APPENDIX F
Military Expended Materials and Direct Strike Impact Analyses

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Draft
Environmental Impact Statement/Overseas Environmental Impact Statement
Atlantic Fleet Training and Testing

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APPENDIX F MILITARY EXPENDED MATERIAL AND DIRECT STRIKE IMPACT ANALYSIS

F.1 ESTIMATING THE IMPACT OF MILITARY EXPENDED MATERIALS AND UNDERWATER EXPLOSIONS ON ABIOTIC SUBSTRATES AS A HABITAT FOR BIOLOGICAL RESOURCES

This section discusses the methods and results for quantifying two scenarios under Alternative 1 and Alternative 2 of the Proposed Action: (1) the highly improbable worst-case scenario of all military expended materials or underwater explosions occurring on one particular substrate type, and (2) the unlikely, but slightly more realistic, scenario of uniform or proportional impact distribution within a particular area. Training and testing typically occurs in areas that are not called out or linked to specific activities for various reasons (e.g., flexibility and national security). Because training and testing activities would not be conducted under the No Action Alternative, it will not be discussed in this appendix.

This section describes the calculation of the disturbance footprint (i.e., military expended material footprint or explosive crater footprint) of an instantaneous impact of military expended materials or explosions on the substrate. The actual instantaneous impact on the bottom will depend on the number and location of military expended materials expended and not recovered, which is likely much lower and more concentrated than either scenario being analyzed. Longer term impacts on the bottom are far more difficult to quantify – refer to the Habitats section of Chapter 3 (Section 3.5, Affected Environment and Environmental Consequences) for qualitative discussion.

The analysis requires two data elements: (1) a tabular summary of the military expended material or crater (underwater explosions) footprints expected in training and testing areas, and (2) a tabular summary of analysis dimensions, which includes abiotic substrate areas. The data for (1) comes from the Atlantic Fleet Training and Testing (AFTT) action proponents and represents the most locational flexibility with regard to expenditure of military expended materials and underwater explosions. The data for both expended and recovered material is reported in Table F-1 through Table F-17 below. Appendix A of the AFTT Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS) provides basic descriptions of military expended materials and Chapter 3.0 (3.0.3.3.2, Explosive Stressors) provides basic descriptions of explosive categories. The data for number of military expended materials and underwater explosions are then multiplied by an estimate of the footprint size documented in Table F-1. The data for (2) comes from a compilation of abiotic substrate mapping presented in the Habitats section of Chapter 3 (Section 3.5-Habitats).

To determine the potential level of disturbance of military expended materials on marine substrates, it was assumed that the impact footprint of the expended material on the seafloor is twice the size of its footprint (unless specified otherwise in Appendix F notes). By doubling the footprint, the results should more accurately reflect the potential disturbance to soft bottom habitats (i.e., to account for sediment plumes), but should overestimate disturbance to hard bottom habitats (i.e., because sediment plumes are not expected) based on mitigation requirements. Items with casings (e.g., small-, medium-, and large-caliber munitions; flares; sonobuoys; etc.) have their impact footprints further doubled to account for both the item and its casing. To be conservative, items and their casings were assumed to be the same size, although in reality the items are a smaller size in order to fit in their casing.

Table F-1: Categories and Footprints for Various Materials and Underwater Explosions

Material Group	*Material Category*	*Bottom Frequency**	*Crater Footprint ($ft.^2$)*	*MEM Size ($ft.^2$)*	*MEM Footprint ($ft.^2$)*	*Material Specific Notes*
Bomb	Bombs (Explosive)	NA	NA	8.1203	112.9048	The MEM footprint was calculated using the bomb with the largest footprint in terms of material fragments, which in this case is the Rockeye which disperses 247 bomblets.
	Bombs (Non-explosive)	NA	NA	8.1203	112.9048	
Countermeasure	Acoustic Countermeasures	NA	NA	0.31107	1.2432	Includes all type of non-recoverable Acoustic Countermeasures
	Chaff- Air Cartridge	NA	NA	0.0012	0.0022	Chaff is a radar reflector material made of thin, narrow, metallic strips cut in various lengths to elicit frequency responses, which deceive enemy radars. Chaff-Air is fired from an aircraft using a small cartridge.
	Chaff-Ship Cartridge	NA	NA	2.000	4.000	Chaff-ship serves the same purpose of chaff-air. It is fired from a ship in cartridges.
	Anti-torpedo Torpedo	NA	NA	4.5424	9.0847	The Countermeasure Anti-torpedo consists of an anti-torpedo torpedo enclosed within All Up Round Equipment canister. The anti-torpedo torpedo is a 6.75-inch diameter high-maneuverability hard-kill torpedo designed to rapidly intercept and engage an incoming threat torpedo. The All Up Round Equipment consists of a nose sabot, ram plate, launch tube, muzzle cover, and breech mechanism to encapsulate, protect, and ultimately launch the anti-torpedo torpedo. Anti-torpedo torpedo s are frequently recovered; assume all are non-recoverable for worst-case.
	Flares	NA	NA	1.2196	4.8782	Assumed to not have parachutes
Explosive Charge	0.5 lb. HE charges	50%	12	NA	NA	None
	10 lb. HE charges	50%	85	NA	NA	None
	20 lb. HE charges	50%	135	NA	NA	None
	5 lb. HE charges	50%	54	NA	NA	None
	60 lb. HE charges	50%	281	NA	NA	None
	650 lb. HE charges	50%	14800.3763	25.7903	51.5806	Another name for an explosive mine including material based on the footprint of a mine shape.
	Line Charges	100%	4324	NA	NA	None

Table F-1: Categories and Footprints for Various Materials and Underwater Explosions (continued)

Material Group	*Material Category*	*Bottom Frequency**	*Crater Footprint (ft^2)*	*MEM Size (ft^2)*	*MEM Footprint (ft^2)*	*Material Specific Notes*
Missiles	Missiles (Explosive)	NA	NA	37.3669	74.7338	MEM size based on SM-6
	Missile (Non-explosive)	NA	NA	31.0011	62.0023	MEM size based on Tomahawk
	Rockets (Explosive)	NA	NA	0.7987	1.5974	MEM sized based on Hydra 70
	Rockets (Non-explosive)	NA	NA	0.7987	1.5974	MEM size based on Hydra 70. Also include flechette rockets.
	Rockets (Non-explosive): Flechette	NA	NA	0.7987	1.5974	MEM size based on Hydra 70. Included flechette darts in warhead.
Other	Air-launched lightweight (Explosive) torpedo	NA	NA	19.1199	38.2399	MEM size based on MK50/MK54
	Air-launched lightweight (Non-explosive) torpedo	NA	NA	19.1199	38.2399	MEM size based on MK50/MK54. Typically recovered
	AMNS/EMNS Neutralizer (Explosive)	50%	430.5564	1.6286	3.2572	AMNS is air deployed whereas EMNS is ship deployed
	AMNS Neutralizer (Non-explosive)	NA	NA	0.1513	0.3026	The neutralizer itself is recovered, but the associated fiber optic cable and the can that holds the fiber optic cable is not.
	Anchor (Expendable)	NA	NA	6.2495	12.5001	Associated primarily with mine shapes.
	Anchor (Recoverable)	NA	NA	6.2495	12.5001	Associated primarily with mine shapes.
	Biodegradable Polymer	NA	NA	NA	NA	A substance composed of molecules that degrade as a result of microorganisms and/or enzymes. Footprint is not applicable because the material breaks up within a couple of hours, depending on the type of material out of which the polymer is made. Reference: Karlsson and Albertsson. 1998. Biodegradable polymers and environmental interaction. Polymer Engineering and Science 38(8): 1251-1253.
	Bottom Placed Instruments	NA	NA	2.0000	4.000	Likely moored tracking beacons, so the footprint on the bottom would be approximately 2 square feet. It would weight approximately 50 pounds.

Table F-1: Categories and Footprints for Various Materials and Underwater Explosions (continued)

Material Group	*Material Category*	*Bottom Frequency**	*Crater Footprint (ft^2)*	*MEM Size (ft^2)*	*MEM Footprint (ft^2)*	*Material Specific Notes*
	Buoy (Explosive)	NA	NA	0.9752	3.8987	Explosive buoys including mini-sound source and SUS. MEM-size based on Marine Marker.
	Buoy (Non-explosive)	NA	NA	0.9752	3.8987	These buoys are separate from sonobuoys, and are included for DWADS (expendable) or IMPASS (recovered). MEM size based on Marine Marker. Can be expended or recovered.
	Concrete slugs	NA	NA	0.0011	0.0022	Assume similar in dimensions to a chaff cartridge
	Endcaps & Pistons – Non Chaff & Flare	NA	NA	0.0043	0.0086	Applies only to where it cannot be associated to another object (e.g., endcaps and pistons associated with chaff would be covered by 'chaff'). Used for testing.
	Endcaps –Chaff & Flare	NA	NA	0.00215	0.0043	Applies only to Chaff-Air and Flares. 1 Endcap is expended per chaff-air or flare.
	Flare O-Ring	NA	NA	0.0043	0.0086	Assumed similar 2-dimensional footprint as endcaps and pistons. Associated with flares. Assumed 1 Flare O-Ring per flare.
	Fiber Optic Can	NA	NA	0.0011	0.0022	Assumed similar 2-dimensional footprint as chaff-air cartridge. Associated with AMNS Neutralizer fiber optic cable. Can that holds fiber optic cable is expended.
	Bathythermograph - Expended	NA	NA	0.0258	0.0516	An instrument that is deployed from a ship to record temperature and depth measurements. Small wires transmit the temperature data from the probe to the ship. This item is fairly standard in terms of footprint; these are off the shelf Commercial products. Reference: NOAA 2015. http://www.aoml.noaa.gov/goos/uot/xbt-what-is.php. Accessed November 3, 2015.
	Fiber optic cables	NA	NA	NA	NA	Associated with some rockets and AMNS neutralizers
	Guidance wires	NA	NA	0	0	Fragments created for relatively small portion associated with explosive devices (associated with heavyweight torpedoes).
	Bathythermograph –	NA	NA	NA	NA	Single vertical wire

Table F-1: Categories and Footprints for Various Materials and Underwater Explosions (continued)

Material Group	*Material Category*	*Bottom Frequency**	*Crater Footprint (ft^2)*	*MEM Size (ft^2)*	*MEM Footprint (ft^2)*	*Material Specific Notes*
	Expended Wire					
	Heavyweight (Explosive) torpedo	NA	NA	39.6155	79.2299	MEM size based on MK-48
	Heavyweight torpedo accessories	NA	NA	0.1615	3.2367	MEM includes ballast weights, flex tubing
	Heavyweight (Non-explosive) torpedo	NA	NA	NA	NA	Typically recovered
	Illumination flares	NA	NA	1.2196	4.8782	Flares that have a large parachute; MEM size based on half the surface area of an 18 ft diameter parachute used with an LUU-2 illumination flare.
	Lightweight Torpedo Accessories	NA	NA	1.0107	2.0215	MEM includes ballast weights, flex tubing (parachute size not included)
	Marine marker			0.9752	3.8987	MEM footprint based on two Navy marine markers (MK25 and MK58
	Mine (Explosive)	50%	14800.376	25.7903	51.5806	Another name for a 650 lb. HE explosive charge including material based on the footprint of a mine shape.
	Parachute (Large)	NA	NA	283.9961	567.9932	MEM size based on diameter of LUU-2 illumination flare parachute (18 ft. diameter).
	Parachute (Medium)	NA	NA	9.0417	18.0834	Associated with air-launched torpedoes
	Small Decelerator/Parachute	NA	NA	2.8438	5.6876	Associated with launched sonobuoys
	Sabot	NA	NA	1.2195	4.8782	An accessory used during projectile firing. Footprint similar in size to the projectile.
	Sonobuoys (Non-explosive)	NA	NA	1.2206	2.4413	Sonobuoys have an extra item footprint (half the dimensions of the sonobuoy) added in addition to the actual sonobuoy and casing to account for the items that are discarded from the sonobuoy following its release. MEM size does not include the associated Small Decelerator/Parachute (noted in table above)
	Sonobuoys (Explosive)	0	NA	1.2206	2.4413	

Table F-1: Categories and Footprints for Various Materials and Underwater Explosions (continued)

Material Group	*Material Category*	*Bottom Frequency**	*Crater Footprint (ft^2)*	*MEM Size (ft^2)*	*MEM Footprint (ft^2)*	*Material Specific Notes*
	Sonobuoy wires	NA	NA	NA	NA	One wire is associated with each sonobuoy
	Surface-Launched Lightweight (Explosive) Torpedo	0	NA	10.0782	20.1576	MEM size based on MK50/MK54
	Surface-Launched Lightweight (Non-Explosive) Torpedo	NA	NA	10.0782	20.1576	Typically recovered
Projectile	Grenades (Explosive)	0	NA	0.1044	0.2088	None
	Large Caliber (Explosive)	NA	NA	1.0097	4.0386	Item assumed to have a projectile and casing
	Large Caliber (Non-explosive)	NA	NA	1.0097	4.0386	Item assumed to have a projectile and casing
	Large caliber (Casing only)	NA	NA	0.5048	1.0097	Used when the target is on land; no MEM from projectile
	Medium Caliber (Explosive)	NA	NA	0.0560	0.2239	Item assumed to have a projectile and casing
	Medium Caliber (Non-explosive)	NA	NA	0.0560	0.2239	Item assumed to have a projectile and casing
	Small Caliber (Non-explosive)	NA	NA	0.0301	0.1216	Item assumed to have a projectile and casing
	Small Caliber (Casing only)	NA	NA	0.0151	0.0301	Used only for small caliber 'blanks'. All other small caliber rounds are included under NEPM
	Kinetic Energy Round	NA	NA	0.5048	1.0097	Item assumed to only have a projectile (no casing) - size of Large Caliber round.
Target	Aerial Drones – Expendable	NA	NA	294.6082	589.2164	MEM when specifically known it is an aerial drone; MEM size based on Firebee
	Aerial Drones – Recovered	NA	NA	294.6082	589.2164	MEM when specifically known it is an aerial drone; MEM size based on Firebee. Typically recovered.
	Air Target – Expended	NA	NA	42.1622	84.3244	MEM when specifically known it is an air launched decoy.

Table F-1: Categories and Footprints for Various Materials and Underwater Explosions (continued)

Material Group	*Material Category*	*Bottom Frequency**	*Crater Footprint (ft^2)*	*MEM Size (ft^2)*	*MEM Footprint (ft^2)*	*Material Specific Notes*
	(Non-Drone)					MEM size based on dimensions of Tactical Air Launched Decoy or Miniature Air-Launched Decoy.
	Metal Plates	NA	NA	2.7782	5.5563	Charges are secured to a 20" X 20" X 1/2" ferrous metal plate The target unit (concrete blocks, metal plate, and any debris) is brought to the surface and analyzed.
	Surface Target - Expended	NA	NA	5.7522	11.5034	Includes remote controlled or towed targets
	Surface Target - Recovered	NA	NA	NA	NA	Reported as recovered.
	Surface Target (Mobile) - Expended	NA	NA	5.7522	11.5034	Includes remote controlled or towed targets
	Surface Target (Stationary) - Expended	NA	NA	96.8752	193.7504	MEM when specifically known it is a stationary surface target. MEM size based on Killer Tomato.
	Subsurface Target (Mobile) - Expended	NA	NA	1.2206	2.4412	MEM when specifically known it is a sub-surface Motorized Autonomous Target
	Mine Shape - Expended	NA	NA	25.7903	51.5807	Mine shapes that were specifically identified as non-recoverable; Footprint based on size of explosive mine; size not including anchor
	Mine Shape - Expended	NA	NA	25.7903	51.5807	Mine shape and associated anchor block that are recovered. The vast majority of practice mines have built-in anchors for placing on the bottom; relatively few are moored/floating, and none are drifting.
	Ship Hulk	NA	NA	316136.0367	632272.0734	None.

Note: * Bottom frequencies (%) are only listed for underwater explosions; crater footprints are only listed for material that may be detonated on the bottom.
MEM = Military Expended Materials; AMNS/EMNS = Airborne Mine Neutralization System/ Expendable Mine Neutralization System; lb. = pound; HE = High Explosive

Additionally, highly explosive munitions that explode either at the surface or in the water column were treated in the same manner as non-explosive practice munitions, although in reality, the explosions would result in smaller fragments reaching the substrate than expected by the fully intact non-explosive practice munitions.

The data for analysis dimensions (data element 2) comes from the Aquatic Habitat Database technical report and supporting databases (U.S. Department of the Navy, 2016), in addition to spatial data depicting training and testing areas.

The combined analysis dimensions data was used to create a table of substrate category acreage by training and testing areas, and large marine ecosystems. Within the AFTT Study Area, there are acreages of substrate that are included under Protective Measures Assessment Protocol categories from the Phase II AFTT EIS/OEIS. These Protective Measures Assessment Protocol categories indicate the amount of mapped substrate that may be protected by Navy mitigation measures. However, the Protective Measures Assessment Protocol areas were not excluded from the quantitative impacts analysis due to how Protective Measures Assessment Protocol is implemented. For more information on the substrates protected under the Protective Measures Assessment Protocol see Chapter 5 (Mitigation).

The percentage of impacted substrate (Scenario 1) was calculated by totaling the impact footprint of individual activities divided by the total area of a given substrate in the training or testing area for which the impacts could occur. The results are provided in Table F-18 through Table F-26.

