	50% TM Rupture 203 dB re 1 μPa^2-s or Slight Lung Injury 13 psi-ms	Onset Massive Lung Injury or Mortality 31 psi-ms
ESA Species				
Blue whale	2	2	0	0
Fin whale	2	1	0	0
Humpback whale	0	0	0	0
Sei whale	0	0	0	0
Sperm whale	2	1	0	0
Guadalupe fur seal	2	2	0	0
Sea otter	0	0	0	0
Non ESA Species				
Bryde's whale	0	0	0	0
Gray whale	6	7	0	0
Minke whale	0	0	0	0
Baird's beaked whale	0	0	0	0
Bottlenose dolphin	14	10	0	0
Cuvier's beaked whale	5	3	0	0
Dall's porpoise	2	2	0	0
Dwarf sperm whale	N/A	N/A	N/A	N/A
False killer whale	N/A	N/A	N/A	N/A
Killer whale	0	0	0	0
Long-beaked common	61	41	1	0
Longman's beaked whale	N/A	N/A	N/A	N/A
Melon-headed whale	N/A	N/A	N/A	N/A
Mesoplodon spp.	2	1	0	0
Northern right whale	19	12	0	0
Pacific white-sided	12	9	0	0
Pantropical spotted	N/A	N/A	N/A	N/A
Pygmy killer whale	N/A	N/A	N/A	N/A
Pygmy sperm whale	1	1	0	0
Risso's dolphin	57	34	1	0
Rough-toothed dolphin	N/A	N/A	N/A	N/A
Short-beaked common	528	354	12	4
Short-finned pilot whale	0	0	0	0
Spinner dolphin	N/A	N/A	N/A	N/A
Striped dolphin	6	6	0	0
Ziphiid whale	2	1	0	0
Northern elephant seal	76	41	0	0
Pacific harbor seal	26	26	1	0
California sea lion	584	510	16	6
Northern fur seal	90	64	3	1
Total	**1,499**	**1,128**	**34**	**11**

6.24.3 Assessment of Marine Mammal Response to Acoustic Exposures

Estimated Effects on ESA Species

Blue Whale

The risk function and Navy post-modeling analysis estimates 538 blue whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be 67 exposures to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. One blue whale would be exposed to sound levels that could cause PTS.

Modeling indicates there would be two exposures to impulsive sound or pressures from underwater detonations of 177 dB re 1 μPa^2-s which is the threshold for sub-TTS behavioral response, and two exposures to182 dB re 1 μPa^2-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).

Given the large size (up to 98 ft [30 m]) of individual blue whales (Leatherwood et al. 1982), pronounced vertical blow, and aggregation of approximately two to three animals in a group (probability of track line detection = 0.90 in Beaufort Sea States of 6 or less; Barlow 2003), it is very likely that lookouts would detect a group of blue whales at the surface. Additionally, mitigation measures call for continuous visual observation during operations with active sonar; therefore, blue whales that migrate into the operating area would be detected by visual observers. Implementation of mitigation measures and probability of detecting a large blue whale reduces the likelihood of exposure, such that effects would be discountable.

In the unlikely event that blue whales are exposed to mid-frequency sonar, the anatomical information available on blue whales suggests that they are not likely to hear mid-frequency (1 kHz–10 kHz) sounds (Ketten 1997). There are no audiograms of baleen whales, but blue whales tend to react to anthropogenic sound below 1 kHz (e.g., seismic air guns), and most of their vocalizations are also in that range, suggesting that they are more sensitive to low frequency sounds (Richardson et al. 1995). Based on this information, if they do no hear these sounds, they are not likely to respond physiologically or behaviorally to those received levels.

Based on the model results, behavioral patterns, acoustic abilities of blue whales, results of past training, and the implementation of procedure mitigation measures presented in Section 11, the Navy finds that the SOCAL Range Complex training events would not likely result in any death or injury to blue whales. Modeling does indicate the potential for Level B harassment, indicating the proposed ASW exercises **may affect blue whales**. An ESA consultation is ongoing, and includes the finding that the proposed ASW exercises may affect blue whales. Should consultation under the ESA conclude that the estimated exposures of humpback whales can be avoided via mitigation measures or that the received sound is not likely to adversely affect blue whales, authorization for the predicted exposures would not be requested under MMPA. At this time, this application requests authorization for the annual harassment of 609 blue whales by Level B harassment (605 from mid-frequency active sonar and four from underwater detonations) and one blue whale by Level A harassment from potential exposure to mid-frequency active sonar.

Fin Whale

The risk function and Navy post-modeling analysis estimates 152 fin whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be 12 exposures to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. No fin whales would be exposed to sound levels that could cause PTS.

Modeling indicates there would be two exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, one exposure to182 dB re 1 μPa^2-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).

Given the large size (up to 78 ft [24m]) of individual fin whales (Leatherwood et al. 1982), pronounced vertical blow, mean aggregation of three animals in a group (probability of trackline detection = 0.90 in Beaufort Sea States of 6 or less; Barlow 2003) it is very likely that lookouts would detect a group of fin whales at the surface. Additionally, mitigation measures call for continuous visual observation during operations with active sonar, therefore, fin whales in the vicinity of operations would be detected by visual observers. Implementation of mitigation measures and probability of detecting a large fin whale reduces the likelihood of exposure, such that effects would be discountable.

In the unlikely event that fin whales are exposed to mid-frequency sonar, the anatomical information available on fin whales suggests that they are not likely to hear mid-frequency (1 kHz–10 kHz) sounds (Richardson et al. 1995; Ketten 1997). Fin whales primarily produce low frequency calls (below 1 kHz) with source levels up to 186 dB re 1µPa at 1 m, although it is possible they produce some sounds in the range of 1.5 to 28 kHz (review by Richardson et al. 1995; Croll et al. 2002). There are no audiograms of baleen whales, but they tend to react to anthropogenic sound below 1 kHz, suggesting that they are more sensitive to low frequency sounds (Richardson et al. 1995). Based on this information, if they do no hear these sounds, they are not likely to respond physiologically or behaviorally to those received levels.

