

APPENDIX R: SEA DISPOSAL OF MILITARY MUNITIONS

Under Section 314 of the Fiscal Year (FY) 2007 National Defense Authorization Act, the Department of Defense (DoD) is required to conduct a historical review of available records to determine the number, size, and probable locations of sites where the military disposed of military munitions in U.S. coastal waters. The Department will include the final Section 314 report in the FY2009 Defense Environmental Programs Annual Report to Congress. In the interim, DoD will report any new information identified during the review.

This interim report identifies the Department's progress on the historical review. Specifically, this report identifies the general locations, types, and quantities of chemical munitions or chemical agents disposed in U.S. waters.

DoD's preliminary research has identified approximately 30,000 tons of disposed chemical agent (CA) at 16 sites in U.S. waters. The term CA as used in Appendix R is limited to those substances on the Chemical Weapons Convention (CWC) schedule of chemicals. Figure R-1 provides a summary of the net chemical agent weight (NCAW) of disposed chemical warfare materials (CWM) according to the chemical agent and disposal

Figure R-1
Summary of Sea Disposal of Military Munitions - Chemical

Chemical Agent	Total Net Chemical Agent Weight by Location (Number of Sites)					
	Atlantic Coast (9)	Pacific Coast (1)	Gulf Coast (2)	Alaska Coast (1)	Hawaii Coast (3)	Total NCAW (tons)
Lewisite	8,394	1,723		843	181	11,141
Mustard	5,172	9,040	8	55	2,153	16,428
Sarin	239					239
VX	124					124
Arsenic Trichloride	505					505
Arsenic	16					16
Phosgene	28		1			29
Cyanogen Chloride	1				204	205
Cyanide	8				2	10
Tabun	1					1
Unknown Agent	519		184			703
Total	15,007	10,763	193	898	2,540	29,401

operation location. Net chemical agent weight totals were determined using assumptions regarding the container sizes and densities of the disposed materials.

Figure R-2 displays the locations of each disposal site. Figures R-3 through R-21 provide information on each CWM disposal site, including any non-CWM items. The tables do not provide a comprehensive list of all materials at a given site; they only provide those materials that references listed as being co-disposed with the CWC schedule chemicals.

Each table identifies the type of CA or other material (e.g., white phosphorus, explosives) that research indicates was disposed of at the site, the type of container or munition disposed (e.g. drum, projectile), the units (e.g., containers, pounds, tons) associated with the quantity, the number of a specific container type of CWM with a specific fill in a disposal area, the NCAW in pounds, and the total NCAW to provide an estimate in short-tons of the CA in all of the items of a given type and fill.

