HAWAII RANGE COMPLEX

UPDATE #2 TO THE

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

SUBMITTED TO

Office of Protected Resources

National Marine Fisheries Service

National Oceanic and Atmospheric Administration

PREPARED BY

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Commander, THIRD Fleet

April 2008

Update #2

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

Submitted to:

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1. DESCRIPTION OF ACTIVITIES

There are no changes to Chapter 1 as described under the February 2008 Updated to the Letter of Authorization.

2. DURATION AND LOCATION OF ACTIVITIES

There are no changes to Chapter 2 as described under the July 2007 Request for Letter of Authorization.

3. MARINE MAMMAL SPECIES AND NUMBERS

There are no changes to Chapter 3 as described under the July 2007 Request for Letter of Authorization.

4. AFFECTED SPECIES STATUS AND DISTRIBUTION

There are no changes to Chapter 4 as described under the July 2007 Request for Letter of Authorization.

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5. HARASSMENT AUTHORIZATION REQUESTED

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 July 2007. The authorization requested was for the incidental harassment of marine mammals by behavioral disruption. However, it is understood that a 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 Hawaii Range Complex (HRC). These include operations that use mid-frequency and high frequency active sonar or involve underwater detonations. The update request is for a 5-year period commencing from the time the permit is issued.

The acoustic modeling approach taken in the HRC Supplement to the EIS/OEIS and this update to the LOA request attempts to quantify potential behavioral responses to marine mammals resulting from operation of mid-frequency and high frequency active sonar.

Modeling results from the analysis does not predict any marine mammal mortalities. Neither NMFS nor the Navy anticipates that marine mammal strandings or mortality will result from the operation of mid-frequency active sonar during Navy exercises within the HRC. For further information, refer to Chapter 5 of the July 2007 LOA.

It is estimated that 27,561 marine mammals will exhibit behavioral responses NMFS will classify as Level B harassment (this total includes 522 TTS and 26,975 Risk Function based on modeling results and analysis [Table 5-1] plus an estimated 64 minke whale behavioral harassment exposures) as a result of MFA/HFA sonar use. For the minke whale, acoustic effects modeling could not be undertaken because no density estimates were available; therefore, they are not represented in the summary of exposures in Table 5-1. A discussion on assumptions for estimating exposures to minke whales is provided in Section 6.8.5. No marine mammals will be exposed to sonar in excess of permanent threshold shift (PTS) threshold indicative of Level A injury (Table 5-1).

Table 5-1. Sonar Exposures by Exercise Type and Sonar Source

Source	Modeled	PTS	TTS	Risk Function
53	1,257 hours	0	502	24,102
Kingfisher	27 hours	0	1	22
56	383 hours	0	0	468
Dipping	1,010 dips	0	0	141
Sonobuoy	2,423 buoys	0	0	947
MK-48	313 runs	0	19	496
Submarine	200 hours	0	0	799
	Total	0	522	26,975

Based on modeling results and analysis, it is estimated that for the sub-TTS behavioral threshold, there may be 63 exposures resulting in behavioral harassment from successive explosions in a single event involving underwater detonations (Table 5-2).

Table 5-2. Explosives Modeling Summary - Yearly Marine Mammal Exposures from all Explosive Sources

Marine Mammal Species	Sub TTS	TTS Modeled at < 182 dB re 1 µPa²–s or 23 psi								Total Exposures		
	Sub-TTS	EER/IEER	MINEX	A-S MISSILEX	S-S MISSILEX	BOMBEX	SINKEX	GUNEX	NSFS	TTS 182 dB, 23 psi	Slight Lung/TM Injury	Onset Massive Lung Injury
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale[2]	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale	5	5	1	0	0	4	0	0	2	12	1	0
Sperm whale	9	1	0	0	0	1	3	0	0	5	0	0
Dwarf sperm whale	13	5	0	0	0	2	4	1	1	13	0	0
Pygmy sperm whale	4	2	0	0	0	1	2	0	0	5	0	0
Cuvier's beaked whale	16	1	0	0	0	2	5	0	0	8	0	0
Longman's beaked whale	0	0	0	0	0	0	0	0	0	0	0	0
Blainville's beaked whale	2	1	0	0	0	0	1	0	0	2	0	0
Unidentified beaked whale	0	0	0	0	0	0	0	0	0	0	0	0
Bottlenose dolphin	0	1	0	0	0	0	0	0	0	1	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0
Short-finned pilot whale	2	2	0	0	0	0	1	1	1	5	0	0
Risso's dolphin	0	1	0	0	0	0	0	0	0	1	0	0
Melon-headed whale	0	1	0	0	0	0	0	0	0	1	0	0
Rough-toothed dolphin	2	2	0	0	0	1	1	0	0	4	0	0
Fraser's dolphin	6	3	0	0	0	1	2	0	0	6	0	0
Pantropical spotted dolphin	0	3	0	0	0	0	0	1	1	5	1	0
Spinner dolphin	2	1	0	0	0	0	1	0	0	2	0	0
Striped dolphin	2	4	0	0	0	1	1	1	1	7	1	0
Monk seal	0	2	0	0	0	0	0	0	1	3	0	0
Total	63	35	1	0	0	13	21	4	7	80	3	0

In addition, the modeling indicates 80 annual exposures to pressure or acoustics from underwater detonations that could result in TTS. The total number of exposures from explosives that NMFS would classify as Level B harassment would be 143. Modeling indicates three exposures from underwater detonations that could cause slight injury, resulting in Level A harassment. However, given, the basis for this injury threshold metric, range clearance procedures, and the sightability of the three species involved (humpback, spinner dolphin, and spinner dolphin, these slight injury exposures are extremely unlikely. Navy is not requesting authorization for any Level A takes associated with training involving underwater detonations.