Assumptions used in the Scenario 1 analysis included:

- Areas of unknown substrate type were not included in the analysis.
- The analysis focused on substrates that are likely to have habitat for sedentary benthic organisms; therefore, areas that are not likely to have substrate inhabited by these organisms (i.e., the Atlantic Basin and Abyssal Zone open ocean areas) were excluded from the analysis.
- Artificial substrate was removed from the analysis because it was inconsistently mapped or mapped with a degree of uncertainty considered too high for quantitative analysis.

The above assumptions also applied to Scenario 2 (Proportional Impacts), which used the proportion of a substrate type in an analysis dimension (i.e., training or testing area) multiplied by the total military expended material or crater footprints. The resulting acres indicated the impact area expected if the military expended materials or bottom explosions were distributed uniformly across the training or testing area. In other words, a majority proportion of the military expended material footprint would impact soft substrate if the majority of the analysis dimension was soft substrate. The results are provided in Tables F-27 through Table F-30. This scenario is considered more realistic than Scenario 1, yet still unlikely as it does not account for areas of concentrated training, nor does it account for the clumping of military expended materials and explosives in a particular area and over a particular substrate type where a training or testing activity occurs.

F.1.1 Military Expended and Recovered Material – Training Activities

Tables F-2 through F-14 show military expended and recovered materials and impact footprints within the AFTT Study Area for both a Single Year and Five Year totals.

Table F-2: Number and Impacts* of Military Expended Materials Proposed for Use During Training Activities in a Single Year Under Alternatives 1 and 2

Military Expended Materials	Size ($ft.^2$)	Impact Footprint ($ft.^2$)	Range Complex: Northeast		VACAPES		Navy Cherry Point		JAX		Key West		GOMEX		Other AFTT Area		SINKEX Area	
			Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)
Bombs																		
Bombs (Explosive)	8.1203	112.9048	0	0.0000	76	0.1970	0	0.0000	50	0.1296	0	0.0000	4	0.0104	0	0.0000	12	0.0311
Bombs (Non-Explosive)	8.1203	112.9048	0	0.0000	2,248	5.8267	596	1.5448	1,366	3.5406	0	0.0000	270	0.6998	0	0.0000	0	0.0000
Projectiles																		
Small-Caliber (Non-Explosive)	0.0301	0.1216	36,600	0.1022	3,806,350	10.6256	833,675	2.3272	1,436,275	4.0094	0	0.0000	237,500	0.6630	200,000	0.5583	0	0.0000
Small-Caliber (Casing Only)	0.0151	0.0301	0	0.0000	3,400	0.0023	0	0.0000	1,000	0.0007	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Medium-Caliber (Explosive)	0.056	0.2239	0	0.0000	65,312	0.3357	23,200	0.1192	58,952	0.3030	0	0.0000	6,250	0.0321	1,350	0.0069	0	0.0000
Medium Caliber (Non-Explosive)	0.056	0.2239	1,000	0.0051	800,769	4.1160	358,574	1.8431	439,234	2.2577	56,000	0.2878	32,000	0.1645	21,250	0.1092	0	0.0000
Large-Caliber (Explosive)	1.0097	4.0386	0	0.0000	2,998	0.2780	756	0.0701	1,160	0.1075	0	0.0000	260	0.0241	96	0.0089	200	0.0185
Large-Caliber (Non-Explosive)	1.0097	4.0386	0	0.0000	3,802	0.3525	1,134	0.1051	1,388	0.1287	0	0.0000	638	0.0592	196	0.0182	0	0.0000
Large-Caliber (Casing only)	0.5048	1.0097	0	0.0000	0	0.0000	960	0.0223	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Missiles																		
Missiles (Explosive)	37.6691	74.7338	4	0.0069	155	0.2659	106	0.1819	136	0.2333	8	0.0137	8	0.0137	0	0.0000	4	0.0069
Rockets (Explosive)	0.7987	1.5974	0	0.0000	1,254	0.0460	76	0.0028	1,330	0.0488	0	0.0000	76	0.0028	0	0.0000	0	0.0000
Rockets (Non-Explosive)	0.7987	1.5974	0	0.0000	2,708	0.0993	289	0.0106	2,996	0.1099	0	0.0000	289	0.0106	0	0.0000	0	0.0000
Rockets (Non-Explosive): Flechette	0.7987	1.5974	0	0.0000	143	0.0052	15	0.0006	158	0.0058	0	0.0000	15	0.0006	0	0.0000	0	0.0000
Countermeasures																		
Chaff-Air Cartridges	0.0011	0.0022	0	0.0000	2,080	0.0001	25,760	0.0013	47,840	0.0024	48,000	0.0024	288	0.0000	0	0.0000	0	0.0000
Chaff - Ship Cartridges	2.0000	4.0000	0	0.0000	264	0.0242	480	0.0441	516	0.0474	0	0.0000	120	0.0110	0	0.0000	0	0.0000
Flares	1.2196	4.8782	0	0.0000	1,000	0.1120	22,300	2.4973	38,000	4.2555	31,000	3.4716	1,840	0.2061	0	0.0000	0	0.0000
Targets																		
Air Target - Expended (Non-Drone)	42.1622	84.3245	4	0.0077	78	0.1510	85	0.1645	65	0.1258	8	0.0155	8	0.0155	0	0.0000	0	0.0000
Surface Target - Expended	5.7522	11.5034	2	0.0005	1,215	0.3209	598	0.1579	775	0.2047	0	0.0000	51	0.0135	0	0.0000	0	0.0000
Surface Target (Stationary)-Expended	96.8752	193.7504	0	0.0000	4	0.0178	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Mine Shapes - Expended	25.7903	51.5807	0	0.0000	292	0.3458	24	0.0284	60	0.0710	8	0.0095	60	0.0710	0	0.0000	0	0.0000
Ship Hulk	316,136	632,272	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	1	14.5150
Other																		
Grenades (Explosive)	0.1044	0.2088	56	0.0003	70	0.0003	28	0.0001	28	0.0001	0	0.0000	28	0.0001	0	0.0000	0	0.0000
AMNS Neutralizer (Explosive)	1.6286	3.2572	0	0.0000	62	0.0046	1	0.0001	2	0.0001	0	0.0000	22	0.0016	0	0.0000	0	0.0000
Compression Pad/Piston	0.0043	0.0086	0	0.0000	1,000	0.0002	22,300	0.0044	38,000	0.0075	31,000	0.0061	1840	0.0004	0	0.0000	0	0.0000
Concrete Slugs	0.0011	0.0022	0	0.0000	14	0.0000	1	0.0000	1	0.0000	6	0.0000	1	0.0000	0	0.0000	0	0.0000
Endcaps	0.0022	0.0043	0	0.0000	3,120	0.0003	48,108	0.0047	85,888	0.0085	79,008	0.0078	2,128	0.0002	0	0.0000	0	0.0000
Fiber Optic Can	0.0011	0.0022	0	0.0000	62	0.0000	1	0.0000	2	0.0000	0	0.0000	22	0.0000	0	0.0000	0	0.0000
Flare O-Ring	0.0043	0.0086	0	0.0000	1,040	0.0002	22,348	0.0044	38,048	0.0075	31,008	0.0061	1,840	0.0004	0	0.0000	0	0.0000
Illumination Flare	1.2196	4.8782	0	0.0000	40	0.0045	48	0.0054	48	0.0054	8	0.0009	0	0.0000	0	0.0000	0	0.0000
Heavyweight Torpedo (Explosive)	39.6155	79.2299	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	1	0.0018
Heavyweight Torpedo Accessories	0.1615	3.2367	24	0.0018	8	0.0006	0	0.0000	48	0.0036	0	0.0000	0	0.0000	0	0.0000	1	0.0001
Lightweight Torpedo Accessories	1.1011	2.0215	0	0.0000	13	0.0006	0	0.0000	44	0.0020	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Marine Marker	0.9752	3.8987	192	0.0172	10,196	0.9126	332	0.0297	1,263	0.1130	0	0.0000	303	0.0271	24	0.0021	0	0.0000
Parachutes - Medium	9.0417	18.0834	0	0.0000	8	0.0033	0	0.0000	28	0.0116	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Parachutes - Large	283.9961	567.9932	0	0.0000	40	0.5216	48	0.6259	48	0.6259	8	0.1043	0	0.0000	0	0.0000	0	0.0000
Total			***37,882***	***0.14***	***4,709,821***	***24.57***	***1,361,843***	***9.80***	***2,194,749***	***16.37***	***276,062***	***3.93***	***285,861***	***2.03***	***222,916***	***0.70***	***219***	***14.57***

Notes: * Calculation for "Impact (ac)" Column = ([Impact Footprint] x [Number]) / 43560
ac=acre; $ft.^2$=square feet; GOMEX= Gulf of Mexico; JAX=Jacksonville; Other AFTT Area = Location outside east coast Range Complexes and other defined areas; VACAPES=Virginia Capes

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Table F-3: Number and Impacts* of Military Expended Materials Proposed for Use During Training Activities in a Single Year Under Alternatives 1 and 2–Inland Waters

Location	Military Expended Materials													
	Projectiles		Targets		Other								Countermeasure	
	Small Caliber (Non-explosive)		Mine Shapes		Concrete Slugs		Marine Marker		Flare O-Ring		Compression Pad/Piston		Flare	
	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)
Boston, MA	0	0.0000	4	0.0047	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Narragansett Bay, RI	8,320	0.0232	0	0.0000	0	0.0000	65	0.0058	0	0.0000	0	0.0000	0	0.0000
Earle, NJ	0	0.0000	4	0.0047	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Delaware Bay, DE	0	0.0000	4	0.0047	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Wilmington, DE	0	0.0000	4	0.0047	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Hampton Roads, VA	0	0.0000	8	0.0095	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
James River and Tributaries, VA	102,000	0.2847	0	0.0000	0	0.0000	660	0.0591	20,400	0.0040	20,400	0.0040	20,400	2.2846
York River, VA	0	0.0000	0	0.0000	0	0.0000	20	0.0018	0	0.0000	0	0.0000	0	0.0000
Lower Chesapeake Bay, VA	28,800	0.0804	0	0.0000	6	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Morehead City, NC	0	0.0000	4	0.0047	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Cooper River, SC	5,100	0.0142	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Savannah, GA	0	0.0000	4	0.0047	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Kings Bay, GA	0	0.0000	4	0.0047	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Mayport, FL	0	0.0000	4	0.0047	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Port Canaveral, FL	12,800	0.0357	4	0.0047	0	0.0000	60	0.0054	0	0.0000	0	0.0000	0	0.0000
Tampa, FL	0	0.0000	4	0.0047	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Beaumont, TX	0	0.0000	8	0.0095	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Corpus Christi, TX	0	0.0000	4	0.0047	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000

Note: * Calculation for "Impact (ac)" Column = ([Impact Footprint] x [Number]) / 43560
ac=acres

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Table F-4: Number and Impacts* of Military Expended Materials Proposed for Use During Training Activities in a Single Year with Differences between Alternatives 1 and 2

Military Expended Materials	Size ($ft.^2$)	Impact Footprint ($ft.^2$)	Range Complex: Northeast Number	Northeast Impact (ac)	VACAPES Number	VACAPES Impact (ac)	Navy Cherry Point Number	Navy Cherry Point Impact (ac)	JAX Number	JAX Impact (ac)	Key West Number	Key West Impact (ac)	GOMEX Number	GOMEX Impact (ac)	Other Training Locations Other AFTT Area Number	Other AFTT Area Impact (ac)
Alternative 1																
Countermeasures																
Acoustic Countermeasures	0.3311	1.2432	84	0.0024	41	0.0012	14	0.0004	164	0.0047	0	0.0000	0	0.0000	88	0.0025
Targets																
Subsurface Target (Mobile) - Expended	1.2206	2.4413	100	0.0056	291	0.0164	81	0.0045	1,108	0.0621	0	0.0000	3	0.0001	178	0.0100
Other																
Buoy (Non-Explosive)	0.9752	3.8987	0	0.0000	24	0.0021	17	0.0015	116	0.0104	0	0.0000	0	0.0000	0	0.0000
Sonobuoys (Non-Explosive)	1.2207	2.4413	3,132	0.1755	8,394	0.4404	2,987	0.1674	30,504	1.7096	0	0.0000	0	0.0000	496	0.0278
Bathythermograph - Expended	0.2771	0.5554	139	0.0018	329	0.0042	85	0.0011	1,171	0.0149	0	0.0000	3	0.0000	154	0.0020
Small Decelerator/Parachute	2.8438	5.6876	3,132	0.4089	8,394	1.096	2,987	0.3900	30,504	3.9829	0	0.0000	0	0.0000	496	0.0648
		Total	***6,579***	***0.5935***	***17,031***	***1.5457***	***6,115***	***0.5597***	***63,215***	***5.7517***	***0***	***0.0000***	***6***	***0.0001***	***1,380***	***0.1040***
Alternative 2																
Countermeasures																
Acoustic Countermeasures	0.3311	1.2432	84	0.0024	51	0.0015	24	0.0007	184	0.0053	0	0.0000	6	0.0002	88	0.0025
Targets																
Subsurface Target (Mobile) - Expended	1.2206	2.4413	102	0.0057	401	0.0225	108	0.0061	1,328	0.0744	0	0.0000	5	0.0003	178	0.0100
Other																
Buoy (Non-Explosive)	0.9752	3.8987	0	0.0000	34	0.0030	22	0.0020	186	0.0166	0	0.0000	16	0.0014	0	0.0000
Sonobuoys (Non-Explosive)	1.2207	2.4413	3,132	0.1755	8,394	0.4404	2,987	0.1674	30,504	1.7096	0	0.0000	785	0.0440	496	0.0278
Bathythermograph - Expended	0.2771	0.5554	142	0.0018	439	0.0056	113	0.0014	1,391	0.0177	0	0.0000	128	0.0016	154	0.0020
Small Decelerator/Parachute	2.8438	5.6876	3,132	0.4089	8,394	1.096	2,987	0.3900	30,504	3.9829	0	0.0000	785	0.1025	496	0.0648
		Total	***6,584***	***0.5936***	***17,271***	***1.5544***	***6,175***	***0.5621***	***63,725***	***5.7731***	***0***	***0.0000***	***1,725***	***0.1500***	***1,380***	***0.1040***

Note: * Calculation for "Impact (ac)" Column = ([Impact Footprint] x [Number]) / 43560
ac=acre; $ft.^2$=square feet; GOMEX= Gulf of Mexico; JAX=Jacksonville; Other AFTT Area = Location outside east coast Range Complexes and other defined areas; VACAPES=Virginia Capes
Blue shading indicated numbers and impacts of MEM that differ between Alternatives 1 and 2.

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Table F-5: Number and Impacts* of Military Expended Materials Proposed for Use DuringTraining Activities in Five Years Under Alternatives 1 and 2