In the St. Lawrence estuary area, fin whales avoided vessels with small changes in travel direction, speed and dive duration, and slow approaches by boats usually caused little response (MacFarlane 1981). Fin whales continued to vocalize in the presence of boat sound (Edds and Macfarlane 1987). Even though any undetected fin whales transiting the SOCAL Range Complex may exhibit a reaction when initially exposed to active acoustic energy, field observations indicate the effects would not cause disruption of natural behavioral patterns to a point where such behavioral patterns would be abandoned or significantly altered.

Based on the model results, behavioral patterns, acoustic abilities of fin whales, results of past training, and the implementation of procedure mitigation measures presented in Section 11, the Navy finds that the SOCAL Range Complex training events would not likely result in any death or injury to fin whales. Modeling does indicate the potential for Level B harassment, indicating the proposed ASW exercises **may affect fin whales**. An ESA consultation is ongoing, and includes the finding that the proposed ASW exercises may affect fin whales. Should consultation under the ESA conclude that the estimated exposures of humpback whales can be avoided via mitigation measures or that the received sound is not likely to adversely affect fin whales, authorization for the predicted exposures would not be requested under MMPA. At this time, this application requests authorization for the annual harassment of 167 fin whales by Level B harassment (164 from mid-frequency active sonar and three from underwater detonations) and no fin whales by Level A harassment from potential exposure to mid-frequency active sonar or underwater detonation.

Humpback Whale

The risk function and Navy post-modeling analysis estimates 13 humpback whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be two exposures to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. No humpback whales would be exposed to sound levels that could cause PTS.

Modeling indicates there would be no exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, no exposures to182 dB re 1 μPa^2-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).

Given the large size (up to 53 ft [16m] of individual humpback whales (Leatherwood et al. 1982), and pronounced vertical blow, it is very likely that lookouts would detect humpback whales at the surface. Additionally, mitigation measures call for continuous visual observation during operations with active sonar, therefore, humpback whales that are present in the vicinity of ASW operations would be detected by visual observers reducing the likelihood of exposure, such that effects would be discountable.

There are no audiograms of baleen whales, but they tend to react to anthropogenic sound below 1 kHz, suggesting that they are more sensitive to low frequency sounds (Richardson et al. 1995). A single study suggested that humpback whales responded to mid-frequency sonar (3.1-3.6 kHz re 1 μPa^2-s) sound (Maybaum 1989). The hand held sonar system had a sound artifact below 1,000 Hz which caused a response to the control playback (a blank tape) and may have affected the response to sonar (i.e., the humpback whale responded to the low frequency artifact rather than the mid-frequency active sonar sound). Humpback whales responded to small vessels (often whale watching boats) by changing swim speed, respiratory rates and social interactions depending on proximity to the vessel and vessel speed, with reponses varying by social status and gender (Watkins et al. 1981; Bauer 1986; Bauer and Herman 1986). Animals may even move out of the area in response to vessel noise (Salden 1988). Humpback whale mother-calf pairs are generally in the shallow protected waters. ASW mid-frequency active sonar activities takes place through out the extensive SOCAL Range Complex but the areas inhabited by humpback whales is represents only a small portion of the SOCAL Range Complex. Frankel and Clark (2000; 2002) reported that there was only a minor response by humpback whales to the Acoustic Thermometry of Ocean Climate (ATOC) sound source and that response was variable with some animals being found closer to the sound source during operation.

Based on the model results, behavioral patterns, acoustic abilities of humpback whales, results of past training, and the implementation of procedure mitigation measures presented in Section 11, the Navy finds that the SOCAL Range Complex training events would not likely result in any death or injury to humpback whales. Modeling does indicate the potential for Level B harassment, indicating the proposed ASW exercises **may affect humpback whales**. An ESA consultation is ongoing, and includes the finding that the proposed ASW exercises may affect humpback whales. Should consultation under the ESA conclude that the estimated exposures of humpback whales can be avoided via mitigation measures or that the received sound is not likely to adversely affect humpback whales, authorization for the predicted exposures would not be requested under MMPA. At this time, this application requests authorization for the annual harassment of 15 humpback whales by Level B harassment (15 from mid-frequency active sonar and none from underwater detonations) and no humpback whales by Level A harassment from potential exposure to mid-frequency active sonar or underwater detonation.

Sei Whale

The risk function and Navy post-modeling analysis estimates no sei whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be no exposures to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. No sei whales would be exposed to sound levels that could cause PTS.

Modeling indicates there would be no exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, no exposures to182 dB re 1 μPa^2-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).

Given the large size (up to 53 ft [16m]) of individual sei whales (Leatherwood et al. 1982), pronounced vertical blow, aggregation of approximately three animals (probability of trackline detection = 0.90 in Beaufort Sea States of 6 or less; Barlow 2003), it is very likely that lookouts would detect a group of sei whales at the surface. Additionally, mitigation measures call for continuous visual observation during operations with active sonar, therefore, sei whales that migrate into the operating area would be detected by visual observers. Implementation of mitigation measures and probability of detecting a large sei whale reduces the likelihood of exposure, such that effects would be discountable.

There is little information on the acoustic abilities of sei whales or their response to human activities. The only recorded sounds of sei whales are frequency modulated sweeps in the range of 1.5 to 3.5 kHz (Thompson et al. 1979) but it is likely that they also vocalized at frequencies below 1 kHz as do fin whales. There are no audiograms of baleen whales but they tend to react to anthropogenic sound below 1 kHz suggesting that they are more sensitive to low frequency sounds (Richardson et al. 1995). Sei whales were more difficult to approach than were fin whales and moved away from boats but were less responsive when feeding (Gunther 1949).