Figure R-2

Approximate Locations of CWC Schedule Disposals in U.S. Waters

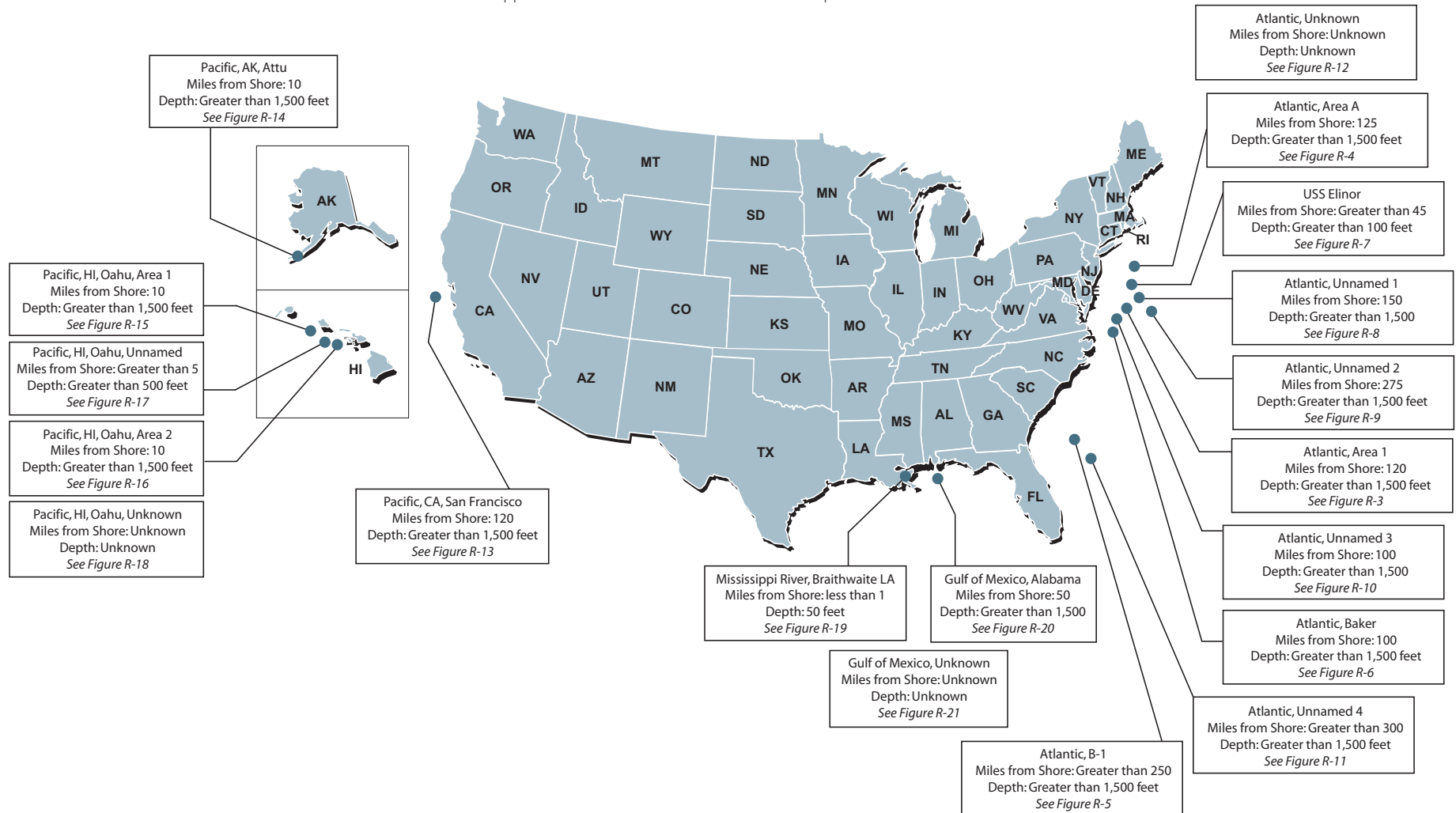


Figure R-3

U.S. Waters - Atlantic Area 1

Detail of CWC Schedule Disposals and Other Materials Co-Disposed

Item or Fill	Container	Unit	Quantity	NCAW Per Unit (lbs)	Total NCAW (tons)
CWC Schedule Disposals					
Lewisite	Ton container	Each	1	1,900	<1
Lewisite Total					<1
Mustard	155 mm projectiles	Each	341	11.7	2
Mustard	105 mm projectiles	Each	378	3.17	<1
Mustard	4.2 inch mortar shells	Each	56,144	6.5	182
Mustard Total					185
Arsenic trichloride	55 gallon drum	Each	1,154	875	505
Arsenic trichloride Total					505
Cyanide	55 gallon drum	Each	20	283	3
Cyanide Total					3
Other Materials Co-Disposed					
Low level radiological waste	Unknown	Pounds	421,757	NA	NA
White Phosphorous (WP)	M74 500 lb Cluster bomb	Each	278	NA	NA
WP	M74 110 lb Cluster bombs	Each	646	NA	NA
WP	57 mm cartridge	Each	2,376	NA	NA
WP	Igniters	Each	2,876	NA	NA
Adamsite	Smoke candles	Each	375	NA	NA
Smoke	M1 155 mm smoke canisters	Each	52	NA	NA
Smoke	M2 155 mm smoke canisters	Each	84	NA	NA

Item or Fill	Container	Unit	Quantity	NCAW Per Unit (lbs)	Total NCAW (tons)
Smoke	M3 155 mm smoke canisters	Each	156	NA	NA
Smoke	M4 155 mm smoke canisters	Each	52.00	NA	NA
Smoke (HC)	105 mm smoke canisters	Each	55,201	NA	NA
Smoke	76 mm smoke canister	Each	84	NA	NA
Smoke	76 mm smoke canister (unfixed)	Each	22,110	NA	NA
Smoke	60 mm smoke canister (unfixed)	Each	378	NA	NA
Smoke	M84 smoke shells (unfixed)	Each	96	NA	NA
Smoke (HC)	2.36 inch T27E1 rocket heads	Each	1,273	NA	NA
Smoke (HC)	T6 rifle grenade heads	Each	155	NA	NA
Incendiary	2.36 inch T31 rocket heads	Each	8	NA	NA