Military Expended Materials	*Size (ft^2)*	*Impact Footprint (ft^2)*	*Range Complex*															
			Northeast		*VACAPES*		*Navy Cherry Point*		*JAX*		*Key West*		*GOMEX*		*Other AFTT Area*		*SINKEX Area*	
			Number	*Impact (ac)*	*Number*	*Impact (ac)*	*Number*	*Impact (ac)*	*Number*	*Impact (ac)*	*Number*	*Impact (ac)*	*Number*	*Impact (ac)*	*Number*	*Impact (ac)*	*Number*	*Impact (ac)*
Bombs																		
Bombs (Explosive)	8.1203	112.9048	0	0.0000	380	0.9849	0	0.0000	250	0.6480	0	0.0000	20	0.0518	0	0.0000	60	0.1555
Bombs (Non-Explosive)	8.1203	112.9048	0	0.0000	11,240	29.1334	2,980	7.7240	6,830	17.7029	0	0.0000	1,350	3.4991	0	0.0000	0	0.0000
Projectiles																		
Small-Caliber (Non-Explosive)	0.0301	0.1216	183,000	0.5109	19,031,750	53.1281	4,168,375	11.6362	7,181,375	20.0472	0	0.0000	1,187,500	3.3150	1,000,000	2.7916	0	0.0000
Small-Caliber (Casing Only)	0.0151	0.0301	0	0.0000	17,000	0.0117	0	0.0000	5,000	0.0035	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Medium-Caliber (Explosive)	0.056	0.2239	0	0.0000	326,560	1.6785	116,000	0.5962	294,760	1.5151	0	0.0000	31,250	0.1606	6,750	0.0347	0	0.0000
Medium Caliber (Non-Explosive)	0.056	0.2239	5,000	0.0257	4,003,845	20.5799	1,792,870	9.2154	2,196,170	11.2884	280,000	1.4392	160,000	0.8224	106,250	0.5461	0	0.0000
Large-Caliber (Explosive)	1.0097	4.0386	0	0.0000	14,990	1.3898	3,780	0.3505	5,800	0.5377	0	0.0000	1,300	0.1205	480	0.0445	1,000	0.0927
Large-Caliber (Non-Explosive)	1.0097	4.0386	0	0.0000	19,010	1.7625	5,670	0.5257	6,940	0.6434	0	0.0000	3,190	0.2958	980	0.0909	0	0.0000
Large-Caliber (Casing only)	0.5048	1.0097	0	0.0000	0	0.0000	4,800	0.1113	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Missiles																		
Missiles (Explosive)	37.6691	74.7338	20	0.0343	775	1.3296	530	0.9093	680	1.1666	40	0.0686	40	0.0686	0	0.0000	20	0.0343
Rockets (Explosive)	0.7987	1.5974	0	0.0000	6,270	0.2299	380	0.0139	6,650	0.2439	0	0.0000	380	0.0139	0	0.0000	0	0.0000
Rockets (Non-Explosive)	0.7987	1.5974	0	0.0000	13,537	0.4964	1,444	0.0530	14,981	0.5494	0	0.0000	1,444	0.0530	0	0.0000	0	0.0000
Rockets (Non-Explosive): Flechette	0.7987	1.5974	0	0.0000	713	0.0261	76	0.0028	789	0.0289	0	0.0000	76	0.0028	0	0.0000	0	0.0000
Countermeasures																		
Chaff-Air Cartridges	0.0011	0.0022	0	0.0000	10,400	0.0005	128,800	0.0065	239,200	0.0121	240,000	0.0121	1,440	0.0001	0	0.0000	0	0.0000
Chaff - Ship Cartridges	2.0000	4.0000	0	0.0000	1,320	0.1212	2,400	0.2204	2,580	0.2369	0	0.0000	600	0.0551	0	0.0000	0	0.0000
Flares	1.2196	4.8782	0	0.0000	5,000	0.5599	111,500	12.4867	190,000	21.2777	155,000	17.3581	9,200	1.0303	0	0.0000	0	0.0000
Targets																		
Air Target - Expended (Non-Drone)	42.1622	84.3245	20	0.0387	390	0.7550	425	0.8227	325	0.6291	40	0.0774	40	0.0774	0	0.0000	0	0.0000
Surface Target - Expended	5.7522	11.5034	10	0.0026	6,075	1.6043	2,990	0.7896	3,875	1.0233	0	0.0000	255	0.0673	15	0.0040	0	0.0000
Surface Target (Stationary) - Expended	96.8752	193.7504	0	0.0000	20	0.0890	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Ship Hulk	316,136	632,272	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	5	72.5748
Other																		
Grenades (Explosive)	0.1044	0.2088	280	0.0013	350	0.0017	140	0.0007	140	0.0007	0	0.0000	140	0.0007	0	0.0000	0	0.0000
Compression Pad/Piston	0.0043	0.0086	0	0.0000	5,000	0.0010	111,500	0.0220	190,000	0.0375	155,000	0.0306	9,200	0.0018	0	0.0000		0.0000
Concrete Slugs	0.0011	0.0022	0	0.0000	70	0.0000	5	0.0000	5	0.0000	30	0.0000	5	0.0000	0	0.0000	0	0.0000
Endcaps	0.0022	0.0043	0	0.0000	15,600	0.0015	240,540	0.0237	429,440	0.0424	395,040	0.0390	10,640	0.0011	0	0.0000	0	0.0000
Flare O-Ring	0.0043	0.0086	0	0.0000	5,200	0.0010	111,740	0.0221	190,240	0.0376	155,040	0.0306	9,200	0.0018	0	0.0000		0.0000
Illumination Flare	1.2196	4.8782	0	0.0000	200	0.0224	240	0.0269	240	0.0269	40	0.0045	0	0.0000	0	0.0000	0	0.0000
Heavyweight Torpedo (Explosive)	39.6155	79.2299	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	5	0.0091
Heavyweight Torpedo Accessories	0.1615	3.2367	120	0.0089	40	0.0030	0	0.0000	240	0.0178	0	0.0000	0	0.0000	0	0.0000	5	0.0004
Lightweight Torpedo Accessories	1.1011	2.0215	0	0.0000	65	0.0030	0	0.0000	220	0.0102	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Marine Marker	0.9752	3.8987	0	0.0000	50,980	4.5628	1,660	0.1486	6,315	0.5652	0	0.0000	1,515	0.1356	120	0.0107	0	0.0000
Parachutes - Medium	9.0417	18.0834	0	0.0000	40	0.0166	0	0.0000	140	0.0581	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Parachutes - Large	283.9961	567.9932	0	0.0000	200	2.6079	240	3.1294	240	3.1294	40	0.5216	0	0.0000	0	0.0000	0	0.0000
Total			***188,450***	***0.6225***	***23,547,020***	***121.1018***	***6,809,085***	***48.8375***	***10,973,425***	***81.4800***	***1,380,270***	***19.5818***	***1,428,785***	***9.7747***	***1,114,595***	***3.5224***	***1,095***	***72.8669***

Note: * Calculation for "Impact (ac)" Column = ([Impact Footprint] x [Number]) / 43560
ac=acre; $ft.^2$=square feet; GOMEX= Gulf of Mexico; JAX=Jacksonville; Other AFTT Area = Location outside east coast Range Complexes and other defined areas; VACAPES=Virginia Capes

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Table F-6: Number and Impacts* of Military Expended Materials Proposed for Use During Training Activities in Five Years Under Alternatives 1 and 2 – Inland Waters

Location	Military Expended Materials											
	Projectiles		Other								Countermeasure	
	Small Caliber (non-explosive)		Concrete Slugs		Marine Marker		Flare O-Ring		Compression Pad/Piston		Flare	
	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)
Boston, MA	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Narragansett Bay, RI	41,600	0.1161	0	0.0000	325	0.0291	0	0.0000	0	0.0000	0	0.0000
Earle, NJ	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Delaware Bay, DE	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Wilmington, DE	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Hampton Roads, VA	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
James River and Tributaries, VA	510,000	1.4237	0	0.0000	3,300	0.2954	102,000	0.0201	102,000	0.0201	102,000	11.4228
York River, VA	0	0.0000	0	0.0000	100	0.0090	0	0.0000	0	0.0000	0	0.0000
Lower Chesapeake Bay, VA	144,000	0.4020	30	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Morehead City, NC	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Cooper River, SC	255,000	0.7118	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Savannah, GA	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Kings Bay, GA	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Mayport, FL	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Port Canaveral, FL	64,000	0.1787	0	0.0000	300	0.0269	0	0.0000	0	0.0000	0	0.0000
Tampa, FL	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Beaumont, TX	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Corpus Christi, TX	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000

Note: * Calculation for “Impact (ac)” Column = ([Impact Footprint] x [Number]) / 43560
ac=acre

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Table F-7: Number and Impacts* of Military Expended Materials Proposed for Use During Training Activities in Five Years with Differences between Alternatives 1 and 2

Military Expended Materials	Size ($ft.^2$)	Impact Footprint ($ft.^2$)	Range Complex: Northeast		VACAPES		Navy Cherry Point		JAX		Key West		GOMEX		Other AFTT Area	
			Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)
Alternative 1																
Countermeasures																
Acoustic Countermeasures	0.3311	1.2432	420	0.0120	205	0.0059	70	0.0020	802	0.0229	0	0.0000	0	0.0000	441	0.0126
Targets																
Mine Shapes -Expended	25.7903	51.5807	0	0.0000	1,456	1.7241	120	0.1421	292	0.3458	40	0.0474	292	0.3458	0	0.0000
Subsurface Target (Mobile)-Expended	1.2206	2.4413	498	0.0279	1,455	0.0815	403	0.0226	5,540	0.3105	0	0.0000	13	0.0007	891	0.0499
Other																
AMNS Neutralizer (Explosive)	1.6286	3.2572	0	0.0000	306	0.0229	5	0.0004	6	0.0004	0	0.0000	106	0.0079	0	0.0000
Buoy (Non-Explosive)	0.9752	3.8987	0	0.0000	114	0.0102	73	0.0065	550	0.0492	0	0.0000	0	0.0000	0	0.0000
Fiber Optic Can	0.0011	0.0022			306	0.0000	5	0.0000	6	0.0000	0	0.0000	16	0.0000	0	0.0000
Sonobuoys (Non-Explosive)	1.2207	2.4413	15,660	0.8777	41,787	2.3419	14,542	0.8150	150,741	8.4482	0	0.0000	0	0.0000	2,480	0.1390
Bathythermograph Expended	0.2771	0.5554	695	0.0089	1,640	0.0209	422	0.0054	5,490	0.0700	0	0.0000	13	0.0002	771	0.0098
Small Decelerator/Parachute	2.8438	5.6876	15,660	2.0447	41,787	5.4561	14,542	1.8987	150,741	19.6822	0	0.0000	0	0.0000	2,480	0.3238
Total			***32,893***	***2.9674***	***87,296***	***9.4993***	***29,902***	***2.8666***	***312,408***	***28.7649***	***40***	***0.0474***	***439***	***0.3546***	***6,903***	***0.5202***
Alternative 2																
Countermeasures																
Acoustic Countermeasures	0.3311	1.2432	420	0.0120	255	0.0073	120	0.0034	820	0.0234	0	0.0000	30	0.0009	441	0.0126
Targets																
Mine Shapes -Expended	25.7903	51.5807	0	0.0000	1,460	1.7288	120	0.14	300	0.3552	40	0.0474	300	0.3552	0	0.0000
Subsurface Target (Mobile)-Expended	1.2206	2.4413	510	0.0286	2,005	0.1124	540	0.0303	6,640	0.3721	0	0.0000	25	0.0014	891	0.0499
Other																
AMNS Neutralizer (Explosive)	1.6286	3.2572	0	0.0000	310	0.0232	5	0.0004	10	0.0007	0	0.0000	110	0.0082	0	0.0000
Buoy (Non-Explosive)	0.9752	3.8987	0	0.0000	170	0.0152	110	0.0098	930	0.0832	0	0.0000	80	0.0072	0	0.0000
Fiber Optic Can	0.0011	0.0022			310	0.0000	5	0.0000	10	0.0000	0	0.0000	110	0.0000	0	0.0000
Sonobuoys (Non-Explosive)	1.2207	2.4413	15,660	0.8777	41,970	2.3522	14,935	0.8370	152,520	8.5479	0	0.0000	3,925	0.2200	2,480	0.1390
Bathythermograph Expended	0.2771	0.5554	708	0.0090	2,193	0.0280	563	0.0072	6,953	0.0887	0	0.0000	640	0.0082	771	0.0098
Small Decelerator/Parachute	2.8438	5.6876	15,660	2.0447	41,970	5.4800	14,935	1.9501	152,520	19.9144	0	0.0000	3,925	0.5125	2,480	0.3238
Total			***32,918***	***2.9682***	***88,883***	***9.5828***	***31,053***	***2.9541***	***318,943***	***29.2215***	***40***	***0.0474***	***9,145***	***1.1135***	***6,903***	***0.5202***

Note: * Calculation for "Impact (ac)" Column = ([Impact Footprint] x [Number]) / 43560
ac=acre; AMNS = Airborne Mine Neutralization System; $ft.^2$=square feet; GOMEX= Gulf of Mexico; JAX=Jacksonville; Other AFTT Area = Location outside east coast Range Complexes and other defined areas; VACAPES=Virginia Capes
Blue shading indicated numbers and impacts of MEM that differ between Alternatives 1 and 2.

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Table F-8: Number and Impacts* of Military Expended Materials Proposed for Use During Training Activities in Five Years with Differences between Alternatives 1 and 2–Inland Waters

Location	*Military Expended Materials*	
	Targets	
	Mine Shapes	
	Number	*Impact (ac)*
Alternative 1		
Boston, MA	12	0.0142
Earle, NJ	12	0.0142
Delaware Bay, DE	12	0.0142
Wilmington, DE	12	0.0142
Hampton Roads, VA	24	0.0284
Morehead City, NC	24	0.0284
Savannah, GA	12	0.0142
Kings Bay, GA	12	0.0142
Mayport, FL	12	0.0142
Port Canaveral, FL	24	0.0284
Tampa, FL	12	0.0142
Beaumont, TX	24	0.0284
Corpus Christi, TX	12	0.0142
Alternative 2		
Boston, MA	20	0.0237
Earle, NJ	20	0.0237
Delaware Bay, DE	20	0.0237
Wilmington, DE	20	0.0237
Hampton Roads, VA	40	0.0474
Morehead City, NC	40	0.0474
Savannah, GA	20	0.0237
Kings Bay, GA	20	0.0237
Mayport, FL	20	0.0237
Port Canaveral, FL	40	0.0474
Tampa, FL	20	0.0237
Beaumont, TX	40	0.0474
Corpus Christi, TX	20	0.0237

Note: * Calculation for "Impact (ac)" Column = ([Impact Footprint] x [Number]) / 43560; ac=acre
Blue shading indicated numbers and impacts of MEM that differ between Alternatives 1 and 2.

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Table F-9: Number of Recovered Materials Proposed for Use During Training Activities In a Single Year Under Alternatives 1 and 2

Recovered Materials	Range Complex						Other Training Locations
	Northeast	VACAPES	Navy Cherry Point	JAX	Key West	GOMEX	Other AFTT Area
	Number	Number	Number	Number	Number	Number	Number
Other							
Air-Launched Lightweight Torpedo (Non-Explosive)	0	8	0	28	0	0	0
Buoy (Non-Explosive)-Recovered	0	15	4	4	0	0	0
Heavyweight Torpedo (Non-explosive)	24	8	0	48	0	0	0
Surface-Launched Lightweight Torpedo (Non-Explosive)	0	5	0	16	0	0	0
Unmanned Aerial System	0	12	12	384	0	0	24
Targets							
Air Targets -Recovered	0	120	40	75	70	0	0
Aerial Drones - Recovered	4	82	60	69	8	8	0
Sub-surface Target-Recovered	6	7	0	116	0	0	0
Surface Target – Recovered	0	2,657	745	1,534	0	0	194
Total	***323***	***2,914***	***861***	***2,174***	***78***	***230***	***218***

Note: ac=acre; GOMEX= Gulf of Mexico; JAX=Jacksonville; Other AFTT Area = Location outside east coast Range Complexes and other defined areas; VACAPES=Virginia Capes

Table F-10: Number and Impacts* of Recovered Bottom Placed Materials Proposed for Use During Training Activities In a Single Year Under Alternatives 1 and 2

Recovered Materials	Size ($ft.^2$)	Impact Footprint ($ft.^2$)	Range Complex												Other Training Locations	
			Northeast		VACAPES		Navy Cherry Point		JAX		Key West		GOMEX		NSWC Panama City	
			Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)
Mine Shape (Non-explosive)	25.7903	51.5807	0	0.0000	21,038	24.9117	4,998	5.9183	4,946	5.8567	6	0.0071	1,523	1.8034	2,928	3.4671
Metal Plates	2.7782	5.5563	0	0.0000	0	0.0000	0	0.0000	0	0.0000	5	0.0006	0	0.0000	0	0.0000
Bottom Placed Instruments	2.0000	4.0000	0	0.0000	96	0.0088	0	0.0000	48	0.0044	48	0.0044	96	0.0088	0	0.0000
		Total	***0***	***0.0000***	***21,134***	***24.9205***	***4,998***	***5.9183***	***4,994***	***5.8611***	***59***	***0.0121***	***1,619***	***1.8122***	***2,928***	***3.4671***

Note: * Calculation for "Impact (ac)" Column = ([Impact Footprint] x [Number]) / 43560
ac=acre; $ft.^2$=square feet; GOMEX= Gulf of Mexico; JAX=Jacksonville; Other AFTT Area = Location outside east coast Range Complexes and other defined areas; VACAPES=Virginia Capes

Table F-11: Number and Impacts* of Recovered Bottom Placed Materials Proposed for Use During Training Activities in a Single Year Under Alternatives 1 and 2 - Inland Waters

Location	Military Recovered Materials			
	Projectiles		Targets	
	Metal Plates		Mine Shapes (Non-Explosive)	
	Number	Impact (ac)	Number	Impact (ac)
Lower Chesapeake Bay, VA	6	0.0008	6	0.0071

Note: * Calculation for "Impact (ac)" Column = ([Impact Footprint] x [Number]) / 43560; ac=acre

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Table F-12: Number of Recovered Materials Proposed for Use During Training Activities In Five Years Under Alternatives 1 and 2

Recovered Materials	Range Complex						Other Training Locations
	Northeast	VACAPES	Navy Cherry Point	JAX	Key West	GOMEX	Other AFTT Area
	Number	Number	Number	Number	Number	Number	Number
Other							
Air-Launched Lightweight Torpedo (Non-Explosive)	0	40	0	140	0	0	0
Buoy (Non-Explosive) - Recovered	0	75	20	20	0	0	0
Heavyweight Torpedo (Non-explosive)	120	40	0	240	0	0	0
Surface-Launched Lightweight Torpedo (Non-Explosive)	0	25	0	80	0	0	0
Unmanned Aerial System	0	60	60	1,920	0	0	120
Targets							
Air Targets -Recovered	20	410	300	345	40	40	0
Aerial Drones - Recovered	0	600	200	375	350	0	0
Sub-surface Target-Recovered	30	35	20	80	0	0	0
Surface Target – Recovered	0	13,285	3,725	7,670	0	1,110	970
Total	***170***	***14,570***	***4,325***	***10,850***	***390***	***1,150***	***1,090***

Note: ac=acre; GOMEX= Gulf of Mexico; JAX=Jacksonville; Other AFTT Area = Location outside east coast Range Complexes and other defined areas; VACAPES=Virginia Capes

Table F-13: Number and Impacts* of Recovered Bottom Placed Materials Proposed for Use During Training Activities In Five Years Under Alternatives 1 and 2

Recovered Materials	Size ($ft.^2$)	Impact Footprint ($ft.^2$)	Range Complex												Other Training Locations	
			Northeast		VACAPES		Navy Cherry Point		JAX		Key West		GOMEX		NSWC Panama City	
			Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)
Mine Shape (Non-explosive)	25.7903	51.5807	0	0.0000	105,190	124.5586	24,990	29.5914	24,730	29.2835	30	0.0355	7,615	9.0171	14,640	17.3357
Metal Plates	2.7782	5.5563	0	0.0000	0	0.0000	0	0.0000	0	0.0000	25	0.0032	0	0.0000	0	0.0000
Bottom Placed Instruments	2.0000	4.0000	0	0.0000	480	0.0441	0	0.0000	240	0.0220	240	0.0220	480	0.0441	0	0.0000
Total			***0***	***0.0000***	***105,670***	***124.6027***	***24,990***	***29.5914***	***24,970***	***29.3055***	***295***	***0.0607***	***8,095***	***9.0612***	***14,640***	***17.3357***

Note: * Calculation for "Impact (ac)" Column = ([Impact Footprint] x [Number]) / 43560
ac=acre; $ft.^2$=square feet; GOMEX= Gulf of Mexico; JAX=Jacksonville; Other AFTT Area = Location outside east coast Range Complexes and other defined areas; VACAPES=Virginia Capes

Table F-14: Number and Impacts* of Recovered Bottom Placed Materials Proposed for Use During Training Activities in Five Years Under Alternatives 1 and 2 - Inland Waters

Location	Recovered Materials			
	Projectiles		Targets	
	Metal Plates		Mine Shapes (Non-Explosive)	
	Number	Impact (ac)	Number	Impact (ac)
Lower Chesapeake Bay, VA	30	0.0038	30	0.0355

Note: * Calculation for "Impact (ac)" Column = ([Impact Footprint] x [Number]) / 43560; ac=acre

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F.1.2 Military Expended and Recovered Materials – Testing Activities

Tables F-15 through F-22 show military expended and recovered materials and impact footprints within the AFTT Study Area for both Single Year and Five Year totals.