Based on the model results, behavioral patterns, acoustic abilities of sei whales, results of past training, and the implementation of procedure mitigation measures presented in Section 11, the Navy finds that the SOCAL Range Complex training events would not likely result in any death or injury to sei whales. Modeling does indicate the potential for Level B harassment, indicating the proposed ASW exercises **may affect sei whales**. An ESA consultation is ongoing, and includes the finding that the proposed ASW exercises may affect sei whales. Should consultation under the ESA conclude that the estimated exposures of sei whales can be avoided via mitigation measures or that the received sound is not likely to adversely affect sei whales, authorization for the predicted exposures would not be requested under MMPA. At this time, this application does not requests authorization for the annual harassment of any sei whale by Level B harassment and no sei whales by Level A harassment from potential exposure to mid-frequency active sonar or underwater detonation.

Sperm Whales

The risk function and Navy post-modeling analysis estimates 137 sperm whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be eight exposures to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. No sperm whales would be exposed to sound levels that could cause PTS.

Modeling indicates there would be two exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, one exposure to182 dB re 1 μPa^2-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).

Given the large size (up to 56 ft [17m]) of individual sperm whales (Leatherwood et al. 1982), pronounced blow (large and angled), mean group size of approximately seven animals (probability of trackline detection = 0.87 in Beaufort Sea States of 6 or less; Barlow 2003; 2006), it is very likely that lookouts would detect a group of sperm whales at the surface. Sperm whales can make prolonged dives of up to two hours (Watwood et al. 2006) making detection more difficult. Additionally, mitigation measures call for continuous visual observation during operations with active sonar; therefore, sperm whales that migrate into the operating area would be detected by visual observers. Implementation of mitigation measures and probability of detecting a large sperm whale reduces the likelihood of exposure, such that effects would be discountable.

In the unlikely event that sperm whales are exposed to mid-frequency sonar, the information available on sperm whales exposed to received levels of active mid-frequency sonar suggests that the response to mid-frequency (1 kHz to 10 kHz) sounds is variable (Richardson et al. 1995). While Watkins et al. (1985) observed that sperm whales exposed to 3.25 kHz to 8.4 kHz pulses interrupted their activities and left the area, other studies indicate that, after an initial disturbance, the animals return to their previous activity. During playback experiments off the Canary Islands, André et al. (1997) reported that foraging whales exposed to a 10 kHz pulsed signal did not exhibit any general avoidance reactions. When resting at the surface in a compact group, sperm whales initially reacted strongly but then ignored the signal completely (André et al. 1997).

Based on the model results, behavioral patterns, acoustic abilities of sperm whales, results of past training, and the implementation of procedure mitigation measures presented in Section 11, the Navy finds that the SOCAL Range Complex training events would not likely result in any death or injury to sperm whales. Modeling does indicate the potential for Level B harassment, indicating the proposed ASW exercises **may affect sperm whales**. An ESA consultation is ongoing, and includes the finding that the proposed ASW exercises may affect sperm whales. Should consultation under the ESA conclude that the estimated exposures of sperm whales can be avoided via mitigation measures or that the received sound is not likely to adversely affect sperm whales, authorization for the predicted exposures would not be requested under MMPA. At this time, this application requests authorization for the annual harassment of 148 sperm whales by Level B harassment (145 from mid-frequency active sonar and three from underwater detonations) and no sperm whales by Level A harassment from potential exposure to mid-frequency active sonar or underwater detonation.

Guadalupe Fur Seal

The risk function and Navy post-modeling analysis estimates 870 Guadalupe fur seals will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be 190 exposures to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. No Guadalupe fur seals would be exposed to sound levels that could cause PTS.

Modeling indicates there would be two exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, two exposures to182 dB re 1 μPa^2-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).

Guadalupe fur seals dive for short periods and often rest on the surface between foraging bouts (Gallo 1994) making them easier to detect.

Based on the model results, behavioral patterns, acoustic abilities of Guadalupe fur seals, results of past training, and the implementation of procedure mitigation measures presented in Section 11, the Navy finds that the SOCAL Range Complex training events would not likely result in any death or injury to Guadalupe fur seals. Modeling does indicate the potential for Level B harassment, indicating the proposed ASW exercises **may affect Guadalupe fur seals**. An ESA consultation is ongoing, and includes the finding that the proposed ASW exercises may affect Guadalupe fur seals. Should consultation under the ESA conclude that the estimated exposures of Guadalupe fur seals can be avoided via mitigation measures or that the received sound is not likely to adversely affect Guadalupe fur seals, authorization for the predicted exposures would not be requested under MMPA. At this time, this application requests authorization for the annual harassment of 1,064 Guadalupe fur seals by Level B harassment (1,060 from mid-frequency active sonar and four from underwater detonations) and no Guadalupe fur seals by Level A harassment from potential exposure to mid-frequency active sonar or underwater detonation.

Estimated Exposures for Non-ESA Species

Bryde's Whale

The risk function and Navy post-modeling analysis estimates no Bryde's whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-17). Modeling also indicates there would be no exposures to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. No Bryde's whales would be exposed to sound levels that could cause PTS.

Modeling indicates there would be no exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, no exposures to182 dB re 1 μPa^2-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).

Given the large size (up to 46 ft. [14 m]) of individual Bryde's whales, pronounced blow, and mean group size of approximately 1.5 animals and (probability of trackline detection = 0.87 in Beaufort Sea States of 6 or less; Barlow 2003; 2006), it is very likely that lookouts would detect a group of Bryde's whales at the surface. Additionally, mitigation measures call for continuous visual observation during operations with active sonar, therefore, minke whales that migrate into the operating area would be detected by visual observers. Implementation of mitigation measures and probability of detecting a minke whale reduces the likelihood of exposure, such that effects would be discountable.