Figure R-4
 U.S. Waters - Atlantic Area A
 Detail of CWC Schedule Disposals and Other Materials Co-Disposed

Item or Fill	Container	Unit	Quantity	NCAW Per Unit (lbs)	Total NCAW (tons)
CWC Schedule Disposals					
Mustard	Ton container	Each	4,577	1,800	4,119
Mustard Total					4,119
Sarin (GB)	M55 Rockets in concrete vaults	Each	29,280	10.7	157
Sarin (GB)	Ton container	Each	19	1,600	15
Sarin Total					172
VX	M55 Rockets in concrete vaults	Each	21,900	10	110
VX	Ton container	Each	19	1,430	14
VX Totals					124
Arsenic	50 & 30 gallon drums or canisters	Each	60	543	16
Arsenic Total					16
Cyanide	50 & 30 gallon drums or canisters	Each	60	176	5
Cyanide Total					5
Unknown Agent	Ton container	Each	28	1,900	27
Unknown Agent Total					27
Other Materials Co-Disposed					
Methyl bromide	Cylinder	Each	4	NA	NA
Explosives	Unknown	Tons	2,444	NA	NA
Water-filled	Ton container	Each	3,500	NA	NA

Figure R-5

U.S. Waters - Atlantic Area B-1
Detail of CWC Schedule Disposals and Other Materials Co-Disposed

Item or Fill	Container	Unit	Quantity	NCAW Per Unit (lbs)	Total NCAW (tons)
CWC Schedule Disposals					
Lewisite	Bomb	Tons	462	1,100	254
Lewisite	M70 115 lb bomb	Tons	2,854	1,100	1,570
Lewisite	M70 115 lb bomb	Each	928	83	38
Lewisite	Ton container	Car	6	20,000	60
Lewisite Total					1,922
Mustard	155 mm projectile	Each	968	11.7	6
Mustard	105 mm projectile	Each	1,048	3.17	2
Mustard	75 mm projectile	Each	86	1.35	<1
Mustard Total					8
Other Materials Co-Disposed					
High Explosive (HE)	1,000 kg bomb	Each	25	NA	NA
HE	1,000 lb bomb	Each	7	NA	NA
HE	500 kg bomb	Each	18	NA	NA
HE	250 kg bomb	Each	24	NA	NA
HE	100 kg bomb	Each	6	NA	NA
HE	100 lb bomb	Each	1	NA	NA
HE	81 mm detonator	Each	176	NA	NA
HE	81 mm detonator	Each	176	NA	NA
WP	81 mm projectile	Each	176	NA	NA

Figure R-6

U.S. Waters - Atlantic Area Baker
Detail of CWC Schedule Disposals and Other Materials Co-Disposed

Item or Fill	Container	Unit	Quantity	NCAW Per Unit (lbs)	Total NCAW (tons)
CWC Schedule Disposal					
Mustard	4.2 inch mortar shells	Each	12,160	6.5	40
Mustard Total					40

Figure R-7
 U.S. Waters - Atlantic U.S.S. Elinor
 Detail of CWC Schedule Disposals and Other Materials Co-Disposed

Item or Fill	Container	Unit	Quantity	NCAW Per Unit (lbs)	Total NCAW (tons)
CWC Schedule Disposals					
Unknown Agent	Miscellaneous	Each	2,460	400	492
Unknown Agent Total					492

Figure R-8
 U.S. Waters - Atlantic Unnamed 1
 Detail of CWC Schedule Disposals and Other Materials Co-Disposed

Item or Fill	Container	Unit	Quantity	NCAW Per Unit (lbs)	Total NCAW (tons)
CWC Schedule Disposals					
Lewisite	Ton container	Each	2	1,900	2
Lewisite	150 lb cylinder	Each	1	75	<1
Lewisite Total					2
Mustard	Ton container	Each	74	1,800	67
Mustard	75 mm projectile	Each	1,700	1.35	1
Mustard Total					68
Cyanogen Chloride	M78 500 lb bomb	Each	10	176	<1
Cyanogen Chloride Total					<1
Other Materials Co-Disposed					
Radiological Waste	55 gallon drum	Each	800	NA	NA
Radiological Waste	Unknown	Each	NA	NA	NA
CNB	Ton container	Each	456	NA	NA

Figure R-9
 U.S. Waters - Atlantic Unnamed 2
 Detail of CWC Schedule Disposals and Other Materials Co-Disposed

