

**Supplemental Environmental Impact Statement/
Overseas Environmental Impact Statement
Mariana Islands Training and Testing**

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APPENDIX E ESTIMATED MARINE MAMMAL AND SEA TURTLE IMPACTS FROM EXPOSURE TO ACOUSTIC AND EXPLOSIVE STRESSORS UNDER NAVY TRAINING AND TESTING ACTIVITIES

Navy training and testing activities would result in the incidental takes of marine mammals and sea turtles within the Study Area. This appendix provides the estimated number of marine mammal and sea turtle impacts. Specifically, estimated impacts are derived from the quantitative analysis for activities under Alternatives 1 and 2 that involve the use of acoustic or explosive stressors. The quantitative analysis takes into account Navy activities, marine species density layers, acoustic modeling, and other environmental parameters. A detailed explanation of the quantitative analysis is provided in the technical report *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase III Training and Testing* (U.S. Department of the Navy, 2018). It is important to note that *impacts*, as discussed in this appendix, represent the estimated instances of take of marine mammals or sea turtles, not necessarily the number of individuals impacted (i.e., some marine mammals or sea turtles could be impacted several times, while others would not experience any impact). In addition, across training and testing activities, the seven-year total impacts in each table may be more or less than seven times the maximum impact in any year, because the level of certain activities may vary annually as described in Chapter 2 (Description of Proposed Action and Alternatives).

E.1 ESTIMATED MARINE MAMMAL IMPACTS FROM SONAR AND OTHER TRANSDUCERS UNDER NAVY TRAINING AND TESTING ACTIVITIES

Table E-1 provides a summary of the estimated number of marine mammal impacts from exposure to sonar and other transducers used during Navy training and testing activities under Alternatives 1 and 2 over the course of one year.

Table E-1: Estimated Marine Mammals Impacts per Year from Sonar Training and Testing Activities

<i>Species</i>	<i>Alternative 1 – Minimum</i>			<i>Alternative 1 – Maximum</i>			<i>Alternative 2 – Maximum</i>		
	<i>Behavioral Response</i>	<i>TTS</i>	<i>PTS</i>	<i>Behavioral Response</i>	<i>TTS</i>	<i>PTS</i>	<i>Behavioral Response</i>	<i>TTS</i>	<i>PTS</i>
<i>Mysticetes</i>									
Blue whale*	3	18	0	3	18	0	4	20	0
Bryde's whale	33	236	0	33	236	0	36	256	0
Fin whale*	4	19	0	4	19	0	5	20	0
Humpback whale*	46	387	0	46	387	0	51	419	0
Minke whale	8	78	0	8	78	0	9	85	0
Omura's whale	3	23	0	3	23	0	3	25	0
Sei whale*	15	125	0	15	125	0	17	135	0
<i>Odontocetes</i>									
Blainville's beaked whale	1,553	26	0	1,557	26	0	1,691	27	0
Bottlenose dolphin	104	21	0	104	21	0	116	21	0
Cuvier's beaked whale	600	4	0	600	4	0	642	4	0
Dwarf sperm whale	1,179	6,428	28	1,186	6,435	28	1,290	7,046	29
False killer whale	571	116	0	573	116	0	641	120	0
Fraser's dolphin	10,123	1,896	0	10,150	1,896	0	11,323	1,947	0
Ginkgo-toothed beaked whale	3,367	63	0	3,373	63	0	3,659	65	0
Killer whale	32	7	0	32	7	0	37	8	0
Longman's beaked whale	5,473	104	0	5,483	104	0	5,958	106	0

Table E-1: Estimated Marine Mammals Impacts per Year from Sonar Training and Testing Activities (continued)