Based on the model results, behavioral patterns, acoustic abilities of Bryde's whales, results of past training, and the implementation of procedure protective measures presented in Section 11, the Navy finds that the SOCAL Range Complex training events would not result in any population level effects, death or injury to Bryde's whales. At this time, this application does not requests authorization for the annual harassment of any Bryde's whale by Level B harassment and no Bryde's by Level A harassment from potential exposure to mid-frequency active sonar or underwater detonation.

Gray Whale

The risk function and Navy post-modeling analysis estimates 4,903 gray whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be 544 exposures to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. One gray whale would be exposed to sound levels that could cause PTS.

Modeling indicates there would be six exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, seven exposures to182 dB re 1 μPa^2-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).

Given the large size (up to 46 ft. [14 m]) of individual gray whales, pronounced blow, and group size of up to 16 animals (Leatherwood et al. 1982) and (probability of trackline detection = 0.87 in Beaufort Sea States of 6 or less; Barlow 2003; 2006), it is very likely that lookouts would detect a group of gray whales at the surface. Additionally, mitigation measures call for continuous visual observation during operations with active sonar, therefore, gray whales that migrate into the operating area would be detected by visual observers. Implementation of mitigation measures and probability of detecting a gray whale reduces the likelihood of exposure, such that effects would be discountable.

Based on the model results, behavioral patterns, acoustic abilities of gray whales, results of past training, and the implementation of procedure protective measures presented in Section 11, the Navy finds that the SOCAL Range Complex training events would not result in any population level effects, death or injury to gray whales. At this time, 5,460 this application requests authorization for the annual harassment of gray whales by Level B harassment (5,447from mid-frequency active sonar and 13 from underwater detonations) and one gray whale by Level A harassment from potential exposure to MFA/HFA active sonar.

Minke Whale

The risk function and Navy post-modeling analysis estimates 110 minke whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be 16 exposures to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. No minke whales would be exposed to sound levels that could cause PTS.

Modeling indicates there would be no exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, no exposures to182 dB re 1 μPa^2-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).

Minke whales are difficult to spot visually but can be detected using passive acoustic monitoring. Additionally, mitigation measures call for continuous visual observation during operations with active sonar, therefore, minke whales that migrate into the operating area would be detected by visual observers. Implementation of mitigation measures and probability of detecting a minke whale reduces the likelihood of exposure, such that effects would be discountable.

Based on the model results, behavioral patterns, acoustic abilities of minke whales, results of past training, and the implementation of procedure protective measures presented in Section 11, the Navy finds that the SOCAL Range Complex training events would not result in any population level effects, death or injury to minke whales. At this time, this application requests authorization for the annual harassment of 139 minke whales by Level B harassment (139 from mid-frequency active sonar and none from underwater detonations) and no minke whales by Level A harassment from potential exposure to mid-frequency active sonar or underwater detonation.

Baird's Beaked Whale

The risk function and Navy post-modeling analysis estimates 12 Baird's beaked whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be one exposure to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. No Baird's beaked whales would be exposed to sound levels that could cause PTS.

Modeling indicates there would be no exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, no exposures to182 dB re 1 μPa^2-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).

Given the size (up to 15.5 ft. [4.7 m]) of individual Baird's beaked whales, aggregation of 2.3 animals, it is likely that lookouts would detect a group of Baird's beaked whales at the surface although beaked whales make prolonged dives that can last up to an hour (Baird et al. 2004). Implementation of mitigation measures and probability of detecting a large sei whale reduces the likelihood of exposure, such that effects would be discountable.

Based on the model results, behavioral patterns, acoustic abilities of Baird's beaked whales, results of past training, and the implementation of procedure protective measures presented in

Section 11, the Navy finds that the SOCAL Range Complex training events would not result in any population level effects, death or injury to Baird's beaked whales. At this time, this application requests authorization for the annual harassment of 13 Baird's beaked whales by Level B harassment (13 from mid-frequency active sonar and none from underwater detonations) and no Baird's beaked whales by Level A harassment from potential exposure to mid-frequency active sonar or underwater detonation.

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 μPa^2-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 μPa^2-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).

Given the frequent surfacing, aggregation of approximately 9 animals (probability of trackline detection = 0.76 in Beaufort Sea States of 6 or less; Barlow 2003), 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.

Based on the model results, behavioral patterns, acoustic abilities of bottlenose dolphins, results of past training, and the implementation of procedure mitigation measures presented in Section 11, the Navy finds that the SOCAL Range Complex training events would not result in any population level effects, death or injury to bottlenose dolphins. At this time, this application requests authorization for the annual harassment of 1,472 bottlenose dolphins by Level B harassment (1,448 from mid-frequency active sonar and 24 from underwater detonations) and no bottlenose dolphins by Level A harassment from potential exposure to mid-frequency active sonar or underwater detonation.

Cuvier's Beaked Whale

The risk function and Navy post-modeling analysis estimates 383 Cuvier's beaked whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-17). Modeling also indicates there would be 37 exposures to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. No Cuvier's beaked whale would be exposed to sound levels that could cause PTS.

Modeling indicates there would five exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, three exposures to182 dB re 1 μPa^2-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).

Given the medium size (up to 23 ft. [7.0 m]) of individual Cuvier's beaked whales, aggregation of approximately two animals (Barlow 2006), it is likely that lookouts would detect a group of Cuvier's beaked whales at the surface although beaked whales make prolonged dives that can last up to an hour (Baird et al. 2004). Implementation of mitigation measures and probability of detecting a large sei whale reduces the likelihood of exposure, such that effects would be discountable.