Therefore, it is estimated that in total, 27,704 marine mammals will exhibit behavioral responses NMFS will classify as Level B harassment. This includes 522 TTS and 27,039 risk function exposures (26,975 plus an estimated 64 minke whales) as a result of MFA/HFA sonar use (27,561 exposures) in addition to 143 exposures (63 sub-TTS exposures and 80 TTS exposures) to underwater detonations.

Marine Mammal Mortality Request

The history of Navy activities in the HRC and analysis in the Hawaii Range Complex EIS/OEIS document indicates that military readiness activities are not expected to realistically result in any sonar–induced Level A injury or mortalities to marine mammals. However, because there is no scientific consensus regarding the causal link between sonar and stranding events and given the frequency of naturally occurring marine mammal strandings in Hawaii, the Navy has requested for take, by mortality, of the most commonly stranded non ESA-listed species including of 2 each of 10 species (bottlenose dolphin, Kogia *spp*., melon-headed whale, pantropical spotted dolphin, pygmy killer whale, short-finned pilot whale, striped dolphin, Cuvier's, Longman's, and Blainville's beaked whales), however, these numbers may be modified through the MMPA process, based on available data.

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6. NUMBER AND SPECIES EXPOSED

There are no changes to Chapter 6.1 through 6.7 as described under the February 2008 Updated to the Letter of Authorization.

6.8 Changes to TTS and PTS Exposures from DEIS/OEIS

Changes to the February 2008 Update to the Letter of Authorization for Chapter 6.8 are identified below (Chapters 6.8.2 through6.8.6). There are no other changes.

6.8.1 New Monk Seal TTS/PTS Criteria

There are no changes to Chapter 6.8.1 as described under the February 2008 Updated to the Letter of Authorization.

6.8.2 Harassment Threshold for Multiple Successive Explosions

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 µPa2-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 µPa2-s in any 1/3 octave band threshold, resulting in a 177 dB re 1 µPa2-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 mPa2-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.

6.8.3 Summary of Exposures

Table 6-3 details the amount of sonar usage for ASW training under the Alternative 3. The sonar modeling input includes surface ship and submarine MFA tactical sonar, the associated DICASS sonobuoy, dipping sonar, and MK-48 torpedo sonar. Table 6-4 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 27,561 marine mammals will exhibit behavioral responses NMFS will classify as harassment (Level B) (27,497 based on modeling results and analysis [Table 6-3] plus an estimated 64 minke whales) as a result of MFA/HFA sonar use. For the minke whale, acoustic effects modeling could not be undertaken because no density estimates were available; therefore, they are not represented in the summary of exposures in Table 6-4. No 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 DEIS/OEIS. Based on that analysis, results of past training, and the implementation of mitigation measures the Navy found that the HRC training events would not result in any death or injury to any marine mammal species. The DEIS/OEIS also found that while the acoustic modeling results indicated MFA 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 6-3. Sonar Usage for Alternative 3

Supplement to the DEIS/OEIS Hours/Events Modeled		
Other HRC ASW Training		
	Source	**Modeled**
	53	360 hours[1]
	56	75 hours
	Dipping	110 dips
	Sonobuoy	1,278 buoys
	MK-48	309 runs
	Submarine	200 hours
RIMPAC		
	Source	**Modeled**
	53	399 hours
	56	133 hours
	Dipping	400 dips
	Sonobuoy	497 buoys
	MK-48	4 runs
USWEX (5 Exercises)		
	Source	**Modeled**
	53	525 hours
	56	175 hours
	Dipping	500 dips
	Sonobuoy	648 buoys
Totals		
	Source	**Modeled**
	53	1,284 hours
	56	383 hours
	Dipping	1,010 dips
	Sonobuoy	2,423 buoys
	MK-48	313 runs
	Submarine	200 hours

Notes: [1] Includes 27 hours for Kingfisher

Table 6-4. Alternative 3 Sonar Modeling Summary—Yearly Marine Mammal Exposures From all ASW (RIMPAC, USWEX and HRC ASW Training)

Marine Mammals	Risk Function 120-195 dB SPL	DEIS/OEIS Dose Function	TTS[3]	PTS[4]
Bryde's whale	64	173	0	0
Fin whale[1, 2]	46	53	0	0
Sei whale[1, 2]	46	53	0	0
Humpback whale[1]	9677	28,359	199	0
Sperm whale[1]	758	767	9	0
Dwarf sperm whale	2061	1,653	35	0
Pygmy sperm whale	842	675	14	0
Cuvier's beaked whale	1121	1,025	5	0
Longman's beaked whale	104	113	1	0
Blainville's beaked whale	347	391	6	0
Unidentified beaked whale	36	33	0	0
Bottlenose dolphin	716	887	17	0
False killer whale	46	53	0	0
Killer whale	46	53	0	0
Pygmy killer whale	192	214	4	0
Short-finned pilot whale	1751	2,012	40	0
Risso's dolphin	486	559	10	0
Melon-headed whale	583	671	13	0
Rough-toothed dolphin	1053	869	18	0
Fraser's dolphin	1216	1,003	19	0
Pantropical spotted dolphin	2144	2,770	49	0
Spinner dolphin	410	338	7	0
Striped dolphin	3126	4,043	73	0
Monk seal[1]	104	362	3	0
TOTAL	26,975	47,129	522	0