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Table F-15: Number and Impacts* of Military Expended Materials Proposed for Use During Testing Activities in a Single Year Under Alternatives 1 and 2

Military Expended Materials	Size ($ft.^2$)	Impact Footprint ($ft.^2$)	Range Complex: Northeast		VACAPES		Navy Cherry Point		JAX		Key West		GOMEX		Testing Ranges: NUWC Newport		SFOMF		NSWC Panama City	
			Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)	Number	Impact (ac)
Bombs																				
Bombs (Explosive)	8.1203	112.9048	0	0.0000	2	0.0052	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Bombs (Non-Explosive)	8.1203	112.9048	0	0.0000	964	2.4986	0	0.0000	12	0.0311	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Projectiles																				
Small-Caliber (Non-Explosive)	0.0301	0.1216	4,800	0.0134	77,800	0.2172	4,800	0.0134	4,800	0.0134	4,800	0.0134	17,800	0.0497	0	0.0000	0	0.0000	7,000	0.0195
Medium-Caliber (Explosive)	0.056	0.2239	3,860	0.0198	17,270	0.0888	3,360	0.0173	14,860	0.0764	3,360	0.0173	3,360	0.0173	0	0.0000	0	0.0000	0	0.0000
Medium Caliber (Non-Explosive)	0.056	0.2239	9,060	0.0466	239,660	1.2319	8,160	0.0419	237,360	1.2200	32,660	0.1679	22,860	0.1175	0	0.0000	0	0.0000	5,100	0.0262
Large-Caliber (Explosive)	1.0097	4.0386	132	0.0122	3,263	0.3025	132	0.0122	6,276	0.5819	832	0.0771	923	0.0856	0	0.0000	4	0.0004	100	0.0093
Large-Caliber (Non-Explosive)	1.0097	4.0386	1,761	0.1633	8,147	0.7553	1,440	0.1335	14,524	1.3466	3,190	0.2958	2,774	0.2572	0	0.0000	0	0.0000	280	0.0260
Kinetic Energy Round	0.5048	1.0100	35,003	0.8116	35,003	0.8116	35,003	0.8116	350,003	8.1153	35,003	0.8116	35,003	0.8116	4	0.0001	4	0.0001	4	0.0001
Missiles																				
Missiles (Explosive)	37.6691	74.7228	10	0.0172	176	0.3019	0	0.0000	70	0.1201	0	0.0000	12	0.0206	0	0.0000	0	0.0000	0	0.0000
Missiles (Non-Explosive)	31.0011	62.0023	24	0.0342	899	1.2796	24	0.0342	136	0.1936	31	0.0441	24	0.0342	0	0.0000	0	0.0000	0	0.0000
Rockets (Explosive)	0.7987	1.5974	0	0.0000	206	0.0076	0	0.0000	200	0.0073	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Rockets (Non-Explosive)	0.7987	1.5974	0	0.0000	746	0.0274	0	0.0000	406	0.0149	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Rockets (Non-Explosive): Flechette	0.7987	1.5974	0	0.0000	249	0.0091	0	0.0000	135	0.0050	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Countermeasures																				
Acoustic Countermeasures	0.3311	1.2432	842	0.0240	1,038	0.0296	764	0.0218	1,330	0.0380	0	0.0000	836	0.0239	64	0.0018	100	0.0029	0	0.0000
Chaff - Air Cartridge	0.0011	0.0022	0	0.0000	20,595	0.0010	0	0.0000	400	0.0000	0	0.0000	1,200	0.0001	0	0.0000	0	0.0000	0	0.0000
Chaff - Ship Cartridge	2.0000	4.0000	144	0.0132	1,019	0.0936	144	0.0132	480	0.0441	144	0.0132	144	0.0132	0	0.0000	0	0.0000	0	0.0000
Anti-Torpedo Torpedo	4.524	9.0847	142	0.0296	160	0.0334	42	0.0088	156	0.0325	0	0.0000	142	0.0296	0	0.0000	0	0.0000	0	0.0000
Flares	1.2196	4.8782	0	0.0000	20,195	2.2616	0	0.0000	0	0.0000	0	0.0000	600	0.0672	0	0.0000	0	0.0000	0	0.0000
Targets																				
Aerial Drones - Expended	294.6082	589.2164	6	0.0812	480	6.4927	6	0.0812	174	2.3536	6	0.0812	6	0.0812	6	0.0812	6	0.0812	6	0.0812
Air Targets - Expended	42.1622	84.3245	60	0.1161	60	0.1161	60	0.1161	60	0.1161	60	0.1161	70	0.1355	0	0.0000	0	0.0000	0	0.0000
Surface Target - Expended	5.7522	11.5034	110	0.0290	400	0.1056	110	0.0290	227	0.0599	110	0.0290	121	0.0320	13	0.0034	13	0.0034	13	0.0034
Surface Target (Mobile) - Expended	1.2206	2.4413	1	0.0001	1	0.0001	1	0.0001	1	0.0001	1	0.0001	1	0.0001	0	0.0000	0	0.0000	0	0.0000
Surface Target (Stationary) - Expended	96.8752	193.7504	61	0.2713	61	0.2713	61	0.2713	61	0.2713	61	0.2713	61	0.2713	0	0.0000	0	0.0000	0	0.0000
Subsurface Target (Mobile)-Expended	5.7522	11.5034	100	0.0264	105	0.0277	0	0.0000	265	0.0700	0	0.0000	100	0.0264	240	0.0634	0	0.0000	0	0.0000
Mine Shapes-Expended	25.7903	51.5807	5,600	6.6311	3,172	3.7561	0	0.0000	1,595	1.8887	0	0.0000	2,754	3.2611	342	0.4050	885	1.0480	4,309	5.1024
Other																				
Air-Launched Lightweight Torpedo (Explosive)	19.1199	38.2399	1	0.0009	1	0.0009	1	0.0009	1	0.0009	1	0.0009	1	0.0009	0	0.0000	0	0.0000	0	0.0000
Anchor - Expendable	6.2495	12.5001	3,600	1.0331	1,800	0.5165	0	0.0000	100	0.0287	0	0.0000	1,923	0.5518	206	0.0591	87	0.0250	0	0.0000
Bathythermograph Expended	0.2771	0.5554	1,834	0.0234	1,019	0.0130	315	0.0040	637	0.0081	10	0.0001	978	0.0125	0	0.0000	4	0.0001	0	0.0000
Compression Pad/Piston	0.0043	0.0086	0	0.0000	20,195	0.0040	0	0.0000	0	0.0000	0	0.0000	600	0.0001	0	0.0000	0	0.0000	0	0.0000
Concrete Slugs	0.0011	0.0022	38	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	38	0.0000	0	0.0000	0	0.0000	0	0.0000
Endcaps and Pistons - Non Chaff & Flare	0.0043	0.0860	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	379	0.0007	0	0.0000	0	0.0000
Endcaps	0.0022	0.0043	0	0.0000	40,790	0.0040	0	0.0000	400	0.0000	0	0.0000	1,800	0.0002	0	0.0000	0	0.0000	0	0.0000
Fiber Optic Can	0.0011	0.0022	0	0.0000	430	0.0000	0	0.0000	100	0.0000	0	0.0000	200	0.0000	0	0.0000	0	0.0000	412	0.0000
Flare O-Ring	0.0043	0.0086	0	0.0000	20,195	0.0040	0	0.0000	0	0.0000	0	0.0000	600	0.0001	0	0.0000	0	0.0000	0	0.0000
Heavyweight Torpedo (Explosive)	39.6155	79.2299	1	0.0018	1	0.0018	1	0.0018	1	0.0018	1	0.0018	1	0.0018	0	0.0000	0	0.0000	0	0.0000
Heavyweight Torpedo Accessories	0.1615	3.2367	191	0.0142	221	0.0164	53	0.0039	235	0.0175	3	0.0002	187	0.0139	60	0.0045	34	0.0025	0	0.0000
Lightweight Torpedo Accessories	1.1011	2.0215	196	0.0091	409	0.0190	120	0.0056	497	0.0231	2	0.0001	196	0.0091	60	0.0028	0	0.0000	252	0.0117
Sabot	1.2196	4.8782	35,003	3.9199	35,003	3.9199	35,003	3.9199	35,003	3.9199	35,003	3.9199	35,003	3.9199	383	0.0429	4	0.0004	4	0.0004
Sonobuoy (Explosive)	1.2207	2.4413	0	0.0000	0	0.0000	0	0.0000	0	0.0000	72	0.0040	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Surface-Launched Lightweight Torpedo (Explosive)	10.0782	20.1576	5	0.0023	5	0.0023	1	0.0005	5	0.0023	1	0.0005	5	0.0023	0	0.0000	0	0.0000	12	0.0056
Parachutes (Medium)	9.0417	18.0834	33	0.0137	196	0.0814	33	0.0137	224	0.0930	2	0.0008	33	0.0137	60	0.0249	0	0.0000	252	0.1046
Total			***102,618***	***13.36***	***551,936***	***25.31***	***89,634***	***5.56***	***670,734***	***20.70***	***115,353***	***5.87***	***130,356***	***9.86***	***1,817***	***0.69***	***1,141***	***1.16***	***17,744***	***5.4***

Note: * Calculation for "Impact (ac)" Column = ([Impact Footprint] x [Number]) / 43560
ac=acre; $ft.^2$=square feet; GOMEX=Gulf of Mexico; JAX=Jacksonville; NSWC Panama City=Naval Surface Warfare Center Panama City; NUWC Newport=Naval Undersea Warfare Center Newport; SFOMF=South Florida Ocean Measurement Facility; VACAPES=Virginia Capes

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Table F-16: Number and Impacts* of Military Expended Materials Proposed for Use During Testing Activities in a Single Year with Differences between Alternatives 1 and 2

Military Expended Materials	Size ($ft.^2$)	Impact Footprint ($ft.^2$)	Range Complex: Northeast Number	Northeast Impact (ac)	VACAPES Number	VACAPES Impact (ac)	Navy Cherry Point Number	Navy Cherry Point Impact (ac)	JAX Number	JAX Impact (ac)	Key West Number	Key West Impact (ac)	GOMEX Number	GOMEX Impact (ac)	Testing Ranges: NUWC Newport Number	NUWC Newport Impact (ac)	SFOMF Number	SFOMF Impact (ac)	NSWC Panama City Number	NSWC Panama City Impact (ac)
Alternative 1																				
Other																				
Sonobuoys (Non-Explosive)	1.2207	2.4413	9,190	0.5150	8,678	0.4864	2,558	0.1434	6,344	0.3555	3,906	0.2189	4,646	0.2604	1,200	0.0673	32	0.0018	192	0.0108
AMNS Neutralizer (Explosive)	1.6286	3.2572	0	0.0000	250	0.0187	0	0.0000	50	0.0037	0	0.0000	100	0.0075	0	0.0000	0	0.0000	328	0.0245
Buoy (Explosive)	0.97521	3.8987	709	0.0635	575	0.0515	337	0.0302	398	0.0356	705	0.0631	351	0.0314	0	0.0000	0	0.0000	0	0.0000
Mines (Explosive)	25.7903	51.5807	0	0.0000	10	0.0118	0	0.0000	8	0.0095	0	0.0000	16	0.0189	0	0.0000	0	0.0000	4	0.0047
Small Decelerator/Parachute	2.8438	5.6876	9,190	1.0040	8,678	1.1331	2,558	0.3340	6,344	0.8283	3,906	0.5100	4,646	0.6066	1,200	0.1567	32	0.0042	192	0.0251
Total			***19,089***	***1.5825***	***18,191***	***1.7014***	***5,453***	***0.5075***	***13,144***	***1.2327***	***8,517***	***0.7920***	***9,759***	***0.9248***	***2,400***	***0.2239***	***64***	***0.0060***	***716***	***0.0651***
Alternative 2																				
Other																				
Sonobuoys (Non-Explosive)	1.2207	2.4413	9,410	0.5274	8,758	0.4908	2,638	0.1478	6,744	0.3780	3,906	0.2189	4,646	0.2604	1,200	0.0673	32	0.0018	192	0.0108
AMNS Neutralizer (Explosive)	1.6286	3.2572	0	0.0000	255	0.0191	0	0.0000	50	0.0037	0	0.0000	100	0.0075	0	0.0000	0	0.0000	333	0.0249
Buoy (Explosive)	0.97521	3.8987	724	0.0648	580	0.0519	342	0.0305	423	0.0379	705	0.0631	351	0.0314	0	0.0000	0	0.0000	0	0.0000
Mines (Explosive)	25.7903	51.5807	0	0.0000	15	0.0178	0	0.0000	8	0.0095	0	0.0000	16	0.0189	0	0.0000	0	0.0000	9	0.0107
Small Decelerator/Parachute	2.8438	5.6876	9,410	1.2287	8,758	1.1435	2,638	0.3444	6,744	0.8805	3,906	0.5100	4,646	0.6066	1,200	0.1567	32	0.0042	192	0.0251
Total			***19,544***	***1.8208***	***18,366***	***1.7231***	***5,618***	***0.5227***	***13,969***	***1.3096***	***8,517***	***0.7920***	***9,759***	***0.9248***	***2,400***	***0.2240***	***64***	***0.0060***	***726***	***0.0714***

Note: * Calculation for "Impact (ac)" Column = ([Impact Footprint] x [Number]) / 43560
ac=acre; AMNS = Airborne Mine Neutralization System; $ft.^2$=square feet; GOMEX=Gulf of Mexico; JAX=Jacksonville; NSWC Panama City=Naval Surface Warfare Center Panama City; NUWC Newport=Naval Undersea Warfare Center Newport; SFOMF=South Florida Ocean Measurement Facility; VACAPES=Virginia Capes
Blue shading indicated numbers and impacts of MEM that differ between Alternatives 1 and 2.