Based on the model results, behavioral patterns, acoustic abilities of Cuvier's beaked whales, results of past training, and the implementation of procedure protective measures presented in Section 11, the Navy finds that the SOCAL Range Complex training events would not result in any population level effects, death or injury to Cuvier's beaked whales. At this time, this application requests authorization for the annual harassment of 428 Cuvier's beaked whales by Level B harassment (420 from mid-frequency active sonar and eight from underwater detonations) and no Cuvier's beaked whales by Level A harassment from potential exposure to mid-frequency active sonar or underwater detonation.

Dall's Porpoise

The risk function and Navy post-modeling analysis estimates 530 Dall's porpoises will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be 88 exposures to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. No Dall's porpoises would be exposed to sound levels that could cause PTS.

Modeling indicates there would be two exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, two exposures to182 dB re 1 μPa^2-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).

Given the frequent surfacing and aggregation of approximately 2-20 animals, it is very likely that lookouts would detect a group of Dall's porpoises at the surface. Additionally, protective measures call for continuous visual observation during operations with active sonar, therefore, Dall's porpoises that migrate into the operating area would be detected by visual observers. Implementation of mitigation measures and probability of detecting large groups of Dall's porpoises reduces the likelihood of exposure.

Based on the model results, behavioral patterns, acoustic abilities of Dall's porpoise, results of past training, and the implementation of procedure protective measures presented in Section 11, the Navy finds that the SOCAL Range Complex training events would not result in any population level effects, death or injury to Dall's porpoise. At this time, this application requests authorization for the annual harassment of 622 Dall's porpoise by Level B harassment (618 from mid-frequency active sonar and four from underwater detonations) and no Dall's porpoise by Level A harassment from potential exposure to mid-frequency active sonar or underwater detonation.

Killer Whale

The risk function and Navy post-modeling analysis estimates six killer whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be one exposure to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. No killer whales would be exposed to sound levels that could cause PTS.

Modeling indicates there would be no exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, no exposures to182 dB re 1 μPa^2-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).

Given their size (up to 23 ft [7.0 m]), conspicuous coloring, pronounce dorsal fin and large mean group size of 6.5 animals (probability of trackline detection = 0.90 in Beaufort Sea States of 6 or less; Barlow, 2003). It is very likely that lookouts would detect a group of killer whales at the surface. Additionally, mitigation measures call for continuous visual observation during operations with active sonar, therefore, killer whales that migrate into the operating area would be detected by visual observers. Implementation of mitigation measures and probability of detecting large groups of killer whales reduces the likelihood of exposure.

Based on the model results, behavioral patterns, acoustic abilities of killer whales, results of past training, and the implementation of procedure mitigation measures presented in Section 11, the Navy finds that the SOCAL Range Complex training events would not result in any population level effects, death or injury to killer whales. At this time, this application requests authorization for the annual harassment of seven killer whales by Level B harassment (seven from mid-frequency active sonar and none from underwater detonations) and no killer whales by Level A harassment from potential exposure to mid-frequency active sonar or underwater detonation.

Long Beaked Common Dolphin

The risk function and Navy post-modeling analysis estimates 4,049 long beaked common dolphin 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 μPa^2-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.

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 to182 dB re 1 μPa^2-s or 23 psi, which is the threshold indicative of onset TTS, and one exposure to impulsive sound or pressures from underwater detonations that would cause slight physical injury (Table 6-6).

Given the frequent surfacing and their large group size (Leatherwood et al. 1982), it is very likely, that lookouts would detect a group of long-beaked common dolphins at the surface. Additionally, protective measures call for continuous visual observation during operations with active sonar and underwater detonations, therefore, common dolphins that migrate into the operating area would be detected by visual observers. Exposure of long-beaked common dolphins to energy levels associated with Level A harassment would not occur because protective measures would be implemented, large groups of long-beaked common dolphins would be observed, and underwater detonations result in a small zone of influence.

Based on the model results, behavioral patterns, acoustic abilities of long-beaked common dolphins, results of past training, and the implementation of procedure mitigation measures presented in Section 11, the Navy finds that the SOCAL Range Complex training events would not result in any population level effects, death or injury to long-beaked common dolphins. At this time, this application requests authorization for the annual harassment of 4,583 long-beaked common dolphins by Level B harassment (4,481 from mid-frequency active sonar and 102 from underwater detonations) and two long-beaked common dolphins by Level A harassment from potential exposure to mid-frequency active sonar and underwater detonations.

Mesoplodont Whales

The risk function and Navy post-modeling analysis estimates 115 Mesoplodont whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be 13 exposures to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. No Mesoplodont whales would be exposed to sound levels that could cause PTS.

Modeling indicates there would be two exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, one exposure to182 dB re 1 μPa^2-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).

Given the size (up to 15.5 ft. [4.7 m]) of individual Mesoplodont beaked whales, it is likely that lookouts would detect a group of Mesoplodont beaked whales at the surface although beaked whales make prolonged dives that can last up to an hour (Baird et al. 2004). Implementation of mitigation measures and probability of detecting a Mesoplodont whale reduces the likelihood of exposure, such that effects would be discountable.

Based on the model results, behavioral patterns, acoustic abilities of Mesoplodont beaked whales, results of past training, and the implementation of procedure protective measures presented in Section 11 for underwater detonations, the Navy finds that the SOCAL Range Complex training events would not result in any population level effects, death or injury to Mesoplodont beaked whales. At this time, this application requests authorization for the annual harassment of 131 Mesoplodont whales by Level B harassment (128 from mid-frequency active sonar and three from underwater detonations) and no Mesoplodont whales by Level A harassment from potential exposure to mid-frequency active sonar or underwater detonation.

Northern Right Whale Dolphin

The risk function and Navy post-modeling analysis estimates 1,306 northern right whale dolphins will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be 166 exposures to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. No northern right whale dolphins would be exposed to sound levels that could cause PTS.

Modeling indicates there would 19 exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, 12 exposures to182 dB re 1 μPa^2-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).