<i>Species</i>	<i>Alternative 1 – Minimum</i>			<i>Alternative 1 – Maximum</i>			<i>Alternative 2 – Maximum</i>		
	<i>Behavioral Response</i>	<i>TTS</i>	<i>PTS</i>	<i>Behavioral Response</i>	<i>TTS</i>	<i>PTS</i>	<i>Behavioral Response</i>	<i>TTS</i>	<i>PTS</i>
Melon-headed whale	2,059	489	0	2,064	489	0	2,305	508	0
Pantropical spotted dolphin	10,733	2,717	0	10,794	2,717	0	12,074	2,816	0
Pygmy killer whale	77	16	0	78	16	0	87	17	0
Pygmy sperm whale	463	2,594	11	465	2,596	11	509	2,840	11
Risso's dolphin	2,358	505	0	2,365	505	0	2,648	519	0
Rough-toothed dolphin	145	35	0	145	35	0	161	36	0
Short-finned pilot whale	874	172	0	876	172	0	987	177	0
Sperm whale*	183	11	0	184	11	0	192	11	0
Spinner dolphin	1,040	223	0	1,042	223	0	1,185	228	0
Striped dolphin	2,891	722	0	2,900	722	0	3,254	751	0

* ESA-listed species within the MITT Study Area

Notes: PTS = permanent threshold shift, TTS = temporary threshold shift

E.2 ESTIMATED MARINE MAMMAL IMPACTS PER SEVEN-YEAR PERIOD FROM SONAR AND OTHER TRANSDUCERS UNDER NAVY TRAINING AND TESTING ACTIVITIES

Table E-2 provides a summary of the estimated number of marine mammal impacts from exposure to sonar and other transducers used during Navy training and testing activities under Alternatives 1 and 2 over the course of seven years.

Table E-2: Estimated Marine Mammals Impacts per Seven-Year Period from Sonar Training and Testing Activities

Species	Alternative 1 – 7-Year			Alternative 2 – 7-Year		
	Behavioral Response	TTS	PTS	Behavioral Response	TTS	PTS
Mysticetes						
Blue whale*	26	103	0	29	140	0
Bryde's whale	226	1,338	0	254	1,792	0
Fin whale*	30	100	0	34	139	0
Humpback whale*	318	2,199	0	358	2,933	0
Minke whale	56	452	0	62	590	0
Omura's whale	20	130	0	23	172	0
Sei whale*	105	708	0	118	947	0
Odontocetes						
Blainville's beaked whale	10,117	117	0	11,844	187	0
Bottlenose dolphin	673	92	0	811	150	0
Cuvier's beaked whale	3,924	19	0	4,498	30	0
Dwarf sperm whale	8,274	37,761	126	9,030	49,298	203
False killer whale	3,700	528	0	4,487	841	0
Fraser's dolphin	64,858	8,401	0	79,242	13,627	0
Ginkgo-toothed beaked whale	21,937	280	0	25,627	452	0
Killer whale	209	32	0	255	54	0
Longman's beaked whale	35,630	477	0	41,731	743	0
Melon-headed whale	13,364	2,179	0	16,127	3,552	0
Pantropical spotted dolphin	69,701	12,367	0	84,487	19,707	0
Pygmy killer whale	499	71	0	609	116	0
Pygmy sperm whale	3,246	15,230	49	3,560	19,868	79
Risso's dolphin	15,223	2,288	0	18,535	3,629	0
Rough-toothed dolphin	943	161	0	1,127	251	0
Short-finned pilot whale	5,639	793	0	6,901	1,235	0
Sperm whale*	1,087	46	0	1,345	75	0
Spinner dolphin	6,747	970	0	8,292	1,598	0
Striped dolphin	18,723	3,257	0	22,776	5,250	0

* ESA-listed species within the MITT Study Area

Notes: PTS = permanent threshold shift, TTS = temporary threshold shift

E.3 ESTIMATED MARINE MAMMAL IMPACTS FROM EXPLOSIVES UNDER NAVY TRAINING AND TESTING ACTIVITIES

Table E-3 provides a summary of the estimated number of marine mammal impacts from exposure to explosives used during Navy training and testing activities under Alternatives 1 and 2 over the course of one year.