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Table F-17: Number and Impacts* of Military Expended Materials Proposed for Use During Testing Activities in Five Years Under Alternatives 1 and 2

Military Expended Materials	*Size ($ft.^2$)*	*Impact Footprint ($ft.^2$)*	*Range Complex*												*Testing Ranges*					
			Northeast		*VACAPES*		*Navy Cherry Point*		*JAX*		*Key West*		*GOMEX*		*NUWC Newport*		*SFOMF*		*NSWC Panama City*	
			Number	*Impact (ac)*	*Number*	*Impact (ac)*	*Number*	*Impact (ac)*	*Number*	*Impact (ac)*	*Number*	*Impact (ac)*	*Number*	*Impact (ac)*	*Number*	*Impact (ac)*	*Number*	*Impact (ac)*	*Number*	*Impact (ac)*
Bombs																				
Bombs (Explosive)	8.1203	112.9048	0	0.0000	10	0.0259	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Bombs (Non-Explosive)	8.1203	112.9048	0	0.0000	4,820	12.4931	0	0.0000	60	0.1555	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Projectiles																				
Small-Caliber (Non-Explosive)	0.0301	0.1216	24,000	0.0670	389,000	1.0859	24,000	0.0670	24,000	0.0670	24,000	0.0670	89,000	0.2484	0	0.0000	0	0.0000	35,000	0.0977
Large-Caliber (Explosive)	1.0097	4.0386	660	0.0612	16,315	1.5126	660	0.0612	31,880	2.9557	4,160	0.3857	4,615	0.4279	0	0.0000	0	0.0000	500	0.0464
Large-Caliber (Non-Explosive)	1.0097	4.0386	8,805	0.8163	40,735	3.7767	7,200	0.6675	72,620	6.7329	15,950	1.4788	13,870	1.2859	0	0.0000	0	0.0000	1,400	0.1298
Kinetic Energy Round	0.5048	1.0100	175,017	4.0580	175,017	4.0580	175,017	4.0580	175,017	4.0580	175,017	4.0580	175,017	4.0580	17	0.0004	17	0.0004	17	0.0004
Countermeasures																				
Acoustic Countermeasures	0.3311	1.2432	4,210	0.1202	5,190	0.1481	3,820	0.1090	6,651	0.1898	0	0.0000	4,180	0.1193	320	0.0091	500	0.0143	0	0.0000
Chaff-Air Cartridges	0.0011	0.0022	0	0.0000	102,975	0.0052	0	0.0000	2,000	0.0001	0	0.0000	6,000	0.0003	0	0.0000	0	0.0000	0	0.0000
Chaff - Ship Cartridges	2.0000	4.0000	720	0.0661	5,095	0.4679	720	0.0661	2,400	0.2204	720	0.0661	720	0.0661	0	0.0000	0	0.0000	0	0.0000
Anti-Torpedo Torpedo	4.524	9.0847	710	0.1481	800	0.1668	210	0.0438	780	0.1627	0	0.0000	710	0.1481	0	0.0000	0	0.0000	0	0.0000
Flares	1.2196	4.8782	0	0.0000	100,975	11.3080	0	0.0000	0	0.0000	0	0.0000	3,000	0.3360	0	0.0000	0	0.0000	0	0.0000
Targets																				
Aerial Drones - Expendable	294.6082	589.2164	0	0.0000	2,397	4.0279	28	0.3787	868	11.7410	28	0.3787	28	0.3787	28	0.3787	28	0.3787	28	0.3787
Air Target - Expended (Non-Drone)	42.1622	84.3245	300	0.5807	300	0.5807	300	0.5807	300	0.5807	300	0.5807	350	0.6775	0	0.0000	0	0.0000	0	0.0000
Surface Target (Stationary) - Expended	96.8752	193.7504	305	1.3566	305	1.3566	305	1.3566	305	1.3566	305	1.3566	305	1.3566	0	0.0000	0	0.0000	0	0.0000
Surface Target (Mobile) - Expended	5.7522	11.5034	4	0.0011	4	0.0011	4	0.0011	4	0.0011	4	0.0011	4	0.0011	0	0.0000	0	0.0000	0	0.0000
Mine Shapes -Expended	25.7903	51.5807	28,000	33.1556	15,860	18.7803	0	0.0000	7,975	9.4434	0	0.0000	13,772	16.3078	1,710	2.0249	4,423	5.2374	21,545	25.5121
Subsurface Target (Mobile)-Expended	1.2206	2.4413	500	0.0280	525	0.0294	0	0.0000	1,325	0.0743	0	0.0000	500	0.0280	1,200	0.0673	0	0.0000	0	0.0000
Other																				
Air-Launched Lightweight Torpedo (Explosive)	19.1199	38.2399	3	0.0026	3	0.0026	3	0.0026	3	0.0026	3	0.0026	3	0.0026	0	0.0000	0	0.0000	0	0.0000
Anchor	6.2495	12.5001	18,000	5.1653	9,000	2.5827	0	0.0000	501	0.1438	0	0.0000	9,614	2.7589	1,026	0.2944	433	0.1243	0	0.0000
Compression Pad/Piston	0.0043	0.0086	0	0.0000	100,975	0.0199	0	0.0000	0	0.0000	0	0.0000	3,000	0.0006	0	0.0000	0	0.0000	0	0.0000
Concrete Slugs	0.0011	0.0022	190	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	190	0.0000	0	0.0000	0	0.0000	0	0.0000
Endcaps	0.0022	0.0043	0	0.0000	203,950	0.0201	720	0.0001	2,000	0.0002	0	0.0000	9,000	0.0009	0	0.0000	0	0.0000	0	0.0000
Endcaps and Pistons - Non Chaff & Flare	0.0043	0.0860	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	1,895	0.0037	0	0.0000	0	0.0000
Flare O-Ring	0.0043	0.0086	0	0.0000	100,975	0.0199	0	0.0000	0	0.0000	0	0.0000	3,000	0.0006	0	0.0000	0	0.0000	0	0.0000
Heavyweight Torpedo (Explosive)	39.6155	79.2299	4	0.0073	4	0.0073	4	0.0073	4	0.0073	4	0.0073	4	0.0073	0	0.0000	0	0.0000	0	0.0000
Heavyweight Torpedo Accessories	0.1615	3.2367	950	0.0706	1,100	0.0817	260	0.0193	1,170	0.0869	10	0.0007	930	0.0691	300	0.0223	170	0.0126	0	0.0000
Sabot	1.2196	4.8782	175,017	19.5998	175,017	19.5998	175,017	19.5998	175,017	19.5998	175,017	19.5998	175,017	19.5998	1,912	0.2141	17	0.0019	17	0.0019
Sonobuoy (Explosive)	1.2207	2.4413	0	0.0000	0	0.0000	0	0.0000	0	0.0000	360	0.0202	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Surface-Launched Lightweight Torpedo (Explosive)	10.0782	20.1576	22	0.0102	22	0.0102	2	0.0009	22	0.0102	2	0.0009	22	0.0102	0	0.0000	0	0.0000	60	0.0278
Total			***437,417***	***65.3148***	***1,451,369***	***82.1687***	***388,270***	***27.0199***	***504,902***	***57.5900***	***395,880***	***28.0043***	***512,851***	***47.8898***	***8,408***	***3.0150***	***5,588***	***5.7696***	***58,567***	***26.1947***

Note: * Calculation for "Impact (ac)" Column = ([Impact Footprint] x [Number]) / 43560
ac=acre; $ft.^2$=square feet; GOMEX=Gulf of Mexico; JAX=Jacksonville; NSWC Panama City=Naval Surface Warfare Center Panama City; NUWC Newport=Naval Undersea Warfare Center Newport; SFOMF=South Florida Ocean Measurement Facility; VACAPES=Virginia Capes

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Table F-18: Number of Recovered Materials Proposed for Use During Testing Activities in a Single Year Under Alternatives 1 and 2

Recovered Materials		Range Complexes: Northeast Number	VACAPES Number	Navy Cherry Point Number	JAX Number	Key West Number	GOMEX Number	Testing Ranges: NUWC Newport Number	SFOMF Number	NSWC Panama City Number
Other										
Air-Launched Lightweight Torpedo (Non-Explosive)		33	196	33	224	1	33	0	0	0
AMNS/EMNS Neutralizer (Recovered)	Alternative 1	0	180	0	50	0	100	0	0	84
	Alternative 2		195	0						99
Heavyweight Torpedo (Non-Explosive)		190	220	52	234	2	186	60	34	0
Surface-Launched Lightweight Torpedo (Non-Explosive)		17	49	45	113	1	17	60	0	240
Unmanned Aerial System		30	1,563	0	48	48	48	360	84	84
Unmanned Surface Vehicle		0	0	0	0	0	0	660	0	0
Unmanned Underwater Vehicle		540	270	10	34	0	311	69	8	10
Unmanned Vehicle		0	0	0	0	0	0	0	0	5
Targets										
Air Targets		76	76	76	76	76	86	1,003	28	28
Aerial Drone - Recovered		6	243	9	11	0	2	0	0	0
Subsurface Target - Recovered		125	351	8	283	31	305	901	235	0
Subsurface Target (Stationary) - Recovered		13,680	6,700	3,200	9,600	0	3,500	30	0	0
Surface Target - Recovered		274	870	270	704	298	398	1,244	137	36
Total		***14,971***	***10,913***	***3,703***	***11,377***	***457***	***4,986***	***4,387***	***526***	***586***

Note: AMNS/EMNS = Airborne Mine Neutralization System/Expendable Mine Neutralization System; GOMEX=Gulf of Mexico; JAX=Jacksonville; NSWC Panama City=Naval Surface Warfare Center Panama City; NUWC Newport=Naval Undersea Warfare Center Newport; SFOMF=South Florida Ocean Measurement Facility; VACAPES=Virginia Capes
Blue shading indicated numbers and impacts of MEM that differ between Alternatives 1 and 2.

Table F-19: Number and Impacts* of Recovered Bottom Placed Materials Proposed for Use During Testing Activities in a Single Year Under Alternatives 1 and 2

Recovered Materials	Size ($ft.^2$)	Impact Footprint ($ft.^2$)	Range Complexes: Northeast Number	Northeast Impact (ac)	VACAPES Number	VACAPES Impact (ac)	Navy Cherry Point Number	Navy Cherry Point Impact (ac)	JAX Number	JAX Impact (ac)	Key West Number	Key West Impact (ac)	GOMEX Number	GOMEX Impact (ac)	Testing Ranges: NUWC Newport Number	NUWC Newport Impact (ac)	SFOMF Number	SFOMF Impact (ac)	NSWC Panama City Number	NSWC Panama City Impact (ac)
Anchor (Recovered)	6.2495	12.5001	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	225	0.0646	0	0.0000
Bottom Placed Instruments	2.0000	4.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	600	0.5510	0	0.0000	0	0.0000
Mine Shape (Non-explosive)	25.7903	51.5807	0	0.0000	919	1.0882	1,200	1.4210	21,802	25.8164	0	0.0000	894	1.0586	825	0.9769	0	0.0000	27,747	32.8560
Total			***0***	***0.0000***	***919***	***1.0882***	***1,200***	***1.4210***	***21,802***	***25.8164***	***0***	***0.0000***	***894***	***1.0586***	***1,425***	***1.5279***	***225***	***0.0646***	***27,747***	***32.8560***

Note: * Calculation for "Impact (ac)" Column = ([Impact Footprint] x [Number]) / 43560
ac=acre; $ft.^2$=square feet; GOMEX=Gulf of Mexico; JAX=Jacksonville; NSWC Panama City=Naval Surface Warfare Center Panama City; NUWC Newport=Naval Undersea Warfare Center Newport; SFOMF=South Florida Ocean Measurement Facility; VACAPES=Virginia Capes

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Table F-20: Number of Recovered Materials Proposed for Use During Testing Activities in Five Years Under Alternatives 1 and 2

Recovered Materials		*Range Complexes*						*Testing Ranges*		
		Northeast	*VACAPES*	*Navy Cherry Point*	*JAX*	*Key West*	*GOMEX*	*NUWC Newport*	*SFOMF*	*NSWC Panama City*
		Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*
Other										
Air-Launched Lightweight Torpedo (Non-Explosive)	Alternative 1	163	735	163	1,049	3	163	0	0	0
	Alternative 2		978		1,118					
AMNS Neutralizer (Non-Explosive)	Alternative 1	0	740	0	250	0	500	0	0	364
	Alternative 2		975							495
Heavyweight Torpedo (Non-Explosive)		947	1,097	257	1,167	7	927	300	170	0
Surface-Launched Lightweight Torpedo (Non-Explosive)		82	242	222	562	2	82	300	0	1,200
Unmanned Aerial System		150	7,815	0	240	240	240	1,800	420	420
Unmanned Surface Vehicle		0	0	0	0	0	0	3,300	0	0
Unmanned Underwater Vehicle		3,700	1,350	50	464	0	1,555	342	38	50
Unmanned Vehicle		0	0	0	0	0	0	0	0	25
Targets										
Air Target - Recovered		379	379	379	379	379	429	5,014	139	139
Aerial Drone-Recovered		30	1,215	45	55	0	10	0	0	0
Subsurface Target - Recovered	Alternative 1	378	1,092	38	1,338	59	1,518	4,504	1,173	0
	Alternative 2		1,754		1,413	155	1,524			
Subsurface Target (Stationary)- Recovered		68,400	33,500	16,000	48,000	0	17,500	150	0	0
Surface Target	Alternative 1	1,368	4,256	1,348	3,452	1,488	1,988	6,220	686	178
	Alternative 2		4,348		3,520					
Total		***75,597***	***60,476***	***18,502***	***63,007***	***2,333***	***26,436***	***21,930***	***2,626***	***2,871***

Note: AMNS=Airborne Mine Neutralization System; GOMEX=Gulf of Mexico; JAX=Jacksonville; NSWC Panama City=Naval Surface Warfare Center Panama City; NUWC Newport=Naval Undersea Warfare Center Newport; SFOMF=South Florida Ocean Measurement Facility; VACAPES=Virginia Capes
Blue shading indicated numbers and impacts of MEM that differ between Alternatives 1 and 2.

Table F-21: Number of Recovered Materials Proposed for Use During Testing Activities in Five Years Under Alternatives 1 & 2–Inland Waters

Location	*Targets*
	Air Target
	Number
Little Creek, VA	210
Norfolk, VA	210

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Table F-22: Number and Impacts* of Recovered Bottom Placed Materials Proposed for Use During Testing Activities in Five Years as Part of Alternatives 1 and 2

Recovered Materials		*Size ($ft.^2$)*	*Impact Footprint ($ft.^2$)*	*Range Complexes*												*Testing Ranges*					
				Northeast		*VACAPES*		*Navy Cherry Point*		*JAX*		*Key West*		*GOMEX*		*NUWC Newport*		*SFOMF*		*NSWC Panama City*	
				Number	*Impact (ac)*	*Number*	*Impact (ac)*	*Number*	*Impact (ac)*	*Number*	*Impact (ac)*	*Number*	*Impact (ac)*	*Number*	*Impact (ac)*	*Number*	*Impact (ac)*	*Number*	*Impact (ac)*	*Number*	*Impact (ac)*
Anchors		6.2495	12.5001	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	1,125	0.3228	0	0.0000
Bottom Placed Instruments		2.0000	4.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	3,000	0.2754	0	0.0000	0	0.0000
Mine Shape (Non-explosive)	Alternative 1	25.7903	51.5807	0	0.0000	3,907	4.6264	6,000	7.1048	109,010	129.0820	0	0.0000	4,470	5.2931	4,125	4.8845	0	0.0000	138,211	163.6598
	Alternative 2					4,595	5.4411													138,735	164.2803
Total	***Alternative 1***			***0***	***0.0000***	***3,907***	***4.6924***	***6,000***	***7.1048***	***109,010***	***129.0820***	***0***	***0.0000***	***4,470***	***5.2931***	***7,125***	***5.1599***	***1,125***	***0.3228***	***138,211***	***163.6598***
	Alternative 2					***4,595***	***5.4411***													***138,735***	***164.2803***

Note: * Calculation for "Impact (ac)" Column = ([Impact Footprint] x [Number]) / 43560
ac=acre; $ft.^2$=square feet; GOMEX=Gulf of Mexico; JAX=Jacksonville; NSWC Panama City=Naval Surface Warfare Center Panama City; NUWC Newport=Naval Undersea Warfare Center Newport; SFOMF=South Florida Ocean Measurement Facility; VACAPES=Virginia Capes
Blue shading indicated numbers and impacts of MEM that differ between Alternatives 1 and 2.

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F.2 IMPACTS TO ABIOTIC SUBSTRATE – TRAINING AND TESTING ACTIVITIES

Tables F-23 through Tables F-35 show impacts to abiotic substrate within the AFTT Study Area for both Single Year and Five Year totals.

Table F-23: Potential Impact from Explosives On or Near the Bottom for Training Activities Under Alternative 1 and 2 in a Single Year

Training Areas	*Net Explosive Weight (lb.)*	*Number of Charges*	*Total Impact Footprint (ac)*	*Hard Substrate*		*Intermediate Substrate*		*Soft substrate*	
				ac	*% Impact*	*ac*	*% Impact*	*ac*	*% Impact*
Northeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone									
VACAPES RC	10	224	2.3524	559,734	0.000420	1,874,186	0.000126	22,262,693	0.000011
	20	296	4.9372		0.000882		0.000263		0.000022
	60	4	0.1389		0.000025		0.000007		0.000001
	AMNS Neutralizer	62	0.3064		0.000055		0.000016		0.000001
Total			***7.7349***		***0.001382***		***0.000413***		***0.000035***
Northeast U.S. Continental Shelf Large Marine Ecosystem									
Lower Chesapeake Bay	5	12	0.0801	0	0	2,134	0.003752	362,740	0.000022
Total			***0.0801***		***0***		***0.003752***		***0.000022***
Northeast and Southeast U.S. Continental Shelf Large Marine Ecosystem									
Navy Cherry Point RC	10	4	0.0420	1,081,358	0.000004	214,657	0.000020	14,611,417	0.000000
	20	12	0.2002		0.000019		0.000093		0.000001
	AMNS Neutralizer	1	0.0049		0.000000		0.000002		0.000000
Total			***0.247108***		***0.000023***		***0.000115***		***0.000001***
Southeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone									
JAX RC	0.5	2	0.0030	9,306,697	0.000000	6,530,477	0.000000	26,485,602	0.000000
	10	8	0.0840		0.000001		0.000001		0.000000
	20	12	0.2002		0.000002		0.000003		0.000001
	AMNS Neutralizer	2	0.0099		0.000000		0.000000		0.000000
Total			***0.297049***		***0.000003***		***0.000004***		***0.000001***
Caribbean and Gulf of Mexico Large Marine Ecosystem									
Key West RC	5	10	0.0667	4,493,152	0.000002	1,472,965	0.000005	14,163,039	0.000001
	10	4	0.0420		0.000001		0.000003		0.000000
	20	8	0.1334		0.000003		0.000009		0.000001
Total			***0.242100***		***0.000006***		***0.000016***		***0.000002***
Gulf of Mexico Large Marine Ecosystem									
GOMEX RC	0.5	2	0.0030	2,955,100	0.000000	3,418,643	0.000000	56,370,160	0.000000
	10	4	0.0420		0.000001		0.000001		0.000000
	20	12	0.2002		0.000007		0.000006		0.000000
	AMNS Neutralizer	22	0.1087		0.000003		0.000003		0.000000
Total			***0.353895***		***0.000012***		***0.000010***		***0.000000***