Given their large group size of up to 100 animals (Leatherwood et al. 1982), it is very likely, that lookouts would detect a group of northern right whale dolphins at the surface. Additionally, mitigation measures call for continuous visual observation during operations with active sonar and underwater detonations, therefore, northern right whale dolphins that migrate into the operating area would be detected by visual observers. Implementation of protective measures and probability of detecting large groups of northern right whale dolphins reduces the likelihood of exposure.

Based on the model results, behavioral patterns, acoustic abilities of northern right whale dolphins, results of past training, and the implementation of procedure protective measures presented in Section 11 for underwater detonations, the Navy finds that the SOCAL Range Complex training events would not result in any population level effects, death or injury to northern right whale dolphins. At this time, this application requests authorization for the annual harassment of 1,503 northern right whale dolphins by Level B harassment (1,472 from mid-frequency active sonar and 31 from underwater detonations) and no northern right whale dolphins by Level A harassment from potential exposure to mid-frequency active sonar or underwater detonations.

Pacific White-sided Dolphin

The risk function and Navy post-modeling analysis estimates 1,150 Pacific white-sided dolphin will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be 189 exposures to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. No Pacific white-sided dolphins would be exposed to sound levels that could cause PTS.

Modeling indicates there would be 12 exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, nine exposures to182 dB re 1 μPa^2-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).

Given their frequent surfacing and large group size of up to several thousand animals (Leatherwood et al. 1982), it is very likely that lookouts would detect a group of Pacific white-sided dolphins at the surface. Additionally, protective measures call for continuous visual observation during operations with active sonar and underwater detonations, therefore, Pacific white-sided dolphins that migrate into the operating area would be detected by visual observers. Implementation of mitigation measures and probability of detecting large groups of Pacific white-sided dolphins reduces the likelihood of exposure.

Based on the model results, behavioral patterns, acoustic abilities of Pacific white-sided dolphins, results of past training, and the implementation of procedure protective measures presented in Section 11, the Navy finds that the SOCAL Range Complex training events would not result in any population level effects, death or injury to Pacific white-sided dolphins. At this time, this application requests authorization for the annual harassment of 1,360 Pacific white-sided dolphins by Level B harassment (1,339 from mid-frequency active sonar and 21 from underwater detonations) and no Pacific white-sided dolphins by Level A harassment from potential exposure to mid-frequency active sonar or underwater detonations.

Pygmy Sperm Whale

The risk function and Navy post-modeling analysis estimates 141 pygmy sperm whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be 16 exposures to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. No pygmy sperm whales would be exposed to sound levels that could cause PTS.

Modeling indicates there would be one exposure to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, one exposure to182 dB re 1 μPa^2-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).

Given their size (up to 10 ft [3 m]) and behavior of resting at the surface (Leatherwood et al. 1982), it is very likely that lookouts would detect a pygmy sperm whale at the surface. Additionally, mitigation measures call for continuous visual observation during operations with active sonar and underwater detonations, therefore, pygmy sperm whales that migrate into the operating area would be detected by visual observers. Implementation of mitigation measures and probability of detecting large groups of pygmy sperm whales reduces the likelihood of exposure.

Based on the model results, behavioral patterns, acoustic abilities of pygmy sperm whale, results of past training, and the implementation of procedure mitigation measures presented in Section 11, the Navy finds that the SOCAL Range Complex training events would not result in any population level effects, death or injury to pygmy sperm whale. At this time, this application requests authorization for the annual harassment of 159 pygmy sperm whales by Level B harassment (157 from mid-frequency active sonar and two from underwater detonations) and no pygmy sperm whales by Level A harassment from potential exposure to mid-frequency active sonar or underwater detonations.

Risso's Dolphin

The risk function and Navy post-modeling analysis estimates 3,123 Risso's dolphins will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be 340 exposures to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. No Risso's dolphins would be exposed to sound levels that could cause PTS.

Modeling indicates there would be 57 exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, 34 exposures to182 dB re 1 μPa^2-s or 23 psi, which is the threshold indicative of onset TTS, and one exposure to impulsive sound or pressures from underwater detonations that would cause slight physical injury (Table 6-6).

Given their frequent surfacing, light coloration and large group size of up to several hundred animals (Leatherwood et al. 1982), probability of trackline detection of 0.76 in Beaufort Sea States of 6 or less (Barlow 2006), it is very likely that lookouts would detect a group of Risso's dolphins at the surface. Additionally, mitigation measures call for continuous visual observation during operations with active sonar and underwater detonations, therefore, Risso's dolphins that migrate into the operating area would be detected by visual observers. Implementation of mitigation measures and probability of detecting large groups of Risso's dolphins reduces the likelihood of exposure.

Based on the model results, behavioral patterns, acoustic abilities of Risso's dolphins, results of past training, and the implementation of procedure mitigation measures presented in Section 11, the Navy finds that the SOCAL Range Complex training events would not result in any population level effects, death or injury to Risso's dolphins. At this time, this application requests authorization for the annual harassment of 3,554 Risso's dolphins by Level B harassment (3,463 from mid-frequency active sonar and 91 from underwater detonations) and one Risso's dolphins by Level A harassment from potential exposure to underwater detonations.

Short-Beaked Common Dolphin

The risk function and Navy post-modeling analysis estimates 34,795 short-beaked common dolphins will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be 3,727 exposures to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. Six short-beaked common dolphins would be exposed to sound levels that could cause PTS.

Modeling indicates there would be 528 exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, 354 exposures to182 dB re 1 μPa^2-s or 23 psi, which is the threshold indicative of onset TTS, 12 exposures to impulsive sound or pressures from underwater detonations that would cause slight physical injury, and four exposures that could cause mortality (Table 6-6).