Notes: [1] Endangered Species
[2] Due to a lack of density data for fin and sei whales, false killer whale results were used because they have a similar size population within the HRC.
[3] For cetacea TTS is the following range 195-215 dB re 1 μPa^2-s. For monk seals TTS is 204-224 dB re 1 μPa^2-s
[4] For cetacea PTS is >215 dB re 1 μPa^2-s. For monk seals PTS is >224 dB re 1 μPa^2-s
dB = decibel
TTS = temporary threshold shift
PTS = permanent threshold shift

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 6-5. Estimates for the sub-TTS behavioral threshold (Level B) indicate there may be 63 exposures resulting in behavioral harassment 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 80 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 143. Modeling indicates three exposures from underwater detonations that could cause slight injury, resulting in Level A harassment. To reiterate, these exposure modeling results are estimates of marine mammal underwater detonation sound exposures without consideration of standard mitigation and monitoring procedures. Given these standard mitigation and monitoring procedures, these three estimated exposures should be precluded from occurring. Implementation of the mitigation and monitoring procedures presented in Chapter 6.0 of the EIS/OEIS will minimize the potential for marine mammal exposure and harassment through range clearance procedures.

Therefore, it is estimated that in total, 27,704 marine mammals will exhibit behavioral responses NMFS will classify as Level B harassment. This includes 522 TTS and 27,039 risk function exposures (26,975 plus an estimated 64 minke whales) as a result of MFA/HFA sonar use (27,561 exposures) in addition to 143 exposures (63 sub-TTS exposures and 80 TTS exposures) to underwater detonations.

Table 6-5. Alternative 3 Explosives Modeling Summary - Yearly Marine Mammal Exposures From all Explosive Sources

Marine Mammal Species	Sub-TTS	TTS Modeled at < 182 dB re 1 µPa^2–s or 23 psi								Total Exposures		
	Sub-TTS 177 dB	EER/IEER	Mine Neutralization	Air to Surface Missile Exercise	Surface to Surface Missile Exercise	Bombing Exercise	Sink Exercise	Surface to surface Gunnery Exercise	Naval Surface Fire Support	TTS 182 dB, 23 psi	Slight Lung/TM Injury	Onset Massive Lung Injury
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale[1, 2]	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale[1]	5	5	1	0	0	4	0	0	2	12	1	0
Sperm whale[1]	9	1	0	0	0	1	3	0	0	5	0	0
Dwarf sperm whale	13	5	0	0	0	2	4	1	1	13	0	0
Pygmy sperm whale	4	2	0	0	0	1	2	0	0	5	0	0
Cuvier's beaked whale	16	1	0	0	0	2	5	0	0	8	0	0
Longman's beaked whale	0	0	0	0	0	0	0	0	0	0	0	0
Blainville's beaked whale	2	1	0	0	0	0	1	0	0	2	0	0
Unidentified beaked whale	0	0	0	0	0	0	0	0	0	0	0	0
Bottlenose dolphin	0	1	0	0	0	0	0	0	0	1	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0
Short-finned pilot whale	2	2	0	0	0	0	1	1	1	5	0	0
Risso's dolphin	0	1	0	0	0	0	0	0	0	1	0	0
Melon-headed whale	0	1	0	0	0	0	0	0	0	1	0	0
Rough-toothed dolphin	2	2	0	0	0	1	1	0	0	4	0	0
Fraser's dolphin	6	3	0	0	0	1	2	0	0	6	0	0
Pantropical spotted dolphin	0	3	0	0	0	0	0	1	1	5	1	0
Spinner dolphin	2	1	0	0	0	0	1	0	0	2	0	0
Striped dolphin	2	4	0	0	0	1	1	1	1	7	1	0
Monk seal[1]	0	2	0	0	0	0	0	0	1	3	0	0
Total	63	35	1	0	0	13	21	4	7	80	3	0

6.8.4 Estimated Behavioral Effects on ESA Listed Marine Mammal Species

ESA listed species that may be affected as a result of implementation of the HRC Alternative 3 includes the blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), Hawaiian monk seal (*Monachus schauinslandi*) humpback whale (*Megaptera novaeangliae*), North Pacific right whale (*Eubalaena japonica*), sei whale (*Balaenoptera borealis*) and sperm whale (*Physeter macrocephalus*).

Blue Whale (*Balaenoptera musculus*)

There is no change from the DEIS/OEIS or LOA application with regard to blue whales. There is no density information available for blue whales in Hawaiian waters given they have not been seen during any surveys. Given they are so few in number, it is unlikely that HRC training events will result in the exposure of any blue whales to accumulated acoustic energy in excess of any energy flux threshold or an SPL that would result in a behavioral response.

No blue whales would be exposed to impulsive sound or pressures from underwater detonations that will exceed the sub-TTS behavioral disturbance threshold or would cause TTS or physical injury.

Fin Whale (*Balaenoptera physalus*)

There is no density information for fin whales in the Hawaiian Islands (Barlow, 2006). For purposes of acoustic effects analysis, it was assumed that the number and density of fin whales did not exceed that of false killer whales (given that previous abundance estimates for the two species were identical in Barlow 2003); the modeled number of exposures for both species will therefore be the same. The risk function and Navy post-modeling analysis estimates 46 fin whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA. The Navy believes this may affect fin whales, therefore the Navy has initiated ESA Section 7 consultation with NMFS (Table 6-4). Modeling 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 fin whales would be exposed to impulsive sound or pressures from underwater detonations that will exceed the sub-TTS behavioral disturbance threshold or would cause TTS or physical injury (Table 6-5).