Note: ac=acre; AMNS=Airborne Mine Neutralization System; GOMEX=Gulf of Mexico; JAX=Jacksonville; lb.=pounds; RC=Range Complex; VACAPES=Virginia Capes

Table F-24: Potential Impact from Explosives On or Near the Bottom for Testing Activities Under Alternative 1 in a Single Year

				Hard Substrate		*Intermediate Substrate*		*Soft substrate*	
Training Areas	***Net Explosive Weight (lb.)***	***Number of Charges***	***Total Impact Footprint (ac)***	***ac***	***% Impact***	***ac***	***% Impact***	***ac***	***% Impact***
Northeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone									
VACAPES RC	650	10	1.6988	559,734	0.0003035	1,874,186	0.0000906	22,262,693	0.0000076
	AMNS Neutralizer	250	1.2355		0.0002207		0.0000659		0.0000055
Total			***2.9343***		***0.0005242***		***0.0001566***		***0.0000132***
Southeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone									
JAX RC	650	8	1.3591	9,306,697	0.0000146	6,530,477	0.0000208	26,485,602	0.0000051
	AMNS Neutralizer	50	0.2471		0.0000027		0.0000038		0.0000009
Total			***1.6062***		***0.0000173***		***0.0000246***		***0.0000061***
Gulf Of Mexico Large Marine Ecosystem									
GOMEX RC	650	16	2.7182	2,955,100	0.0000920	3,418,643	0.0000795	56,370,160	0.0000048
	AMNS Neutralizer	100	0.4942		0.0000167		0.0000145		0.0000009
Total			***3.2124***		***0.0001087***		***0.0000940***		***0.0000057***
NSWC Panama City Testing Range	650	4	0.6795	1,260,458	0.0000539	2,368,180	0.0000287	15,776,970	0.0000043
	AMNS Neutralizer	328	1.6201		0.0001285		0.0000684		0.0000103
	Line Charge	4	4.2739		0.0003391		0.00018047		0.0000271
Total			***6.5736***		***0.0005215***		***0.0002776***		***0.0000417***

Note: ac=acre; AMNS=Airborne Mine Neutralization System; GOMEX=Gulf of Mexico; JAX=Jacksonville; lb.=pounds; NSWC Panama City=Naval Surface Warfare Center Panama City; RC=Range Complex; VACAPES=Virginia Capes

Blue shading indicated numbers and impacts of MEM that differ between Alternatives 1 and 2

Table F-25: Potential Impact from Explosives On or Near the Bottom for Testing Activities Under Alternative 2 in a Single Year

				Hard Substrate		*Intermediate Substrate*		*Soft substrate*	
Training Areas	*Net Explosive Weight (lb.)*	*Number of Charges*	*Total Impact Footprint (ac)*	*ac*	*% Impact*	*ac*	*% Impact*	*ac*	*% Impact*
Northeast U.S. Continental Shelf Large Marine Ecosystem									
VACAPES RC	650	15	2.5483	559,734	0.0004553	1,874,186	0.0001360	21,573,934	0.0000118
	AMNS Neutralizer	255	1.2602		0.0002251		0.0000672		0.0000058
Total			***3.8085***		***0.0006804***		***0.0002032***		***0.0000177***
Southeast U.S. Continental Shelf Large Marine Ecosystem									
JAX RC	650	8	1.3591	9,306,697	0.0000146	6,530,477	0.0000208	26,485,602	0.0000051
	AMNS Neutralizer	50	0.2471		0.0000027		0.0000038		0.0000009
Total			***1.6062***		***0.0000173***		***0.0000246***		***0.0000061***
Gulf Of Mexico Large Marine Ecosystem									
GOMEX RC	650	16	2.7182	2,955,100	0.0000920	3,418,643	0.0000795	56,370,160	0.0000048
	AMNS Neutralizer	100	0.4942		0.0000167		0.0000145		0.0000009
Total			***3.2124***		***0.0001087***		***0.0000940***		***0.0000057***
NSWC Panama City Testing Range	650	9	1.5290	1,260,458	0.0001213	2,368,180	0.0000646	15,776,970	0.0000097
	AMNS Neutralizer	333	1.6457		0.0001306		0.0000695		0.0000104
	Line Charge	4	4.2739		0.0003391		0.0001805		0.0000271
Total			***13.8733***	***4,215,558***	***0.0005909***	***5,786,823***	***0.0003145***	***72,147,130***	***0.0000472***

Note: ac=acre; AMNS=Airborne Mine Neutralization System; GOMEX=Gulf of Mexico; JAX=Jacksonville; lb.=pounds; NSWC Panama City=Naval Surface Warfare Center Panama City; RC=Range Complex; VACAPES=Virginia Capes

Blue shading indicated numbers and impacts of MEM that differ between Alternatives 1 and 2

Table F-26: Potential Impact from Explosives On or Near the Bottom for Training Activities under Alternatives 1 and 2 Over Five Years

Training Areas	Net Explosive Weight (lb.)	Number of Charges	Total Impact Footprint (ac)	Hard Substrate		Intermediate Substrate		Soft substrate	
				ac	% Impact	ac	% Impact	ac	% Impact
Alternative 1									
Northeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone									
VACAPES RC	10	1,120	11.7622	559,734	0.0021014	1,874,186	0.0006276	22,262,693	0.0000528
	20	1,480	24.6858		0.0044103		0.0013171		0.0001109
	60	20	0.6944		0.0001241		0.0000371		0.0000031
	AMNS Neutralizer	306	1.5123		0.0002702		0.0000807		0.0000068
Total			***38.6547***		***0.0069059***		***0.0020625***		***0.0001736***
Northeast U.S. Continental Shelf Large Marine Ecosystem									
Lower Chesapeake Bay	5	60	0.4003	0	0	2,134	0.0187582	362,740	0.0001104
Total			***0.4003***		***0***		***0.0187582***		***0.0001104***
Northeast and Southeast U.S. Continental Shelf Large Marine Ecosystem									
Navy Cherry Point RC	10	20	0.2100	1,081,358	0.000019	214,657	0.0000978	14,611,417	0.0000014
	20	60	1.0008		0.000093		0.0004662		0.0000068
	AMNS Neutralizer	5	0.0247		0.000002		0.0000115		0.0000002
Total			***1.235500***		***0.000114***		***0.0005756***		***0.0000085***
Southeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone									
JAX RC	0.5	6	0.0089	9,306,697	0.0000001	6,530,477	0.0000001	26,485,602	0.0000000
	10	40	0.4201		0.0000045		0.0000064		0.0000016
	20	60	1.0008		0.0000108		0.0000153		0.0000038
	AMNS Neutralizer	6	0.0297		0.0000003		0.0000005		0.0000001
Total			***1.459500***		***0.0000157***		***0.0000223***		***0.0000055***
Caribbean and Gulf of Mexico Large Marine Ecosystem									
Key West RC	5	50	0.3336	4,493,152	0.0000074	1,472,965	0.0000226	14,163,039	0.0000024
	10	20	0.2100		0.0000047		0.0000143		0.0000015
	20	40	0.6672		0.0000148		0.0000453		0.0000047
Total			***1.210800***		***0.0000269***		***0.0000822***		***0.0000085***
Gulf of Mexico Large Marine Ecosystem									
GOMEX RC	0.5	6	0.0089	2,955,100	0.0000003	3,418,643	0.0000003	56,370,160	0.0000000
	10	20	0.2100		0.0000071		0.0000061		0.0000004
	20	60	1.0008		0.0000339		0.0000293		0.0000018
	AMNS Neutralizer	106	0.5239		0.0000177		0.0000153		0.0000009
Total			***1.743600***		***0.000059***		***0.0000510***		***0.0000031***

Table F-26: Potential Impact from Explosives On or Near the Bottom for Training Activities under Alternatives 1 and 2 Over Five Years (continued)

Training Areas	Net Explosive Weight (lb.)	Number of Charges	Total Impact Footprint (ac)	Hard Substrate		Intermediate Substrate		Soft substrate	
				Acre	% Impact	Acre	% Impact	Acre	% Impact
Alternative 2									
Northeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone									
VACAPES RC	10	1,120	11.7622	559,734	0.00210139	1,874,186	0.0006276	22,262,693	0.0000528
	20	1,480	24.6858		0.00441027		0.0013171		0.0001109
	60	20	0.6944		0.00012406		0.0000371		0.0000031
	AMNS Neutralizer	310	1.5321		0.00027371		0.0000817		0.0000069
Total			***38.6745***		***0.00690944***		***0.0020635***		***0.0001737***
Northeast U.S. Continental Shelf Large Marine Ecosystem									
Chesapeake Bay Area	5	60	0.4003	0	0	2,134	0.0187582	362,740	0.0001104
Total			***0.4003***		***0***		***0.0187582***		***0.0001104***
Navy Cherry Point RC	10	20	0.2100	1,081,358	0.000019	214,657	0.0000978	14,611,417	0.0000014
	20	60	1.0008		0.000093		0.0004662		0.0000068
	AMNS Neutralizer	5	0.0247		0.000002		0.0000115		0.0000002
Total			***1.235500***		***0.000114***		***0.0005756***		***0.0000085***
Southeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone									
JAX RC	0.5	10	0.0148	9,306,697	0.0000002	6,530,477	0.0000002	26,485,602	0.0000001
	10	40	0.4201		0.0000045		0.0000064		0.0000016
	20	60	1.0008		0.0000108		0.0000153		0.0000038
	AMNS Neutralizer	10	0.0494		0.0000005		0.0000008		0.0000002
Total			***1.485100***		***0.0000160***		***0.0000227***		***0.0000056***
Caribbean and Gulf of Mexico Large Marine Ecosystem									
Key West RC	5	50	0.3336	4,493,152	0.0000074	1,472,965	0.0000226	14,163,039	0.0000024
	10	20	0.2100		0.0000047		0.0000143		0.0000015
	20	40	0.6672		0.0000148		0.0000453		0.0000047
Total			***1.210800***		***0.0000269***		***0.0000822***		***0.0000085***
Gulf of Mexico Large Marine Ecosystem									
GOMEX RC	0.5	10	0.0148	2,955,100	0.0000005	3,418,643	0.0000004	56,370,160	0.0000000
	10	20	0.2100		0.0000071		0.0000061		0.0000004
	20	60	1.0008		0.0000339		0.0000293		0.0000018
	AMNS Neutralizer	110	0.5436		0.0000184		0.0000159		0.0000010
Total			***1.769200***		***0.0000599***		***0.0000518***		***0.0000031***

Note: ac=acre; AMNS=Airborne Mine Neutralization System; GOMEX=Gulf of Mexico; JAX=Jacksonville; lb.=pounds; RC=Range Complex; VACAPES=Virginia Capes

Blue shading indicated numbers and impacts of MEM that differ between Alternatives 1 and 2.

Table F-27: Potential Impact from Explosives On or Near the Bottom for Testing Activities under Alternatives 1 and 2 Over Five Years

Testing Areas	*Net Explosive Weight (lb.)*	*Number of Charges*	*Total Impact Footprint (ac)*	*Hard Substrate*		*Intermediate Substrate*		*Soft substrate*	
				Acre	*% Impact*	*Acre*	*% Impact*	*Acre*	*% Impact*
Alternative 1									
Northeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone									
VACAPES RC	650	50	8.4942	559,734	0.00151754	1,874,186	0.0004532	22,262,693	0.0000382
	AMNS Neutralizer	1090	5.3869		0.0009624		0.0002874		0.0000242
Total			***13.8811***		***0.00247995***		***0.0007406***		***0.0000624***
Southeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone									
JAX RC	650	40	6.7954	9,306,697	0.0000730	6,530,477	0.0001041	26,485,602	0.0000257
	AMNS Neutralizer	250	1.2355		0.0000133		0.0000189		0.0000047
Total			***8.0309***		***0.0000863***		***0.0001230***		***0.0000303***
Gulf Of Mexico Large Marine Ecosystem									
GOMEX RC	650	80	13.5908	2,955,100	0.0004599	3,418,643	0.0003975	56,370,160	0.0000241
	AMNS Neutralizer	500	2.4711		0.0000836		0.0000723		0.0000044
Total			***16.0619***		***0.0005435***		***0.0004698***		***0.0000285***
NSWC Panama City Testing Range	650	20	3.3977	1,260,458	0.0002696	2,368,180	0.0001435	15,776,970	0.0000215
	AMNS Neutralizer	1584	7.8283		0.0006211		0.0003306		0.0000496
	Line Charge	20	21.3697		0.0016954		0.0009024		0.0001354
Total			***32.5957***		***0.0025860***		***0.0013764***		***0.0002066***
Alternative 2									
Northeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone									
VACAPES RC	650	75	12.7414	559,734	0.00227633	1,874,186	0.0006798	22,262,693	0.0000572
	AMNS Neutralizer	1275	6.3012		0.00112575		0.0003362		0.0000283
Total			***19.0426***		***0.0034021***		***0.0010160***		***0.0000855***
Southeast U.S. Continental Shelf Large Marine Ecosystem									
JAX RC	650	40	6.7954	9,306,697	0.0000730	6,530,477	0.0001041	26,485,602	0.0000257
	AMNS Neutralizer	250	1.2355		0.0000133		0.0000189		0.0000047
Total			***8.0309***		***0.0000863***		***0.0001230***		***0.0000303***
Gulf Of Mexico Large Marine Ecosystem									
GOMEX RC	650	80	13.5908	2,955,100	0.0004599	3,418,643	0.0003975	56,370,160	0.0000241
	AMNS Neutralizer	500	2.4711		0.0000836		0.0000723		0.0000044
Total			**16.0619**		***0.0005435***		***0.0004698***		***0.0000285***
NSWC Panama City Testing Range	650	45	7.6448	1,260,458	0.0006065	2,368,180	0.0003228	15,776,970	0.0000485
	AMNS Neutralizer	1665	8.2286		0.0006528		0.0003475		0.0000522
	Line Charge	20	21.3697		0.0016954		0.0009024		0.0001354
Total			***69.3668***		***0.0029547***		***0.0015726***		***0.0002361***

Note: ac=acre; AMNS=Airborne Mine Neutralization System; GOMEX=Gulf of Mexico; JAX=Jacksonville; lb.=pounds; NSWC Panama City=Naval Surface Warfare Center Panama City; RC=Range Complex; VACAPES=Virginia Capes

Blue shading indicated numbers and impacts of MEM that differ between Alternatives 1 and 2

Table F-28: Potential Impact of Military Expended Materials from Training Activities on Each Substrate Type in a Single Year

Training Areas	*Percent Impact to Hard Bottom*		*Percent Impact to Intermediate Bottom*		*Percent Impact to Soft Bottom*	
	Alternative 1	*Alternative 2*	*Alternative 1*	*Alternative 2*	*Alternative 1*	*Alternative 2*
Northeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone						
Northeast RC	0.00002989	0.0000299	0.000011859	0.0000119	0.000002358	
VACAPES RC	0.00472		0.001408	0.001409	0.00011860	
Northeast and Southeast U.S. Continental Shelf Large Marine Ecosystem						
Lower Chesapeake Bay	0		0		0	
Northeast and Southeast U.S. Continental Shelf Large Marine Ecosystem						
Navy Cherry Point RC	0.0010025	0.001027	0.0050503	0.005051	0.00007420	0.00007421
Southeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone						
JAX RC	0.0002433	0.0002435	0.0003467	0.000347	0.00008548	0.00008556
Caribbean and Gulf of Mexico Large Marine Ecosystems						
Key West RC	0.00008737		0.0002665		0.00002772	
Gulf of Mexico Large Marine Ecosystem						
GOMEX RC	0.00007273	0.000078	0.00006287	0.00006725	0.00000381	0.00000408
Abyssal Zone						
Other AFTT Area	0		0		0.00000335	
SINKEX Area	0		0		0.00003118	

Note: GOMEX=Gulf of Mexico; JAX=Jacksonville; RC=Range Complex; SINKEX = Sinking Exercise; VACAPES=Virginia Capes
Blue shading indicated numbers and impacts of MEM that differ between Alternatives 1 and 2

Table F-29: Potential Impact of Military Expended Materials from Testing Activities on Each Substrate Type in a Single Year

Testing Areas	*Percent Impact to Hard Bottom*		*Percent Impact to Intermediate Bottom*		*Percent Impact to Soft Bottom*	
	Alternative 1	*Alternative 2*	*Alternative 1*	*Alternative 2*	*Alternative 1*	*Alternative 2*
Northeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone						
Northeast RC	0.00049380	0.00049550	0.00019590	0.00019660	0.00003895	0.00003909
VACAPES RC	0.00444900	0.00445300	0.00132860	0.00132980	0.00011185	0.00011194
Northeast U.S. Continental Shelf Large Marine Ecosystem						
NUWC Newport Testing Range	0.00038630		0.00004579		0.00001033	
Northeast and Southeast U.S. Continental Shelf Large Marine Ecosystem						
Navy Cherry Point RC	0.00028600	0.00028740	0.00144100	0.00144800	0.00002116	0.00002127
Southeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone						
JAX RC	0.00012840	0.00012920	0.00018290	0.00018410	0.00004511	0.00004540
Southeast U.S. Continental Shelf Large Marine Ecosystem						
SFOMF	0.00036250		0.03811000		0.00128500	
Caribbean and Gulf of Mexico Large Marine Ecosystems						
Key West RC	0.00008227		0.00025100		0.00002610	
Gulf of Mexico Large Marine Ecosystem						
GOMEX RC	0.00026380		0.00022800		0.00001383	
NSWC Panama City Testing Range	0.00042400	0.00042240	0.00022570	0.00022590	0.00003387	0.00003391