Given the frequent surfacing and their large group size of up to 1,000 animals (Leatherwood et al. 1982), it is very likely, that lookouts would detect a group of short-beaked common dolphins at the surface. Additionally, mitigation measures call for continuous visual observation during operations with active sonar and underwater detonations, therefore, common dolphins that migrate into the operating area would be detected by visual observers. Exposure of short-beaked common dolphins to energy levels associated with Level A harassment would not occur because mitigation measures would be implemented, large groups of short-beaked common dolphins would be observed, and underwater detonations result in a small zone of influence.

Based on the model results, behavioral patterns, acoustic abilities of short-beaked common dolphins, results of past training, and the implementation of procedure mitigation measures presented in Section 11, the Navy finds that the SOCAL Range Complex training events would not result in any population level effects, death or injury to short-beaked common dolphins. At this time, this application requests authorization for the annual harassment of 39,404 short-beaked common dolphins by Level B harassment (38,522 from mid-frequency active sonar and 882 from underwater detonations), 18 short-beaked common dolphins by Level A harassment (six from mid-frequency active sonar and 12 from underwater detonations). The four predicted exposures to underwater detonations that otherwise result in severe lung injury or mortality would be unlikely to occur given range clearance procedures and mitigation measures.

Short-finned Pilot Whale

The risk function and Navy post-modeling analysis estimates 39 short-finned pilot whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be six exposures to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. No short-finned pilot whale would be exposed to sound levels that could cause PTS.

Modeling indicates there would be no exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, no exposures to182 dB re 1 μPa^2-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).

Given their size (up to 20 ft [6.1 m]), and large mean group size of 22.5 animals (probability of trackline detection = 0.76 in Beaufort Sea States of 6 or less; Barlow 2006). It is very likely that lookouts would detect a group of short-finned pilot whales at the surface. Additionally, mitigation measures call for continuous visual observation during operations with active sonar, therefore, short-finned pilot whales that migrate into the operating area would be detected by visual observers. Implementation of mitigation measures and probability of detecting groups of short-finned pilot whales reduces the likelihood of exposure.

Based on the model results, behavioral patterns, acoustic abilities of short-finned pilot whale, results of past training, and the implementation of procedure mitigation measures presented in Section 11, the Navy finds that the SOCAL Range Complex training events would not result in any population level effects, death or injury to short-finned pilot whale. At this time, this application requests authorization for the annual harassment of 45 short-finned pilot whales by Level B harassment (45 from mid-frequency active sonar and none from underwater detonations) and no short-finned pilot whales by Level A harassment from potential exposure to from mid-frequency active sonar or underwater detonations.

Striped Dolphin

The risk function and Navy post-modeling analysis estimates 1,569 striped dolphins will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be 249 exposures to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. One striped dolphin would be exposed to sound levels that could cause PTS.

Modeling indicates there would be six exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, six exposures to182 dB re 1 μPa^2-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).

Given their frequent surfacing, aerobatics and large mean group size of 37.3 animals (probability of trackline detection = 1.00 in Beaufort Sea States of 6 or less; Barlow 2006), it is very likely that lookouts would detect a group of striped dolphins at the surface. Additionally, mitigation measures call for continuous visual observation during operations with active sonar, therefore, striped dolphins that migrate into the operating area would be detected by visual observers.

Implementation of mitigation measures and probability of detecting groups of striped dolphins reduces the likelihood of exposure.

Based on the model results, behavioral patterns, acoustic abilities of striped dolphins, results of past training, and the implementation of procedure mitigation measures presented in Section 11 for underwater detonations, the Navy finds that the SOCAL Range Complex training events would not result in any population level effects, death or injury to striped dolphins. At this time, this application requests authorization for the annual harassment of 1,830 striped dolphins by Level B harassment (1,818 from mid-frequency active sonar and 12 from underwater detonations) and one striped dolphins by Level A harassment from potential exposure to from mid-frequency active sonar.

Ziphiid Whales

The risk function and Navy post-modeling analysis estimates 86 Ziphiid whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be eight exposures to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. No Ziphiid whales would be exposed to sound levels that could cause PTS.

Modeling indicates there be would two exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, one exposure to182 dB re 1 μPa^2-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).

Given the medium size (up to 23 ft. [7.0 m]) of individual Ziphiid whales, aggregation of approximately two animals (Barlow 2006), it is likely that lookouts would detect a group of Ziphiid whales at the surface although Ziphiid whales make prolonged dives that can last up to an hour (Baird et al. 2004). Implementation of mitigation measures and probability of detecting a large sei whale reduces the likelihood of exposure, such that effects would be discountable.

Based on the model results, behavioral patterns, acoustic abilities of Ziphiid whales, results of past training, and the implementation of procedure protective measures presented in Section 11, the Navy finds that the SOCAL Range Complex training events would not result in any population level effects, death or injury to Ziphiid whales. At this time, this application requests authorization for the annual harassment of 97 Ziphiid whales by Level B harassment (94 from mid-frequency active sonar and three from underwater detonations) and no Ziphiid whales by Level A harassment from potential exposure to from mid-frequency active sonar or underwater detonations.

Northern Elephant Seal

The risk function and Navy post-modeling analysis estimates 833 northern elephant seals will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be five exposures to accumulated acoustic energy above 204 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS for northern elephant seals. No northern elephant seals would be exposed to sound levels that could cause PTS.

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, 41 exposures to182 dB re 1 μPa^2-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).

Northern elephant seals tend to dive for long periods, 20-30 minutes, and only spend about 10% of the time at the surface making them difficult to detect. Elephant seals migrate out of the Southern California area to forage for several months at a time (Le Boeuf 1994).

Based on the model results, behavioral patterns, acoustic abilities of Northern elephant seals, results of past training, and the implementation of procedure mitigation measures presented in Section 11, the Navy finds that the SOCAL Range Complex training events would not result in any population level effects, death or injury to Northern elephant seals. At this time, this application requests authorization for the annual harassment of 955 northern elephant seals by Level B harassment (838 from mid-frequency active sonar and 117 from underwater detonations) and no northern elephant seals by Level A harassment from potential exposure to mid-frequency active sonar.