Humpback Whale (*Megaptera novaeangliae*)

The risk function and Navy post-modeling analysis estimates 9,677 humpback whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA. The Navy believes this may affect humpback whales; therefore the Navy has initiated ESA Section 7 consultation with NMFS (Table 6-4). Modeling indicates there would be 199 exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s (the thresholds established to be indicative of onset TTS and onset PTS respectively). Modeling indicates there would be no exposures to accumulated acoustic energy above 215 dB re 1 μPa^2-s.

Estimates for the sub-TTS behavioral threshold indicate there may be five exposures resulting in behavioral harassment 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 disturbance threshold. Without consideration of clearance procedures during events involving underwater detonations, modeling estimates there would be 12 exposures from impulsive sound or pressures from underwater detonations that would exceed the TTS threshold, one exposure that would exceed the slight injury threshold, and no exposures that exceed the massive injury threshold (Table 6-5). Target area clearance procedures would make sure there are no humpback whales within the safety zone. Potential exposure of humpback whales to levels that exceed thresholds for TTS or injury levels from underwater detonations is, therefore, highly unlikely.

North Pacific Right Whale (*Eubalaena japonica*)

There is no change from the DEIS/OEIS and the LOA application with regard to effects on North Pacific right whales. There is no density information available for North Pacific right whales in Hawaiian waters since they have not been seen during surveys. Given they are so few in number, it is unlikely that HRC training events will result in the exposure of any North Pacific right whales to accumulated acoustic energy in excess of any energy flux threshold or an SPL that would result in a behavioral response.

No right whales would be exposed to impulsive sound or pressures from underwater detonations that will exceed the sub-TTS behavioral disturbance threshold or would cause TTS or physical injury.

Sei Whale (*Balaenoptera borealis*)

For purposes of the acoustic effects analysis, the same assumptions made previously regarding fin whales are also made for sei whales. It was therefore assumed that the number and density of sei whales did not exceed that of false killer whales, and the modeled number of exposures for both species would therefore be the same. The risk function and Navy post-modeling analysis estimates 46 sei whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA. The Navy believes this may affect sei whales; therefore the Navy has initiated ESA Section 7 consultation with NMFS (Table 6-4). Modeling indicates there would be no exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s (the thresholds established to be indicative of onset TTS and onset PTS respectively). Modeling indicates no exposures for sei whales to accumulated acoustic energy above 215 dB re 1 μPa^2-s.

No sei whales would be exposed to impulsive sound or pressures from underwater detonations that will exceed the sub-TTS behavioral disturbance threshold or would cause TTS or physical injury (Table 6-5).

Sperm Whales (*Physeter macrocephalus*)

The risk function and Navy post-modeling analysis estimates 758 sperm whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA. The Navy believes

this may affect sperm whales; therefore, the Navy has initiated ESA Section 7 consultation with NMFS (Table 6-4). Modeling indicates there would benign exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s (the thresholds established to be indicative of onset TTS and onset PTS respectively). Modeling indicates no exposures for sperm whales to accumulated acoustic energy above 215 dB re 1 μPa^2-s.

Estimates for the sub-TTS behavioral threshold indicate there may be nine exposures resulting in behavioral harassment 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 clearance procedures, there would be five exposures from impulsive sound or pressures from underwater detonations that would exceed the TTS threshold (Table 6-4). Target area clearance procedures would make sure there are no sperm whales within the safety zone, and therefore potential exposure of sperm whales to sound levels from underwater detonations that exceed TTS is highly unlikely.

Hawaiian Monk Seal (*Monachus schauinslandi*)

The risk function and Navy post-modeling analysis estimates 104 Hawaiian monk seals will exhibit behavioral responses NMFS will classify as harassment under the MMPA. The Navy believes this may affect Hawaiian monk seals; therefore the Navy has initiated ESA Section 7 consultation with NMFS (Table 6-4). Modeling indicates there would be three exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s (the thresholds established to be indicative of onset TTS and onset PTS respectively). Modeling indicates there would be no exposures for monk seals to accumulated acoustic energy above 224 dB re 1 μPa^2-s.

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 clearance procedures, modeling estimates there would be three exposures from impulsive sound or pressures from underwater detonations that would exceed the TTS threshold and no exposures that would exceed the injury threshold (Table 6-4). In the rare event that a monk seal was present, target area clearance procedures would be used to detect monk seals within the safety zone, and therefore potential exposure of monk seals to underwater detonations that exceed the TTS threshold is highly unlikely.

6.8.5 Estimated Behavioral Harassment Exposures for Non-ESA Species

Bryde's Whale (*Balaenoptera edeni*)

The risk function and Navy post-modeling analysis estimates 64 Bryde's whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-4). Modeling 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 impulsive noise or pressures from underwater detonations that will exceed the sub-TTS behavioral disturbance threshold or would cause physical injury (Table 6-5).

Minke Whale (*Balaenoptera acutorostrata*)

Despite several reports of seasonal acoustic detections of minke whales in Hawaiian waters (e.g. Rankin and Barlow, 2005), there is no density information available for minke whales in Hawaiian waters given they have rarely been visually sighted during surveys. Taken conservatively, the acoustic detections suggest that minke whales may be more common than the survey data indicates. Therefore, although acoustic effects modeling cannot be undertaken without density estimates, the Navy will assume 64 minke whales may exhibit behavioral responses that NMFS would classify as harassment under the MMPA. This exposure number is based on the modeled exposures for the Bryde's whale, another seasonal baleen whale that has a reported abundance of 469 whales in the HRC (Barlow 2006).