Note: GOMEX=Gulf of Mexico; JAX=Jacksonville; NSWC=Naval Surface Warfare Center; NUWC=Naval Undersea Warfare Center; ; RC=Range Complex; SFOMF = South Florida Ocean Measurement Facility
Blue shading indicated numbers and impacts of MEM that differ between Alternatives 1 and 2

Table F-30: Potential Impact of Military Expended Materials from Training Activities on Each Substrate Type over Five Years

Training Areas	Percent Impact to Hard Bottom		Percent Impact to Intermediate Bottom		Percent Impact to Soft Bottom	
	Alternative 1	Alternative 2	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Northeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone						
Northeast RC	0.0001495	0.0001495	0.0000593	0.0000593	0.0000118	0.0000018
VACAPES RC	0.024		0.00704	0.007045	0.00059270	0.00059310
Northeast and Southeast U.S. Continental Shelf Large Marine Ecosystem						
Lower Chesapeake Bay	0		0.00000007		0	
Northeast and Southeast U.S. Continental Shelf Large Marine Ecosystem						
Navy Cherry Point RC	0.005006	0.005014	0.02522	0.02526	0.00037050	0.00037110
Southeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone						
JAX RC	0.001213	0.001218	0.001728	0.001735	0.00042610	0.00042780
Caribbean and Gulf of Mexico Large Marine Ecosystems						
Key West RC	0.0004369		0.001333		0.00013860	
Gulf of Mexico Large Marine Ecosystem						
GOMEX RC	0.00036331	0.00038899	0.00031405	0.00033625	0.00001905	0.00002039
Abyssal Zone						
Other AFTT Area	0		0		0.00001680	
SINKEX Area	0		0		0.00015590	

Note: GOMEX=Gulf of Mexico; JAX=Jacksonville; NSWC=Naval Surface Warfare Center; NUWC=Naval Undersea Warfare Center; Other AFTT Area = Location outside east coast Range Complexes and other defined areas; RC=Range Complex; SINKEX = Sinking Exercise

Blue shading indicated numbers and impacts of MEM that differ between Alternatives 1 and 2

Table F-31: Potential Impact of Military Expended Materials from Testing Activities on Each Substrate Type over Five Years

Testing Areas	*Percent Impact to Hard Bottom*		*Percent Impact to Intermediate Bottom*		*Percent Impact to Soft Bottom*	
	Alternative 1	*Alternative 2*	*Alternative 1*	*Alternative 2*	*Alternative 1*	*Alternative 2*
Northeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone						
Northeast RC	0.002445	0.002478	0.000970	0.000983	0.000193	0.000195
VACAPES RC	0.022031	0.022263	0.006580	0.006649	0.000554	0.000560
Northeast U.S. Continental Shelf Large Marine Ecosystem						
NUWC Newport Testing Range	0.001931		0.000229		0.000052	
Northeast and Southeast U.S. Continental Shelf Large Marine Ecosystem						
Navy Cherry Point RC	0.783671	0.001437	0.007184	0.007239	0.000106	0.000106
Southeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone						
JAX RC	0.000636	0.000646	0.000906	0.000921	0.000223	0.000227
Southeast U.S. Continental Shelf Large Marine Ecosystem						
SFOMF	0.001812		0.190547		0.006424	
Caribbean and Gulf of Mexico Large Marine Ecosystems						
Key West RC	0.000410	0.000411	0.001249	0.001255	0.000130	0.000131
Gulf of Mexico Large Marine Ecosystem						
GOMEX RC	0.001310	0.001319	0.001132	0.001140	0.000069	0.000069
NSWC Panama City Testing Range	0.002120	0.002122	0.001128	0.001130	0.000169	0.000170

Note GOMEX=Gulf of Mexico; JAX=Jacksonville; NSWC=Naval Surface Warfare Center; NUWC=Naval Undersea Warfare Center; RC=Range Complex; SFOMF = South Florida Ocean Measurement Facility;
Blue shading indicated numbers and impacts of MEM that differ between Alternatives 1 and 2

Table F-32: Proportional Impact to Bottom Habitat from Training Activities Under Alternatives 1 and 2 in a Single Year

Training Areas		*Impact to Hard Bottom*		*Impact to Intermediate Bottom*		*Impact to Soft Bottom*		*Impact to Unknown Bottom*	
		MEM Footprint (ac)	*Explosive Footprint (ac)*	*MEM Footprint (ac)*	*Explosive Footprint (ac)*	*MEM Footprint (ac)*	*Explosive Footprint (ac)*	*MEM Footprint (ac)*	*Explosive Footprint (ac)*
Northeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone									
Northeast	Alternative 1	0.04531	0	0.11421	0	0.57441	0	0.000057	0
	Alternative 2	0.04532		0.11423		0.57454			
VACAPES	Alternative 1	0.597657	0.175056	2.001162	0.586148	23.770983	6.962617	0	0
	Alternative 2	0.597848		2.001803		23.778601			
Northeast U.S. Continental Shelf Large Marine Ecosystem									
Lower Chesapeake Bay	Alternative 1	0	0	0.000004	0.000442	0.000718	0.075073	0.000001	0.000092
	Alternative 2								
Northeast and Southeast U.S. Continental Shelf Large Marine Ecosystem									
Navy Cherry Point	Alternative 1	0.735981	0.016775	0.146098	0.003330	9.944648	0.226665	0	0
	Alternative 2	0.736140		0.146129		9.946793			
Southeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone									
JAX	Alternative 1	4.974781	0.065249	3.490787	0.045785	14.157555	0.185689	0	0
	Alternative 2	4.979482		3.494085		14.170934			
Caribbean and Gulf of Mexico Large Marine Ecosystems									
Key West	Alternative 1	0.822796	0.050689	0.269733	0.016617	2.593566	0.159779	0.242469	0.014938
	Alternative 2								
Gulf of Mexico Large Marine Ecosystem									
GOMEX	Alternative 1	0.101346	0.016618	0.117244	0.019225	1.933235	0.316999	0.000033	0.000005
	Alternative 2	0.108383		0.125384		2.067464		0.000036	
Abyssal Zone									
Other AFTT	Alternative 1	0	0	0	0	0.0475608	0	0.760309	0
	Alternative 2								
SINKEX Area	Alternative 1	0	0	0	0	10.164693	0	4.40833	0
	Alternative 2								

Note: ac=acre; GOMEX=Gulf of Mexico; JAX=Jacksonville; MEM = Military Expended Materials; NSWC=Naval Surface Warfare Center; NUWC=Naval Undersea Warfare Center; Other AFTT Area = Location outside east coast Range Complexes and other defined areas; RC=Range Complex; SINKEX = Sinking Exercise

Blue shading indicated numbers and impacts of MEM that differ between Alternatives 1 and 2

Table F-33: Proportional Impact to Bottom Habitat from Testing Activities Under Alternatives 1 and 2 in a Single Year

Training Areas		Impact to Hard Bottom		Impact to Intermediate Bottom		Impact to Soft Bottom		Impact to Unknown Bottom	
		MEM Footprint (ac)	Explosive Footprint (ac)	MEM Footprint (ac)	Explosive Footprint (ac)	MEM Footprint (ac)	Explosive Footprint (ac)	MEM Footprint (ac)	Explosive Footprint (ac)
Northeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone									
Northeast RC	Alternative 1	0.748575	0	1.886734	0	9.489532	0	0.000941	0
	Alternative 2	0.751188		1.893320		9.522659		0.000944	
VACAPES RC	Alternative 1	0.563561	0.066411	1.886998	0.222366	22.414872	2.641399	0	0
	Alternative 2	0.564052	0.086194	1.888640	0.288608	22.434380	3.428258		
Northeast U.S. Continental Shelf Large Marine Ecosystem									
NUWC Newport Testing Range	Alternative 1	0.007991	0	0.151772	0	0.672726	0	0.004980	0
	Alternative 2								
Northeast and Southeast U.S. Continental Shelf Large Marine Ecosystem									
Navy Cherry Point RC	Alternative 1	0.209937	0	0.041674	0	2.836683	0	0	0
	Alternative 2	0.210980		0.041881		2.850788			
Southeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone									
JAX RC	Alternative 1	2.624418	0.352843	1.841545	0.247589	7.468739	1.004144	0.000000	0.000000
	Alternative 2	2.641308		1.853396		7.516804		0.000000	
Southeast U.S. Continental Shelf Large Marine Ecosystem									
SFOMF	Alternative 1	0.934114	0	0.008884	0	0.263547		0.000032	0
	Alternative 2								
Caribbean and Gulf of Mexico Large Marine Ecosystems									
Key West RC	Alternative 1	0.773768	0	0.253660	0	2.439023	0	0.228021	0
	Alternative 2								
Gulf of Mexico Large Marine Ecosystem									
GOMEX RC	Alternative 1	0.366057	0.150862	0.423478	0.174527	6.982745	2.877781	0.000120	0.000050
	Alternative 2								
NSWC Panama City Testing Range	Alternative 1	0.345426	0.424939	0.648994	0.798385	4.323641	5.318893	0.000061	0.000075
	Alternative 2	0.345833	0.481438	0.649759	0.904537	4.328734	6.026086		0.000085

Note: ac=acre; GOMEX=Gulf of Mexico; JAX=Jacksonville; MEM = Military Expended Materials; NSWC=Naval Surface Warfare Center; NUWC=Naval Undersea Warfare Center; Other AFTT Area = Location outside east coast Range Complexes and other defined areas; RC=Range Complex; SINKEX = Sinking Exercise

Blue shading indicated numbers and impacts of MEM that differ between Alternatives 1 and 2

Table F-34: Proportional Impact to Bottom Habitat from Training Activities Under Alternatives 1 and 2 over Five Years

Training Areas		Impact to Hard Bottom		Impact to Intermediate Bottom		Impact to Soft Bottom		Impact to Unknown Bottom	
		MEM Footprint (ac)	Explosive Footprint (ac)	MEM Footprint (ac)	Explosive Footprint (ac)	MEM Footprint (ac)	Explosive Footprint (ac)	MEM Footprint (ac)	Explosive Footprint (ac)
Northeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone									
Northeast RC	Alternative 1	0.226561	0	0.571032	0	2.872069	0	0.000285	0
	Alternative 2	0.226614		0.571166		2.872740		0.000285	
VACAPES RC	Alternative 1	2.987384	0.874833	10.002798	2.929244	118.819124	34.795292	0	0
	Alternative 2	2.989241	0.875280	10.009017	2.930742	118.893003	34.813086		
Northeast U.S. Continental Shelf Large Marine Ecosystem									
Lower Chesapeake Bay	Alternative 1	0	0	0.000021	0.002209	0.003590	0.003590	0	0
	Alternative 2								
Northeast and Southeast U.S. Continental Shelf Large Marine Ecosystem									
Navy Cherry Point RC	Alternative 1	3.674852	0.083875	0.729485	0.016650	49.654945	1.133327	0	0
	Alternative 2	3.680700		0.730646		49.733967			
Southeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone									
JAX RC	Alternative 1	24.797111	0.320599	17.400046	0.224963	70.569223	0.912381	0	0
	Alternative 2	24.897412	0.326244	17.470427	0.228924	70.854668	0.928447		
Caribbean and Gulf of Mexico Large Marine Ecosystems									
Key West RC	Alternative 1	4.113978	0.253446	1.348663	0.083086	12.967828	0.798895	1.212344	0.074688
	Alternative 2								
Gulf of Mexico Large Marine Ecosystem									
GOMEX RC	Alternative 1	0.506272	0.081883	0.585687	0.094728	9.657419	1.561971	0.000166	0.000027
	Alternative 2	0.541915	0.083090	0.626921	0.096124	10.337320	1.584993	0.000178	0.000027
Abyssal Zone									
Other AFTT	Alternative 1	0	0	0	0	0.237804	0	3.801546	0
	Alternative 2								
SINKEX Area	Alternative 1	0	0	0	0	50.823465	0	22.041663	0
	Alternative 2								

Note: ac=acre; GOMEX=Gulf of Mexico; JAX=Jacksonville; MEM = Military Expended Materials; NSWC=Naval Surface Warfare Center; NUWC=Naval Undersea Warfare Center; Other AFTT Area = Location outside east coast Range Complexes and other defined areas; RC=Range Complex; SINKEX = Sinking Exercise

Blue shading indicated numbers and impacts of MEM that differ between Alternatives 1 and 2

Table F-35: Proportional Impact to Bottom Habitat from Testing Activities Under Alternatives 1 and 2 over Five Years

Training Areas		Impact to Hard Bottom		Impact to Intermediate Bottom		Impact to Soft Bottom		Impact to Unknown Bottom	
		MEM Footprint (ac)	Explosive Footprint (ac)	MEM Footprint (ac)	Explosive Footprint (ac)	MEM Footprint (ac)	Explosive Footprint (ac)	MEM Footprint (ac)	Explosive Footprint (ac)
Northeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone									
Northeast RC	Alternative 1	3.706831	0	9.342822	0	46.990735	0	0.004659	0
	Alternative 2	3.755942		9.466600		47.613293		0.004721	
VACAPES RC	Alternative 1	2.790877	0.314158	9.344825	1.051910	111.003336	12.495209	0	0
	Alternative 2	2.820258	0.430971	9.443200	1.443041	112.171899	17.141291		
Northeast U.S. Continental Shelf Large Marine Ecosystem									
NUWC Newport Testing Range	Alternative 1	0.089956	0	0.758862	0	3.363629	0	0.024902	0
	Alternative 2								
Northeast and Southeast U.S. Continental Shelf Large Marine Ecosystem									
Navy Cherry Point RC	Alternative 1	1.046931	0	0.207824	0	14.146236	0	0	0
	Alternative 2	1.054902		0.209406		14.253939			
Southeast U.S. Continental Shelf Large Marine Ecosystem and Abyssal Zone									
JAX RC	Alternative 1	12.998343	1.764216	9.120892	1.237944	36.991525	5.020720	0	0
	Alternative 2	13.206538		9.266982		37.584022			
Southeast U.S. Continental Shelf Large Marine Ecosystem									
SFOMF	Alternative 1	4.670572	0	0.044422	0	1.317736	0	0.000160	0
	Alternative 2								
Caribbean and Gulf of Mexico Large Marine Ecosystems									
Key West RC	Alternative 1	3.851870	0	1.262737	0	12.141628	0	1.135104	0
	Alternative 2	3.868838		1.268300		12.195114		1.140104	
Gulf of Mexico Large Marine Ecosystem									
GOMEX RC	Alternative 1	1.817717	0.754311	2.102848	0.872634167	34.673953	14.388903	0.000598	0.000248
	Alternative 2	1.830287		2.117389		34.913723		0.000602	
NSWC Panama City Testing Range	Alternative 1	1.726857	2.106805	3.244461	3.958317	21.614811	26.370563	0.000307	0.000374
	Alternative 2	1.729163	2.407190	3.248793	4.522687	21.643669	30.130432	0.000307	0.000427

Note: ac=acre; GOMEX=Gulf of Mexico; JAX=Jacksonville; MEM = Military Expended Materials; NSWC=Naval Surface Warfare Center; NUWC=Naval Undersea Warfare Center; Other AFTT Area = Location outside east coast Range Complexes and other defined areas; RC=Range Complex; SINKEX = Sinking Exercise

Blue shading indicated numbers and impacts of MEM that differ between Alternatives 1 and 2

F.3 Statistical and Probability Analysis for Estimating Direct Strike Impact and Number of Potential Exposures From Military Expended Materials

This section discusses the methods and results for calculating the probability of a direct strike of an animal from any military items from the proposed training and testing activities falling toward (or directed at) the sea surface. For the purposes of this section, military items include non-explosive practice munitions, sonobuoys, acoustic countermeasures, targets, and high-energy lasers. Only marine mammals and sea turtles will be analyzed using these methods because animal densities are necessary to complete the calculations, and density estimates are currently only available for marine mammals and sea turtles within the Study Area. The analysis conducted here does not account for explosive munitions because impacts from explosives are analyzed within the Navy Acoustic Effects Model as described in the 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, 2017).

F.3.1 DIRECT IMPACT ANALYSIS

A probability was calculated to estimate the impact probability (P) and number of exposures (T) associated with direct impact of military items on marine animals on the sea surface within the specified training or testing area (R) in which the activities are occurring. The statistical probability analysis is based on probability theory and modified Venn diagrams with rectangular "footprint" areas for the individual animal (A) and total impact (I) inscribed inside the training or testing area (R). The analysis is over-predictive and conservative, in that it assumes: (1) that all animals would be at or near the surface 100 percent of the time, when in fact, marine mammals spend the majority of their time underwater, and (2) that the animals are stationary, which does not account for any movement or any potential avoidance of the training or testing activity.