Pacific Harbor Seal

The risk function and Navy post-modeling analysis estimates 1,014 Pacific harbor seals will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be 4,559 exposures to accumulated acoustic energy above 183 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS for Pacific harbor seals. Nine Pacific harbor seals would be exposed to sound levels that could cause PTS.

Modeling indicates there would be 26 exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, 26 exposures to182 dB re 1 μPa^2-s or 23 psi, which is the threshold indicative of onset TTS, and one exposure to impulsive sound or pressures from underwater detonations that would cause slight physical injury (Table 6-6).

Harbor seals forage near their rookeries (usually within 50 km) therefore they tend to remain in the Southern California area most of the time in comparison to northern elephant seals.

Based on the model results, behavioral patterns, acoustic abilities of harbor seals, results of past training, and the implementation of procedure mitigation measures presented in Section 11, the Navy finds that the SOCAL Range Complex training events would not result in any population level effects, death or injury to harbor seals. At this time, this application requests authorization for the annual harassment of 5.625 Pacific harbor seals by Level B harassment (5,573 from mid-frequency active sonar and 52 from underwater detonations) and 10 Pacific harbor seals by Level A harassment (nine from MFA/HFA sonar and one from underwater detonations).

California Sea Lion

The risk function and Navy post-modeling analysis estimates 54,346 California sea lions will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be three exposures to accumulated acoustic energy above 206 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS for California sea lions. No California sea lions would be exposed to sound levels that could cause PTS.

Modeling indicates there would be 584 exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, 510 exposures to182 dB re 1 μPa^2-s or 23 psi, which is the threshold indicative of onset TTS, 16 exposures to impulsive sound or pressures from underwater detonations that would cause slight physical injury and six exposures that could cause mortality (Table 6-6).

California sea lions make short duration dives and may rest at the surface (Feldkamp et al. 1989) making them easier to detect than other pinnipeds.

Based on the model results, behavioral patterns, acoustic abilities of California sea lions, results of past training, and the implementation of procedure mitigation measures presented in Sections 11, the Navy finds that the SOCAL Range Complex training events would not result in any population level effects, death or injury to harbor seals. At this time, this application requests authorization for the annual harassment of 55,443 California sea lions by Level B harassment (54,349 from mid-frequency active sonar and 1,094 from underwater detonations), 16 California sea lions by Level A harassment (none from mid-frequency active sonar and 16 from underwater detonations), six by exposure to underwater detonations that could cause severe lung injury or mortality.

Northern Fur Seal

The risk function and Navy post-modeling analysis estimates 1,072 northern fur seals will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-1). Modeling also indicates there would be three exposures to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. No northern fur seals would be exposed to sound levels that could cause PTS.

Modeling indicates there would be 90 exposures to impulsive sound or pressures from underwater detonations of 177 db which is the threshold for sub-TTS behavioral response, 64 exposures to182 dB re 1 μPa^2-s or 23 psi, which is the threshold indicative of onset TTS, three exposures to impulsive sound or pressures from underwater detonations that would cause slight physical injury and one exposure that could cause mortality (Table 6-6).

Nothern fur seals make short duration dives and often rest at the surface (Antonelis et al. 1990) making them easier to detect.

Based on the model results, behavioral patterns, acoustic abilities of northern fur seals, results of past training, and the implementation of procedure mitigation measures presented in Section 11, the Navy finds that the SOCAL Range Complex training events would not result in any population level effects, death or injury to northern fur seals. At this time, this application requests authorization for the annual harassment of 1,229 northern fur seals by Level B harassment (1,075 from mid-frequency active sonar and 154 from underwater detonations) and three northern fur seals by Level A harassment (three from underwater detonations), one by exposure to underwater detonations that could cause severe lung injury or mortality.

7. IMPACTS TO MARINE MAMMAL SPECIES OR STOCKS

There are no changes to Chapter 7 as described under the April 2008 Request for Letter of Authorization.

8. IMPACTS ON SUBSISTENCE USE

There are no changes to Chapter 8 as described under the April 2008 Request for Letter of Authorization.

9. IMPACTS TO THE MARINE MAMMAL HABITAT AND THE LIKELIHOOD OF RESTORATION

There are no changes to Chapter 9 as described under the April 2008 Request for Letter of Authorization.

10. IMPACTS TO MARINE MAMMALS FROM LOSS OR MODIFICATION OF HABITAT

There are no changes to Chapter 10 as described under the April 2008 Request for Letter of Authorization.

11. MEANS OF EFFECTING THE LEAST PRACTICABLE ADVERSE IMPACTS – MITIGATION MEASURES

There are no changes to Chapter 11 as described under the April 2008 Request for Letter of Authorization (LOA).

12. MINIMIZATION OF ADVERSE EFFECTS ON SUBSISTENCE USE

There are no changes to Chapter 12 as described under the April 2008 Request for Letter of Authorization.

13. MONITORING AND REPORTING MEASURES

There are no changes to Chapter 13 as described under the April 2008 Request for Letter of Authorization.

14. RESEARCH

There are no changes to Chapter 14 as described under the April 2008 Request for Letter of Authorization.

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15. LIST OF PREPARERS

Conrad Erkelens, Senior Scientist, KAYA Associates, Inc.
M.A., Anthropology, 1993, University of Hawaii
B.A., Anthropology, 1989, University of Hawaii
Years of Experience: 13

Wesley S. Norris, Managing Senior, KAYA Associates, Inc.
B.S., 1976, Geology, Northern Arizona University
Years of Experience: 30

Philip H. Thorson, Senior Research Biologist, SRS Technologies
Ph.D., 1993, Biology, University of California at Santa Cruz
Years of Experience: 25

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16. REFERENCES

There are no changes to Chapter 16 as described under the April 2008 Request for Letter of Authorization.

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