Item or Fill	Container	Unit	Quantity	NCAW Per Unit (lbs)	Total NCAW (tons)
CWC Schedule Disposals					
Lewisite	Ton container	Each	48	1,900	46
Lewisite Total					46

Figure R-10

U.S. Waters - Atlantic Unnamed 3
 Detail of CWC Schedule Disposals and Other Materials Co-Disposed

Item or Fill	Container	Unit	Quantity	NCAW Per Unit (lbs)	Total NCAW (tons)
CWC Schedule Disposals					
Mustard	4.2 inch mortar shells	Each	19,728	6.5	64
Mustard Total					64

Figure R-11

U.S. Waters - Atlantic Unnamed 4
 Detail of CWC Schedule Disposals and Other Materials Co-Disposed

Item or Fill	Container	Unit	Quantity	NCAW Per Unit (lbs)	Total NCAW (tons)
CWC Schedule Disposals					
Lewisite	Container	Each	3,711	1,900	3,525
Lewisite Total					3,525
Mustard	75 mm & 155 mm projectiles	Car	62	20,000	620
Mustard Total					620
Sarin (GB)	M121 155 mm projectiles	Each	3	6	<1
Sarin (GB)	M55 rockets	Each	12,500	10.7	67
Sarin Total					67
VX	M23 Land Mine	Each	1	10.5	<1
VX Total					<1
Other Materials Co-Disposed					
Incendiary	M14 500 lb bomb	Each	60	NA	NA
Unknown	Experimental Munitions		NA	NA	NA

Figure R-12

U.S. Waters - Atlantic Area Unknown
Detail of CWC Schedule Disposals and Other Materials Co-Disposed

Item or Fill	Container	Unit	Quantity	NCAW Per Unit (lbs)	Total NCAW (tons)
CWC Schedule Disposals					
Lewisite	55 gallon barrel	Each	364	780	142
Lewisite	M70 115 lb bomb	Each	30,432	83	1,263
Lewisite	Ton container	Each	1,572	1,900	1,493
Lewisite Total					2,898
Mustard	1,000 lb bomb	Each	6	420	1
Mustard	500 lb bomb	Each	71	220	8
Mustard	1,000 & 500 German	Container	3	NA	NA
Mustard	100 lb bomb	Each	52	70	2
Mustard	Unspecified	NA	NA	NA	NA
Mustard (HN)	Ton container	Each	63	1,800	57
Mustard Total					68
Phosgene	1,000 lb bomb	Each	6	475	1
Phosgene	500 lb bomb	Each	70	205	7
Phosgene	M79 1000 lb & M78 500 lb	NA	NA	NA	NA
Phosgene	Cylinder	Each	20	2,000	20
Phosgene Total					28
Tabun (GA)	1,000 lb bomb	Each	6	420	1
Tabun (GA)	German 1000 lb bomb	Shipping container	40	NA	NA
Tabun Total					1
Unknown Agent	100 lb bomb, 105 mm projectiles & chemical munitions	NA	NA	NA	NA
Unknown Agent Total					NA
Other Materials Co-Disposed					
Stannic Chloride (KJ)	Hand Grenades	NA	NA	NA	NA
Decontaminating agent	Unknown	Pounds	70,180	NA	NA
Water-Filled	Ton container	Container	2	NA	NA

Figure R-13

U.S. Waters - Pacific West Coast

Detail of CWC Schedule Disposals and Other Materials Co-Disposed

Item or Fill	Container	Unit	Quantity	NCAW Per Unit (lbs)	Total NCAW (tons)
CWC Schedule Disposals					
Lewisite	Ton container	Each	1,814	1,900	1,723
Lewisite Total					1,742
Mustard	M70 115 lb bomb	Each	301,000	60	9,030
Mustard	M47 115 lb bomb	Each	6	74.75	<1
Mustard	Ton container	Each	11	1,800	10
Mustard Total					9,040
Other Materials Co-Disposed					
Other	55 gallon drum	Each	4	NA	NA
Other	Contaminated soil w/fragments	NA	NA	NA	NA

Figure R-14

U.S. Waters - Pacific Alaska

Detail of CWC Schedule Disposals and Other Materials Co-Disposed

Item or Fill	Container	Unit	Quantity	NCAW Per Unit (lbs)	Total NCAW (tons)
CWC Schedule Disposals					
Lewisite	Ton container	Each	887	1,900	843
Lewisite Total					843
Mustard	Ton container	Each	61	1,800	55
Mustard Total					55