No minke whales would be exposed to impulsive noise or pressures from underwater detonations that would exceed the sub-TTS behavioral threshold or cause physical injury. No minke whales would be exposed to impulsive noise or pressures from underwater detonations that will exceed the sub-TTS behavioral disturbance threshold or would cause TTS or physical injury (Table 6-5)

Blainville's Beaked Whale (*Mesoplodon densirostris*)

The risk function and Navy post-modeling analysis estimates 347 Blainville's beaked whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-4). Modeling indicates six exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s (the thresholds established to be indicative of onset TTS and onset PTS respectively). Modeling for all alternatives indicates that no Blainville's beaked whales would be exposed to accumulated acoustic energy at or above 215 dB re 1 μPa^2-s.

Estimates for the sub-TTS behavioral threshold indicate there may be two exposures resulting in behavioral harassment 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, modeling indicates there would be two exposures to impulsive noise or pressures from underwater detonations of 182 dB or 23 psi, which is the threshold indicative of onset TTS, and no exposures to impulsive noise or pressures from underwater detonations that would cause physical injury (Table 6-5). Given that many of these events occur in relatively shallow water and taking into consideration range clearance procedures for underwater detonation, most if not all exposures as a result of that event should be precluded.

Bottlenose Dolphin (*Tursiops truncatus*)

The risk function and Navy post-modeling analysis estimates 716 bottlenose dolphins will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-4). Modeling indicates 17 exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s (the thresholds established to be indicative of onset TTS and onset PTS respectively). Modeling for all alternatives indicates that no bottlenose dolphins would be exposed to accumulated acoustic energy at or above 215 dB re 1 μPa^2-s.

No bottlenose dolphin would be exposed to impulsive noise or pressures from underwater detonations that will exceed the sub-TTS behavioral disturbance threshold. Without consideration of range clearance procedures, modeling indicates there would be one exposure to impulsive noise or pressures from underwater detonations of 182 dB or 23 psi, which is the threshold indicative of onset TTS, and no exposures to impulsive noise or pressures from underwater detonations that would cause physical injury (Table 6-5).

Cuvier's Beaked Whale (*Ziphius cavirostris*)

The risk function and Navy post-modeling analysis estimates 1,121 Cuvier's beaked whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-4). Modeling indicates five exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s (the thresholds established to be indicative of onset TTS and onset PTS respectively). Modeling for all alternatives indicates that no Cuvier's beaked whales would be exposed to accumulated acoustic energy at or above 215 dB re 1 μPa^2-s.

Estimates for the sub-TTS behavioral threshold indicate there may be 16 exposures resulting in behavioral harassment 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, modeling indicates there would be eight exposures to impulsive noise or pressures from underwater detonations of 182 dB or 23 psi, which is the threshold indicative of onset TTS, and no exposures to impulsive noise or pressures from underwater detonations that would cause slight physical injury (Table 6-5). Given that many of these events occur in relatively shallow water and taking into consideration range clearance procedures for underwater detonation, most if not all exposures as a result of that event should be precluded.

Dwarf Sperm Whale (*Kogia sima*)

The risk function and Navy post-modeling analysis estimates 2,061 dwarf sperm whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-4). Modeling indicates 35 exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s (the thresholds established to be indicative of onset TTS and onset PTS respectively). Modeling for all alternatives indicates that no dwarf sperm whales would be exposed to accumulated acoustic energy at or above 215 dB re 1 μPa^2-s.

Estimates for the sub-TTS behavioral threshold indicate there may be 13 exposures resulting in behavioral harassment 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, modeling indicates 13 exposures to impulsive noise or pressures from underwater detonations of 182 dB or 23 psi, which is the threshold indicative of onset TTS, and no exposures to impulsive noise or pressures from underwater detonations that would cause slight physical injury or onset of massive lung injury (Table 6-5). Range clearance procedures for underwater detonation, however, should preclude most if not all exposures as a result of that event.

False Killer Whale (*Pseudorca crassidens*)

The risk function and Navy post-modeling analysis estimates 46 false killer whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-4). Modeling 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 false killer whales would be exposed to impulsive noise or pressures from underwater detonations that will exceed the sub-TTS behavioral disturbance threshold or would cause physical injury (Table 6-5).

Fraser's Dolphin (*Lagenodelphis hosei*)

The risk function and Navy post-modeling analysis estimates 1,216 Fraser's dolphins will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-4). Modeling indicates 19 exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s (the thresholds established to be indicative of onset TTS and onset PTS respectively). Modeling for all alternatives indicates that no Fraser's dolphins would be exposed to accumulated acoustic energy at or above 215 dB re 1 μPa^2-s.

Estimates for the sub-TTS behavioral threshold indicate there may be six exposures resulting in behavioral harassment 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, modeling indicates there would be six exposures to impulsive noise or pressures from underwater detonations of 182 dB or 23 psi, which is the threshold indicative of onset TTS, and no exposures to impulsive noise or pressures from underwater detonations that would cause slight physical injury or onset of massive lung injury (Table 6-5).

Killer Whale (*Orcinus orca*)

The risk function and Navy post-modeling analysis estimates 46 killer whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-4). Modeling 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 killer whales would be exposed to impulsive noise or pressures from underwater detonations that will exceed the sub-TTS behavioral disturbance threshold or would cause physical injury (Table 6-5).