1. A = length*width, where the individual animal's width (breadth) is assumed to be 20 percent of its length for marine mammals and 112 percent of its length for sea turtles. This product for A is multiplied by the number of animals Na in the specified training or testing area (i.e., product of the highest average month animal density [D] and training or testing area [R]: Na = D*R) to obtain the total animal footprint area (A*Na = A*D*R) in the training or testing area. As a conservative scenario, the total animal footprint area is calculated for the species with the highest average month density in the training or testing area with the highest use of military items within the entire Study Area.
2. I = Nmun*length*diameter, where Nmun = total annual number of military items for each type, and "length" and "diameter" refer to the individual military equipment dimensions. For each type, the individual impact footprint area is multiplied by the total annual number of military items to obtain the type-specific impact footprint area (I = Nmun*length*diameter). Each training or testing activity uses one or more different types of military items, each with a specific number and dimensions, and several training and testing activities occur in a given year. When integrating over the number of military items types for the given activity, and then over the number of activities in a year, these calculations are repeated (accounting for differences in dimensions and numbers) for all military items types used, to obtain the type-specific impact footprint area (I). These impact footprint areas are summed over all military items types for the given activity, and then summed (integrated) over all activities to obtain the total impact footprint area resulting from all activities occurring in the training or testing area in a given year. As a conservative scenario, the total impact footprint area is calculated for the training or testing area with the highest use of military items within the entire Study Area.

Though marine mammals and sea turtles may not be randomly distributed in the environment, a random point calculation was chosen due to the intensive data needs that would be required for a calculation that incorporated more detailed information on an animal's or military item's spatial occurrence.

The analysis is expected to provide an overestimation of the probability of a strike for the following reasons: (1) it calculates the probability of a single military item (of all the items expended over the course of the year) hitting a single animal at its species' highest seasonal density, (2) it does not take into account the possibility that an animal may avoid military activities, (3) it does not take into account the possibility that an animal may not be at the water surface, (4) it does not take into account that most projectiles fired during training and testing activities are fired at targets, and so only a very small portion of those projectiles that miss the target would hit the water with their maximum velocity and force, and (5) it does not quantitatively take into account the Navy avoiding animals that are sighted

through the implementation of mitigation measures (for consideration of mitigation during analysis see Sections 3.7.3.4 [Marine Mammals] and 3.8.3.4 [Reptiles]).

The likelihood of an impact is calculated as the probability (P) that the animal footprint (A) and the impact footprint (I) will intersect within the training or testing area (R). This is calculated as the area ratio A/R or I/R, respectively. Note that A (referring to an **individual** animal footprint) and I (referring to the impact footprint resulting from the **total** number of military items N_{mun}) are the relevant quantities used in the following calculations of single-animal impact probability [P], which is then multiplied by the number of animals to obtain the number of exposures (T). The probability that the random point in the training or testing area is within both types of footprints (i.e., A and I) depends on the degree of overlap of A and I. The probability that I overlaps A is calculated by adding a buffer distance around A based on one-half of the impact area (i.e., 0.5*I), such that an impact (center) occurring anywhere within the combined (overlapping) area would impact the animal. Thus, if L_i and W_i are the length and width of the impact footprint such that $L_i*W_i = 0.5*I$ and $W_i/L_i = L_a/W_a$ (i.e., similar geometry between the animal footprint and impact footprint), and if L_a and W_a are the length and width (breadth) of the individual animal such that $L_a*W_a = A$ (= individual animal footprint area), then, assuming a purely static, rectangular scenario (Scenario 1), the total area $A_{tot} = (L_a + 2*L_i)*(W_a + 2*W_i)$, and the buffer area $A_{buffer} = A_{tot} – L_a*W_a$.

Four scenarios were examined with respect to defining and setting up the overlapping combined areas of A and I:

1. Scenario 1: Purely static, rectangular scenario. Impact is assumed to be static (i.e., direct impact effects only; non-dynamic; no explosions or scattering of military items after the initial impact). Hence the impact footprint area (I) is assumed to be rectangular and given by the product of military items length and width (multiplied by the number of military items). $A_{tot} = (L_a + 2*L_i)*(W_a + 2*W_i)$ and $A_{buffer} = A_{tot} – L_a*W_a$.
2. Scenario 2: Dynamic scenario with end-on collision, in which the length of the impact footprint (Li) is enhanced by Rn = 5 military items lengths to reflect forward momentum. $A_{tot} = (L_a + (1 + R_n)*L_i)*(W_a + 2*W_i)$ and $A_{buffer} = A_{tot} – L_a*W_a$.
3. Scenario 3: Dynamic scenario with broadside collision, in which the width of the impact footprint (W_i) is enhanced by R_n = 5 military items lengths to reflect forward momentum. $A_{tot} = (L_a + 2*W_i)*(W_a + (1 + R_n)*L_i)$ and $A_{buffer} = A_{tot} – L_a*W_a$.
4. Scenario 4: Purely static, radial scenario, in which the rectangular animal and impact footprints are replaced with circular footprints while conserving area. Define the radius (R_a) of the circular individual animal footprint such that $\pi*R_a^2 = L_a*W_a$, and define the radius (R_i) of the circular impact footprint such that $\pi *R_i^2 = 0.5*L_i*W_i = 0.5*I$. Then $A_{tot} = \pi *(R_a + R_i)^2$ and $A_{buffer} = A_{tot} – \pi *R_a^2$ (where $\pi = 3.1415927$).

Static impacts (Scenarios 1 and 4) assume no additional aerial coverage effects of scattered military items beyond the initial impact. For dynamic impacts (Scenarios 2 and 3), the distance of any scattered military items must be considered by increasing the length (Scenario 2) or width (Scenario 3), depending on orientation (broadside versus end-on collision), of the impact footprint to account for the forward horizontal momentum of the falling object. Forward momentum typically accounts for five object lengths, resulting in a corresponding increase in impact area. Significantly different values may result from the static and dynamic orientation. Both of these types of collision conditions can be calculated each with 50 percent likelihood (i.e., equal weighting between Scenarios 2 and 3, to average these potentially different values).

Impact probability P is the probability of impacting one animal with the given number, type, and dimensions of all military items used in training or testing activities occurring in the area per year, and is given by the ratio of total area (A_{tot}) to training or testing area (R): $P = A_{tot}/R$. Number of exposures is $T = N*P = N*A_{tot}/R$, where N = number of animals in the training or testing area per year (given as the product of the animal density [D] and range size [R]). Thus, $N = D*R$ and hence $T = N*P = N*A_{tot}/R = D*A_{tot}$. Using this procedure, P and T were calculated for each of the four scenarios, for Endangered Species Act (ESA)-listed marine mammals and the marine mammal and sea turtle species with the highest average month density (used as the annual density value) and for each military item type. The scenario-specific P and T values were averaged over the four scenarios (using equal weighting) to obtain a single scenario -averaged annual estimate of P and T. The potential numbers of exposures (T) are reported in Table F-36 through Table F-39.

F.3.2 Parameters for Analysis

Impact probabilities (P) and number of exposures (T) were estimated by the analysis for the following parameters:

1. Two action alternatives: Alternative 1 and Alternative 2. Animal densities, animal dimensions, and military item dimensions are the same for the two action alternatives.
2. Two training or testing areas: Virginia Capes (VACAPES) and Jacksonville (JAX) Range Complexes. Areas are approximately 28,000 square nautical miles (NM^2) and 50,000 NM^2, respectively. These two training and testing areas were chosen because they constitute the areas with the highest estimated numbers and concentrations of military expended materials for both alternatives, and would, thus, provide a reasonable comparison for all other areas with fewer expended materials.
3. The following types of non-explosive munitions or other items:
    - **Small-caliber projectiles**: up to and including .50 caliber rounds
    - **Medium-caliber projectiles:** larger than .50 caliber rounds but smaller than 57 millimeters (mm) projectiles
    - **Large-caliber projectiles:** includes projectiles greater than or equal to a 57 mm projectile
    - **Missiles:** includes rockets and jet-propelled munitions
    - **Bombs:** Non-explosive practice bombs and mine shapes, ranging from 10 to 2,000 lbs
    - **Torpedoes:** includes all lightweight torpedoes
    - **Sonobuoys:** includes all sonobuoys
    - **Targets:** includes expended airborne and surface, as well as mine shapes
    - **Lightweight torpedo accessories:** includes all accessories that are dropped along with the torpedo (nose cap, air stabilizer, etc.)
    - **Anchors:** includes blocks used to anchor mine shapes to the seafloor
    - **Acoustic countermeasures:** includes aircraft deployed acoustic countermeasures
    - **High Energy Lasers**: includes high energy laser weapons that are directed at a surface target
    - **Expended Bathythermographs**: small sensor deployed from ships
4. Animal species of interest: The six species of Endangered Species Act (ESA)-listed marine mammals and the non-ESA listed marine mammal species with the highest average month

density in the training and testing areas of interest. The sea turtle species with the highest average month density in the training and testing areas of interest.

F.3.3 INPUT DATA

Input data for the direct strike analysis include animal species likely to be in the area and military items proposed for use under each of the two action alternatives. Animal species data include: (1) species identification and status (i.e., threatened, endangered, or neither), (2) highest average month density estimate each species of interest, and (3) adult animal dimensions (length and width) for the species with the highest density. The animal's dimensions are used to calculate individual animal footprint areas (A = length*width), and animal densities are used to calculate the number of exposures (T) from the impact probability (P): T = N*P. Military items data include: (1) military items category (e.g., projectile, bomb, rocket, target), (2) military items dimensions (length and width), and (3) total number of military items used annually.

Military items input data, specifically the quantity (e.g., numbers of bombs, and rockets), are different in magnitude between the two action alternatives. All animal species input data, the military items identification and category, and military items dimensions are the same for the two alternatives, only the quantities (i.e., total number of military items) are different.

F.3.4 OUTPUT DATA

Estimates of impact probability (P) and number of exposures (T) for a given species of interest were made for the specified training or testing area with the highest annual number of military items used for each of the two action alternatives. The calculations derived P and T from the highest annual number of military items used in the Study Area for the given alternative. Differences in P and T between the alternatives arise from different numbers of events (and therefore military items) for the two alternatives.

Results for marine mammals and sea turtles are presented in Tables F-36 through F-39.

Table F-36: Estimated Representative Marine Mammal Exposures from Direct Strike of a High Energy Laser by Area and Alternative in a Single Year

Northeast United States Continental Shelf Large Marine Ecosystem and Gulf Stream Open Ocean Area				
VACAPES Range Complex				
	Training		*Testing*	
Species	*Alternative 1*	*Alternative 2*	*Alternative 1*	*Alternative 2*
North Atlantic Right Whale	0.000000	0.000000	0.000000	0.000000
Sei Whale	0.000000	0.000000	0.000001	0.000001
Fin Whale	0.000001	0.000001	0.000005	0.000005
Blue Whale	0.000000	0.000000	0.000000	0.000000
Sperm Whale	0.000002	0.000002	0.000010	0.000010
Short Beaked Common	0.000007	0.000007	0.000140	0.000140

Note: VACAPES=Virginia Capes

Table F-37: Estimated Representative Sea Turtle Exposures from Direct Strike of a High Energy Laser by Area and Alternative in a Single Year

Northeast United States Continental Shelf Large Marine Ecosystem and Gulf Stream Open Ocean Area				
VACAPES Range Complex				
Species	*Training*		*Testing*	
	Alternative 1	*Alternative 2*	*Alternative 1*	*Alternative 2*
Loggerhead Sea Turtle	0.000008	0.000008	0.000136	0.000136

Note: VACAPES=Virginia Capes

Table F-38: Estimated Representative Marine Mammal Exposures from Direct Strike of Military Expended Materials by Area and Alternative in a Single Year

Northeast United States Continental Shelf Large Marine Ecosystem and Gulf Stream Open Ocean Area				
VACAPES Range Complex				
Species	*Training*		*Testing*	
	Alternative 1	*Alternative 2*	*Alternative 1*	*Alternative 2*
North Atlantic Right Whale	0.000071	0.000071	0.000032	0.000032
Sei Whale	0.000295	0.000295	0.000132	0.000132
Fin Whale	0.001450	0.001450	0.000655	0.000655
Blue Whale	0.000003	0.000003	0.000001	0.000001
Sperm Whale	0.003516	0.003517	0.001581	0.001581
Short Beaked Common Dolphin	0.079457	0.079474	0.035275	0.035275
Southeast United States Continental Shelf Large Marine Ecosystem and Gulf Stream Open Ocean Area				
JAX Range Complex				
Species	*Training*		*Testing*	
	Alternative 1	*Alternative 2*	*Alternative 1*	*Alternative 2*
North Atlantic Right Whale	0.000217	0.000022	0.000543	0.000544
Sei Whale	0.000015	0.000015	0.000039	0.000039
Fin Whale	0.000016	0.000016	0.000040	0.000041
Blue Whale	0.000001	0.000001	0.000003	0.000003
Sperm Whale	0.000051	0.000051	0.000126	0.000127
Atlantic Spotted Dolphin	0.007223	0.007231	0.018350	0.018362

Note: JAX=Jacksonville; VACAPES=Virginia Capes

Table F-39: Estimated Representative Sea Turtle Exposures from Direct Strike of Military Expended Materials by Area and Alternative in a Single Year

Northeast United States Continental Shelf Large Marine Ecosystem and Gulf Stream Open Ocean Area				
VACAPES Range Complex				
Species	*Training*		*Testing*	
	Alternative 1	*Alternative 2*	*Alternative 1*	*Alternative 2*
Loggerhead Sea Turtle	0.075879	0.075895	0.033703	0.033712
Southeast United States Continental Shelf Large Marine Ecosystem and Gulf Stream Open Ocean Area				
JAX Range Complex				
Species	*Training*		*Testing*	
	Alternative 1	*Alternative 2*	*Alternative 1*	*Alternative 2*
Loggerhead Sea Turtle	0.025516	0.025545	0.064775	0.064818

Note: JAX=Jacksonville; VACAPES=Virginia Capes

F.4 Poisson Probability of Direct Vessel Strike with Marine Mammals

In order to assess the probability of a Navy vessel striking a marine mammal during future training and testing activities, the Navy considered data on vessel usage within the Study Area (steaming days) and past ship strike records from the time period beginning in 2009. The Navy determined that data beginning in 2009 would be the most representative for predicting the potential for future vessel strikes, because this year coincided with when the Navy's mitigation, monitoring, and reporting requirements became standardized across the Fleets with the issuance of Marine Mammal Protection Act (MMPA) permits for sonar and explosive usage in at-sea Navy ranges.

Between 2007 and 2009, the Navy developed and distributed additional training, mitigation, and reporting tools to Navy operators to improve marine mammal protection and to ensure compliance with upcoming permit requirements. In 2007, the Navy implemented the Marine Species Awareness Training, which is designed to improve the effectiveness of visual observations for marine resources, including marine mammals and sea turtles. In subsequent years, the Navy issued refined policy guidance regarding marine mammal incidents (e.g., ship strikes) in order to collect the most accurate and detailed data possible in response to a possible incident. For over a decade, the Navy has implemented the Protective Measures Assessment Protocol software tool, which provides operators with notification of the required mitigation and a visual display of the planned training or testing activity location overlaid with relevant environmental data (see Chapter 5.1 for more detail).

Similar mitigation, reporting and monitoring requirements have been in place since 2009 and are expected to continue into the future. Therefore, the conditions affecting the potential for ship strikes are the most consistent across this time frame. As a result, data from the past eight years (i.e., 2009 to 2016) are used to calculate the probability of a Navy vessel striking a whale during proposed training and testing activities in the Study Area. The level of vessel use and the manner in which the Navy trains and tests in the future is expected to be consistent with this time period.

In the AFTT Study Area, there were a total of three reported Navy vessel whale strikes from 2009-2016. During this same time period there were a total of 39,040 steaming days of vessel use within the Study Area. Therefore, there was an average strike rate of 0.00008 strikes per steaming day. Based on the annual average from 2009-2016, the Navy estimates that 34,160 steaming days will occur between 2017 and 2023, extending through the end of the anticipated MMPA authorization. These values were used to determine the rate parameters to calculate a series of Poisson probabilities (a Poisson distribution is often used to describe random occurrences when the probability of an occurrence is small, e.g., count

data such as cetacean sighting data, or in this case strike data, are often described as a Poisson or over-dispersed Poisson distribution). In modeling strikes as a Poisson process, we assume this strike rate for the future and we use the Poisson distribution to estimate the number of strikes over a defined time period in the future:

$$P\left\langle n \middle| \mu \right\rangle = \frac{e^{-\mu} \bullet \mu^{n}}{n!}$$

P($n|\mu$) is the probability of observing *n* events in some time interval, when the expected number of events in that time interval is *u*. As stated previously, the Navy estimates that 34,160 steaming days could occur during this period (2017-2023); given a strike rate of 0.00008 strikes per steaming day the expected number of strikes over the period 2017-2023 equals 2.63 strikes. To estimate zero occurrences (in this case, no whales being struck), the formula P(0)=e-$^{\mu}$would apply. Assuming the estimated number of strikes over the next 7 years, the equation yields a value of P(0) = 0.0721. The resulting probabilities of one through five strikes over the next 7 years covering through the end of the anticipated MMPA authorization are:

1. P(1) = (0.0721 * 2.63^1)/1 = 0.190 (or a 19 percent probability of striking one whale in the 7 year period from 2017-2023)
2. P(2) = (0.0721 069 * 2.63^ 2)/2 = 0.250 (or a 25 percent probability of striking two whales in the 7 year period from 2017-2023)
3. P(3) = (0.0721 * 2.63^ 3)/6 = 0.218 (or a 22 percent probability of striking three whales in the 7 year period from 2017-2023)
4. P(4) = (0.0721 * 2.63^ 4)/24 = 0.143 (or a 14 percent probability of striking four whales in the 7 year period from 2017-2023)
5. P(5) = (0.0721 * 2.63^ 5)/120 = 0.075 (or an 8 percent probability of striking five whales in the 7 year period from 2017-2023)

References

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