Table E-3: Estimated Marine Mammals Impacts per Year from Explosive Training and Testing Activities

<i>Species</i>	<i>Alternative 1 – Minimum</i>				<i>Alternative 1 – Maximum</i>				<i>Alternative 2 – Maximum</i>			
	<i>Behavioral Response</i>	<i>TTS</i>	<i>PTS</i>	<i>Injury</i>	<i>Behavioral Response</i>	<i>TTS</i>	<i>PTS</i>	<i>Injury</i>	<i>Behavioral Response</i>	<i>TTS</i>	<i>PTS</i>	<i>Injury</i>
<i>Mysticetes</i>												
Blue whale*	0	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	2	2	0	0	3	2	0	0	3	2	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale*	5	2	0	0	6	2	0	0	7	4	0	0
Minke whale	1	0	0	0	2	0	0	0	2	0	0	0
Omura's whale	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	2	0	0	0	2	0	0	0	2	1	0	0
<i>Odontocetes</i>												
Blainville's beaked whale	0	0	0	0	0	0	0	0	0	0	0	0
Bottlenose dolphin	0	0	0	0	0	0	0	0	0	0	0	0
Cuvier's beaked whale	0	0	0	0	0	0	0	0	0	0	0	0
Dwarf sperm whale	57	89	17	0	58	92	18	0	64	100	20	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	4	5	1	0	4	5	1	0	4	5	1	0
Ginkgo-toothed beaked 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

Table E-3: Estimated Marine Mammals Impacts per Year from Explosive Training and Testing Activities (continued)

Species	Alternative 1 – Minimum				Alternative 1 – Maximum				Alternative 2 – Maximum			
	Behavioral Response	TTS	PTS	Injury	Behavioral Response	TTS	PTS	Injury	Behavioral Response	TTS	PTS	Injury
Longman's beaked whale	1	1	0	0	1	1	0	0	1	1	0	0
Melon-headed whale	1	0	0	0	1	0	0	0	1	0	0	0
Pantropical spotted dolphin	4	2	1	0	4	2	1	0	5	3	1	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0
Pygmy sperm whale	23	32	7	0	23	33	8	0	25	37	9	0
Risso's dolphin	1	0	0	0	1	0	0	0	1	1	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	0	0	0	0	0	0	0	0	0	0	0	0
Spinner dolphin	0	1	0	0	0	1	0	0	0	1	0	0
Striped dolphin	0	1	0	0	0	1	0	0	0	1	0	0

* ESA-listed species within the MITT Study Area

Notes: PTS = permanent threshold shift, TTS = temporary threshold shift

E.4 ESTIMATED MARINE MAMMAL IMPACTS PER SEVEN-YEAR PERIOD FROM EXPLOSIVES UNDER NAVY TRAINING AND TESTING ACTIVITIES

Table E-4 provides a summary of the estimated number of marine mammal impacts from exposure to explosives used during Navy training and testing activities under Alternatives 1 and 2 over the course of seven years.

Table E-4: Estimated Marine Mammals Impacts per Seven-Year Period from Explosive Training and Testing Activities

<i>Species</i>	<i>Alternative 1 – 7-Year</i>				<i>Alternative 2 – 7-Year</i>			
	<i>Behavioral Response</i>	<i>TTS</i>	<i>PTS</i>	<i>Injury</i>	<i>Behavioral Response</i>	<i>TTS</i>	<i>PTS</i>	<i>Injury</i>
<i>Mysticetes</i>								
Blue whale*	0	0	0	0	0	0	0	0
Bryde's whale	22	11	0	0	22	11	0	0
Fin whale*	0	0	0	0	0	0	0	0
Humpback whale*	38	19	0	0	39	20	0	0
Minke whale	8	0	0	0	8	0	0	0
Omura's whale	0	0	0	0	0	0	0	0
Sei whale*	11	0	0	0	11	3	0	0
<i>Odontocetes</i>								
Blainville's beaked whale	0	0	0	0	0	0	0	0
Bottlenose dolphin	0	0	0	0	0	0	0	0
Cuvier's beaked whale	0	0	0	0	0	0	0	0
Dwarf sperm whale	404	635	125	0	446	686	137	0
False killer whale	0	0	0	0	0	0	0	0
Fraser's dolphin	28	30	6	0	29	33	7	0
Ginkgo-toothed beaked whale	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0
Longman's beaked whale	4	6	0	0	5	7	0	0

Table E-4: Estimated Marine Mammals Impacts per Seven-Year Period from Explosive Training and Testing Activities (continued)