Longman's Beaked Whale (*Indopacetus pacificus*)

The risk function and Navy post-modeling analysis estimates 104 Longman's beaked whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-4). Modeling indicates one exposure to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s (the thresholds established to be indicative of onset TTS and onset PTS respectively).

Modeling for all alternatives indicates that no Longman's beaked whale would be exposed to accumulated acoustic energy at or above 215 dB re 1 μPa^2-s.

No Longman's beaked whales would be exposed to impulsive noise or pressures from underwater detonations that will exceed the sub-TTS behavioral disturbance threshold or would cause physical injury (Table 6-5).

Melon-headed Whale (*Peponocephala electra*)

The risk function and Navy post-modeling analysis estimates 583 melon-headed whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-4). Modeling indicates 13 exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s (the thresholds established to be indicative of onset TTS and onset PTS respectively). Modeling for all alternatives indicates that no melon-headed whales would be exposed to accumulated acoustic energy at or above 215 dB re 1 μPa^2-s.

One melon-headed whale would be exposed to impulsive noise or pressures from underwater detonations that will exceed the TTS behavioral disturbance threshold and none would be exposed to levels that would cause physical injury (Table 6-5).

Pantropical Spotted Dolphin (*Stenella attenuata*)

The risk function and Navy post-modeling analysis estimates 2,144 pantropical spotted dolphins will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-4). Modeling indicates 49 exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s (the thresholds established to be indicative of onset TTS and onset PTS respectively). Modeling for all alternatives indicates that no pantropical spotted dolphins would be exposed to accumulated acoustic energy at or above 215 dB re 1 μPa^2-s.

Without consideration of range clearance procedures, modeling estimates five exposures to impulsive noise or pressures from underwater detonations of 182 dB or 23 psi, which is the threshold indicative of onset TTS, one exposure to impulsive noise or pressures from underwater detonations that would cause slight injury, and no exposures resulting in massive lung injury (Table 6-5). Given that many of these events occur in relatively shallow water and taking into consideration range clearance procedures for underwater detonation with the high probability of detecting pantropical spotted dolphins at the surface, these exposures associate with underwater detonations should be precluded from occurring.

Pygmy Killer Whale (*Feresa attenuata*)

The risk function and Navy post-modeling analysis estimates 192 pygmy killer whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-4). Modeling indicates four exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s (the thresholds established to be indicative of onset TTS and onset PTS respectively). Modeling for all alternatives indicates that no pygmy killer whales would be exposed to accumulated acoustic energy at or above 215 dB re 1 μPa^2-s.

No pygmy killer whales would be exposed to impulsive noise or pressures from underwater detonations that will exceed the sub-TTS behavioral disturbance threshold or would cause physical injury (Table 6-5).

Pygmy Sperm Whale (*Kogia breviceps*)

The risk function and Navy post-modeling analysis estimates 842 pygmy sperm whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-4). Modeling indicates 14 exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s (the thresholds established to be indicative of onset TTS and onset PTS respectively). Modeling for all alternatives indicates that no pygmy sperm whales would be exposed to accumulated acoustic energy at or above 215 dB re 1 μPa^2-s.

Estimates for the sub-TTS behavioral threshold indicate there may be four exposures resulting in behavioral harassment 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, modeling indicates five exposures to impulsive noise or pressures from underwater detonations of 182 dB or 23 psi, which is the threshold indicative of onset TTS, and no exposures to impulsive noise or pressures from underwater detonations that would cause slight physical injury (Table 6-5). Given that many of these events occur in relatively shallow water and taking into consideration range clearance procedures for underwater detonation, these five exposures should be precluded from occurring.

Risso's Dolphin (*Grampus griseus*)

The risk function and Navy post-modeling analysis estimates 486 Risso's dolphins will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-4). Modeling indicates 10 exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s (the thresholds established to be indicative of onset TTS and onset PTS respectively). Modeling for all alternatives indicates that no Risso's dolphins would be exposed to accumulated acoustic energy at or above 215 dB re 1 μPa^2-s.

One Risso's dolphin would be exposed to impulsive noise or pressures from underwater detonations that will exceed the TTS behavioral disturbance threshold and none would be exposed to levels that would cause physical injury (Table 6-5).

Rough-Toothed Dolphin (*Steno bredanensis*)

The risk function and Navy post-modeling analysis estimates 1,053 rough-toothed dolphins will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-4). Modeling indicates 18 exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s (the thresholds established to be indicative of onset TTS and onset PTS respectively). Modeling for all alternatives indicates that no rough-toothed dolphins would be exposed to accumulated acoustic energy at or above 215 dB re 1 μPa^2-s.

Estimates for the sub-TTS behavioral threshold indicate there may be two exposures resulting in behavioral harassment 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, modeling indicates there would be four exposures to impulsive noise or pressures from underwater detonations of 182 dB or 23 psi, which is the threshold indicative of onset TTS, and no exposures to impulsive noise or pressures from underwater detonations that would cause slight physical injury or massive lung injury (Table 6-5). Given that many of these events occur in relatively shallow water and taking into consideration range clearance procedures for underwater detonation with the high probability of detecting rough-toothed dolphins at the surface, these four exposures should be precluded from occurring.

Short-finned Pilot Whale (*Globicephala macrorhynchus*)

The risk function and Navy post-modeling analysis estimates 1,751 short-finned pilot whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6_4). Modeling indicates 40 exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s (the thresholds established to be indicative of onset TTS and onset PTS respectively). Modeling for all alternatives indicates that no short-finned pilot whales would be exposed to accumulated acoustic energy at or above 215 dB re 1 μPa^2-s.