Figure R-15

U.S. Waters - Pacific, Hawaii, Oahu Area 1
 Detail of CWC Schedule Disposals and Other Materials Co-Disposed

Item or Fill	Container	Unit	Quantity	NCAW Per Unit (lbs)	Total NCAW (tons)
CWC Schedule Disposals					
Lewisite	Ton container	Each	190	1,900	181
Lewisite Total					181
Mustard	M70 115 lb bomb	Each	14,956	60	449
Mustard	M110 155 mm projectile	Each	1,949	11.7	11
Mustard	MK2 155 mm projectile	Each	1,747	11.4	10
Mustard	MK2A1 155 mm projectile	Each	595	11.4	3
Mustard	M60 105 mm projectile	Each	10,773	3.17	17
Mustard	M64 75 mm projectile	Each	2,390	1.04	1
Mustard	4.2 inch mortar shells	Each	30,917	6.5	100
Mustard	Ton container	Each	1,038	1,800	934
Mustard Total					1,525
Cyanogen Chloride	M79 1,000 lb bomb	Each	1,100	351	193
Cyanogen Chloride	M78 500 lb bomb	Each	125	176	11
Cyanogen Chloride Total					204
Cyanide (AC)	M79 1,000 lb bomb	Each	20	200	2
Cyanide Total					2

Figure R-16

U.S. Waters - Pacific, Hawaii, Oahu Area 2
 Detail of CWC Schedule Disposals and Other Materials Co-Disposed

Item or Fill	Container	Unit	Quantity	NCAW Per Unit (lbs)	Total NCAW (tons)
CWC Schedule Disposals					
Mustard	M104 155 mm projectile	Each	888	11.7	5
Mustard	M60 105 mm projectile	Each	14,119	3.17	22
Mustard	MKII 75 mm shells	Each	1,213	1.35	1
Mustard	M64 75 mm projectile	Each	2,151	1.04	1
Mustard Total					29

Figure R-17

U.S. Waters - Pacific, Hawaii, Oahu Unnamed
 Detail of CWC Schedule Disposals and Other Materials Co-Disposed

Item or Fill	Container	Unit	Quantity	NCAW Per Unit (lbs)	Total NCAW (tons)
CWC Schedule Disposals					
Mustard	M47A2 100 lb bomb	Each	16,000	74.75	598
Mustard Total					598

Figure R-18

U.S. Waters - Pacific, Hawaii, Oahu Unknown
 Detail of CWC Schedule Disposals and Other Materials Co-Disposed

Item or Fill	Container	Unit	Quantity	NCAW Per Unit (lbs)	Total NCAW (tons)
CWC Schedule Disposals					
Mustard	MK42 100 lb bomb	Each	6	40.5	<1
Mustard	M47A2 100 lb bomb	Each	36	74.75	1
Mustard Total					1

Figure R-19

U.S. Waters - Gulf of Mexico, Louisiana, Braithwaite
 Detail of CWC Schedule Disposals and Other Materials Co-Disposed

Item or Fill	Container	Unit	Quantity	NCAW Per Unit (lbs)	Total NCAW (tons)
CWC Schedule Disposals					
Mustard	100 lb bomb	Each	20	74.75	<1
Mustard Total					<1
Unknown Agent	Bomb	Each	2	NA	NA
Unknown Agent Total					

Figure R-20

U.S. Waters - Gulf of Mexico, Alabama, Mobile
 Detail of CWC Schedule Disposals and Other Materials Co-Disposed

Item or Fill	Container	Unit	Quantity	NCAW Per Unit (lbs)	Total NCAW (tons)
CWC Schedule Disposals					
Mustard	1000 lb bomb	Each	30	540	8
Mustard	500 lb bomb	Each	3	235	<1
Mustard Total					4

Figure R-21

U.S. Waters - Gulf of Mexico, Unknown
 Detail of CWC Schedule Disposals and Other Materials Co-Disposed

Item or Fill	Container	Unit	Quantity	NCAW Per Unit (lbs)	Total NCAW (tons)
CWC Schedule Disposals					
Mustard	T3 126 lb bomb	Each	2	60	<1
Mustard Total					<1
Phosgene	250 kg bomb	Each	1	240	<1
Phosgene	500 kg bomb	Each	1	475	<1
Phosgene	250 kg bomb	Each	2	386	<1
Phosgene Total					<1
Unknown Agent	Munitions	Short tons	921.73	400	184
Unknown Agent Total					184
Other Materials Co-Disposed					
CNS	4.2 inch mortar shells	Barge		NA	NA