<i>Species</i>	<i>Alternative 1 – 7-Year</i>				<i>Alternative 2 – 7-Year</i>			
	<i>Behavioral Response</i>	<i>TTS</i>	<i>PTS</i>	<i>Injury</i>	<i>Behavioral Response</i>	<i>TTS</i>	<i>PTS</i>	<i>Injury</i>
Melon-headed whale	5	0	0	0	5	0	0	0
Pantropical spotted dolphin	28	17	5	0	29	18	6	0
Pygmy killer whale	0	0	0	0	0	0	0	0
Pygmy sperm whale	160	231	52	0	175	250	56	0
Risso's dolphin	4	0	0	0	5	4	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0
Sperm whale*	0	0	0	0	0	0	0	0
Spinner dolphin	0	4	0	0	0	4	0	0
Striped dolphin	0	4	0	0	0	5	0	0

* ESA-listed species within the MITT Study Area

Notes: PTS = permanent threshold shift, TTS = temporary threshold shift

E.5 ESTIMATED SEA TURTLE IMPACTS FROM SONAR AND OTHER TRANSDUCERS UNDER NAVY TRAINING AND TESTING ACTIVITIES

Based on the quantitative analysis, no sea turtle impacts are anticipated from exposure to sonar and other transducers used during Navy training and testing activities under Alternatives 1 and 2 over the course of one year or seven years.

E.6 ESTIMATED SEA TURTLE IMPACTS FROM EXPLOSIVES UNDER NAVY TRAINING AND TESTING ACTIVITIES

Table E-5 provides a summary of the estimated number of sea turtle impacts from exposure to explosives used during Navy training and testing activities under Alternatives 1 and 2 over the course of one year.

Table E-5: Estimated Sea Turtle Impacts per Year from Explosive Training and Testing Activities

<i>Species</i>	<i>Alternative 1 – Minimum</i>			<i>Alternative 1 – Maximum</i>			<i>Alternative 2 – Maximum</i>		
	<i>TTS</i>	<i>PTS</i>	<i>Injury</i>	<i>TTS</i>	<i>PTS</i>	<i>Injury</i>	<i>TTS</i>	<i>PTS</i>	<i>Injury</i>
<i>Explosive Training and Testing Activities</i>									
<i>Family Cheloniidae (hardshell turtles)</i>									
Green turtle*	6	3	0	6	3	0	6	3	0
Hawksbill turtle*	0	0	0	0	0	0	0	0	0
Loggerhead turtle*	0	0	0	0	0	0	0	0	0
<i>Family Dermochelyidae (scuteless turtles)</i>									
Leatherback turtle*	0	0	0	0	0	0	0	0	0

* ESA-listed species within the MITT Study Area

Notes: PTS = permanent threshold shift, TTS = temporary threshold shift

E.7 ESTIMATED SEA TURTLE IMPACTS PER SEVEN-YEAR PERIOD FROM EXPLOSIVES UNDER NAVY TRAINING AND TESTING ACTIVITIES

Table E-6 provides a summary of the estimated number of sea turtle impacts from exposure to explosives used during Navy training and testing activities under Alternatives 1 and 2 per seven-year period.

Table E-6: Estimated Sea Turtle Impacts per Seven-Year Period from Explosive Training and Testing Activities

<i>Species</i>	<i>Alternative 1 – 7-Year</i>			<i>Alternative 2 – 7-Year</i>		
	<i>TTS</i>	<i>PTS</i>	<i>Injury</i>	<i>TTS</i>	<i>PTS</i>	<i>Injury</i>
<i>Explosive Training and Testing Activities</i>						
<i>Family Cheloniidae (hardshell turtles)</i>						
Green turtle*	40	20	0	40	20	0
Hawksbill turtle*	0	0	0	0	0	0
Loggerhead turtle*	0	0	0	0	0	0
<i>Family Dermochelyidae (scuteless turtles)</i>						
Leatherback turtle*	0	0	0	0	0	0

* ESA-listed species within the MITT Study Area

Notes: PTS = permanent threshold shift, TTS = temporary threshold shift

REFERENCES

U.S. Department of the Navy. (2018). *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase III Training and Testing* (Technical Report prepared by NUWC Division Newport, Space and Naval Warfare Systems Center Pacific, G2 Software Systems, and the National Marine Mammal Foundation). Newport, RI: Naval Undersea Warfare Center.

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