Estimates for the sub-TTS behavioral threshold indicate there may be two exposures resulting in behavioral harassment 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, modeling indicates there would be five exposures to impulsive noise or pressures from underwater detonations of 182 dB or 23 psi, which is the threshold indicative of onset TTS, and no exposures to impulsive noise or pressures from underwater detonations that would cause slight physical injury or massive lung injury (Table 6-5). Given that many of these events occur in relatively shallow water and taking into consideration range clearance procedures for underwater detonation with the high probability of detecting short-finned pilot whales at the surface, these five exposures should be precluded from occurring.

Spinner Dolphin (*Stenella longirostris*)

The risk function and Navy post-modeling analysis estimates 410 spinner dolphins will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-4). Modeling indicates seven exposures to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. Modeling for all alternatives indicates that no spinner dolphins would be exposed to accumulated acoustic energy at or above 215 dB re 1 μPa^2-s, which is the threshold indicative of onset PTS.

Estimates for the sub-TTS behavioral threshold indicate there may be two exposures resulting in behavioral harassment 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, modeling estimates there would be two exposures to impulsive noise or pressures from underwater detonations of 182 dB or 23 psi, which is the threshold indicative of onset TTS, no exposure to impulsive noise or pressures from underwater detonations that would cause slight injury or massive lung injury (Table 6-5). Given range clearance procedures for underwater detonation and the high probability of detecting spinner dolphins at the surface, these exposures from underwater detonations should be precluded from occurring.

Striped Dolphin (*Stenella coeruleoalba*)

The risk function and Navy post-modeling analysis estimates 3,126 striped dolphins will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-4). Modeling indicates 73 exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s (the thresholds established to be indicative of onset TTS and onset PTS respectively). Modeling for all alternatives indicates that no striped dolphins would be exposed to accumulated acoustic energy at or above 215 dB re 1 μPa^2-s.

Estimates for the sub-TTS behavioral threshold indicate there may be two exposures resulting in behavioral harassment 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, modeling indicates seven exposures to impulsive noise or pressures from underwater detonations of 182 dB or 23 psi, which is the threshold indicative of onset TTS, one exposure to impulsive noise or pressures from underwater detonations that would cause slight physical injury and none that would cause massive lung injury (Table 6-5). Given that many of these events occur in relatively shallow water and taking into consideration range clearance procedures for underwater detonation with the high probability of detecting striped dolphins at the surface, these exposures should be precluded from occurring.

Unidentified Beaked Whales

The risk function and Navy post-modeling analysis estimates 36 unidentified beaked whales will exhibit behavioral responses NMFS will classify as harassment under the MMPA (Table 6-4). Modeling indicates no exposures to accumulated acoustic energy above 195 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS.

No unidentified beaked whales would be exposed to impulsive noise or pressures from underwater detonations that will exceed the sub-TTS behavioral disturbance threshold or would cause physical injury (Table 6-5).

6.8.6 Summary of Exposures by Exercise

HRC ASW Training—Alternative 3

The Alternative 3 modeling included surface ship sonar, submarine sonar, associated sonobuoys, MK-48 torpedo sonar, and dipping sonars per twelve month period. The modeled exposures for marine mammals during ASW training, without consideration of mitigation measures are presented in Table 6-6. Effects on marine mammals from these exposures are included in the previous discussion in Sections 6.8.3 for ESA listed species and 6.8.4 for non-ESA listed species.

Major Exercises—Alternative 3

Rim of the Pacific (RIMPAC)

There are no changes in the Alternatives for the RIMPAC exercise between the DEIS/OEIS and the Supplement to the DEIS/OEIS and this update to the LOA. The modeled exposures for marine mammals during RIMPAC, without consideration of mitigation measures are presented in Table 6-7.

Undersea Warfare Training Exercise (USWEX)

The Alternative 3 for USWEX has changed from the Alternatives presented in the DEIS/OEIS and the Supplement to the DEIS/OEIS and this update to the LOA. There were six USWEX analyzed in the DEIS/OEIS proposed under the Alternative 3 and in the Supplement to the DEIS/OEIS and this update to the LOA there are five USWEX proposed (Table 6-8).

Table 6-6. Alternative 3 Sonar Modeling Summary—Yearly Marine Mammal Exposures From Other HRC ASW Training

Marine Mammals	Risk Function	DEIS/OEIS Dose Function	TTS[3]	PTS[4]
Bryde's whale	14	84	0	0
Fin whale[1, 2]	10	28	0	0
Sei whale[1, 2]	10	28	0	0
Humpback whale[1]	1561	8,938	57	0
Sperm whale[1]	166	391	2	0
Dwarf sperm whale	451	836	10	0
Pygmy sperm whale	185	342	4	0
Cuvier's beaked whale	266	490	1	0
Longman's beaked whale	22	56	0	0
Blainville's beaked whale	76	191	2	0
Unidentified beaked whale	9	16	0	0
Bottlenose dolphin	152	454	5	0
False killer whale	10	28	0	0
Killer whale	10	28	0	0
Pygmy killer whale	41	110	1	0
Shortfinned pilot whale	376	1,044	12	0
Risso's dolphin	104	290	3	0
Melonheaded whale	125	348	4	0
Roughtoothed dolphin	230	439	5	0
Fraser's dolphin	264	507	5	0
Pantropical spotted dolphin	459	1,424	14	0
Spinner dolphin	89	171	2	0
Striped dolphin	669	2,078	21	0
Monk seal[1]	29	177	1	0
TOTAL	5,328	18,498	149	0

Note: [1] Endangered Species
[2] Due to a lack of density data for fin and sei whales, false killer whale results were used because they have a similar size population within the HRC.
[3] For cetacea TTS is the following range 195-215 dB re 1 µPa^2-s. For monk seals TTS is 204-224 dB re 1 µPa^2-s
[4] For cetacea PTS is >215 dB re 1 µPa^2-s. For monk seals PTS is >224 dB re 1 µPa^2-
dB = decibel
TTS = temporary threshold shift
PTS = permanent threshold shift

Table 6-7. Alternative 3 Sonar Modeling Summary—Yearly Marine Mammal Exposures for RIMPAC (Conducted Every Other Year)

Marine Mammals	Risk Function	DEIS/OEIS Dose Function	TTS[3]	PTS[4]
Bryde's whale	19	2	0	0
Fin whale[1, 2]	14	7	0	0
Sei whale[1, 2]	14	7	0	0
Humpback whale[1]	0	-	0	-
Sperm whale[1]	245	115	3	0
Dwarf sperm whale	608	211	11	0
Pygmy sperm whale	248	89	4	0
Cuvier's beaked whale	347	157	2	0
Longman's beaked whale	32	16	0	0
Blainville's beaked whale	102	54	2	0
Unidentified beaked whale	11	5	0	0
Bottlenose dolphin	225	128	5	0
False killer whale	14	7	0	0
Killer whale	14	7	0	0
Pygmy killer whale	58	30	1	0
Shortfinned pilot whale	547	289	12	0
Risso's dolphin	152	80	3	0
Melonheaded whale	182	96	4	0
Roughtoothed dolphin	311	115	6	0
Fraser's dolphin	361	133	6	0
Pantropical spotted dolphin	682	409	15	0
Spinner dolphin	122	45	2	0
Striped dolphin	994	596	23	0
Monk seal[1]	35	49	1	0
TOTAL	5,337	2,676	100	0

Note: [1] Endangered Species
[2] Due to a lack of density data for fin and sei whales, false killer whale results were used because they have a similar size population within the HRC.
[3] For cetacea TTS is the following range 195-215 dB re 1 µPa^2-s. For monk seals TTS is 204-224 dB re 1 µPa^2-s
[4] For cetacea PTS is >215 dB re 1 µPa^2-s. For monk seals PTS is >224 dB re 1 µPa^2-
dB = decibel
TTS = temporary threshold shift
PTS = permanent threshold shift

Table 6-8. Alternative 3 Sonar Modeling Summary—Yearly Marine Mammal Exposures From USWEX (5 per year)

Marine Mammals	Risk Function	DEIS/OEIS Dose Function	TTS[3]	PTS[4]
Bryde's whale	31	65	0	0
Fin whale[1, 2]	22	19	0	0
Sei whale[1, 2]	22	19	0	0
Humpback whale[1]	8116	19,421	142	0
Sperm whale[1]	347	262	4	0
Dwarf sperm whale	1002	599	14	0
Pygmy sperm whale	409	244	6	0
Cuvier's beaked whale	508	378	2	0
Longman's beaked whale	50	41	1	0
Blainville's beaked whale	169	145	2	0
Unidentified beaked whale	16	12	0	0
Bottlenose dolphin	339	305	7	0
False killer whale	22	19	0	0
Killer whale	22	19	0	0
Pygmy killer whale	93	74	2	0
Shortfinned pilot whale	828	679	16	0
Risso's dolphin	230	189	4	0
Melonheaded whale	276	226	5	0
Roughtoothed dolphin	512	315	7	0
Fraser's dolphin	591	363	8	0
Pantropical spotted dolphin	1003	938	20	0
Spinner dolphin	199	122	3	0
Striped dolphin	1463	1,368	29	0
Monk seal[1]	40	136	1	0
TOTAL	16,310	25,958	273	0

Note: [1] Endangered Species
[2] Due to a lack of density data for fin and sei whales, false killer whale results were used because they have a similar size population within the HRC.
[3] For cetacea TTS is the following range 195-215 dB re 1 μPa^2-s. For monk seals TTS is 204-224 dB re 1 μPa^2-s
[4] For cetacea PTS is >215 dB re 1 μPa^2-s. For monk seals PTS is >224 dB re 1 μPa^2-
dB = decibel
TTS = temporary threshold shift
PTS = permanent threshold shift

7. IMPACTS TO MARINE MAMMAL SPECIES OR STOCKS

There are no changes to Chapter 7 as described under the July 2007 Request for Letter of Authorization.

8. IMPACTS ON SUBSISTENCE USE

There are no changes to Chapter 8 as described under the July 2007 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 July 2007 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 July 2007 Request for Letter of Authorization (LOA).

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

Refer to the April 2008 HRC EIS/OEIS for updated mitigation measures.

12. MINIMIZATION OF ADVERSE EFFECTS ON SUBSISTENCE USE

There are no changes to Chapter 12 as described under the July 2007 Request for Letter of Authorization.

13. MONITORING AND REPORTING MEASURES

There are no changes to Chapter 13 as described under the July 2007 Request for Letter of Authorization.

14. RESEARCH

There are no changes to Chapter 14 as described under the July 2007 Request for Letter of Authorization.

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Years of Experience: 25

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Years of Experience: 21

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16. REFERENCES

There are no changes to Chapter 16 as described under the February 2008 Updated to the Letter of Authorization.

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