



Sea Disposal of Military Munitions

**Environment, Energy, and Sustainability Symposium
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(Installations & Environment)**

Report Documentation Page

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Highlights

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- **History of DoD sea disposal operations**
- **Legislation**
- **Results of research**



History of Sea Disposals

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- **Disposed of excess or deteriorating munitions**
- **Locations at depth, beyond reach, were considered safe:**
 - Ranged from 5 to over 250 miles (10 to over 400 km) from shore
 - Depths ranged from 50 to 16,000 feet (15 to 4,900 m)
- **Types of Munitions:**
 - Munitions
 - Bulk materials – chemical agents, explosives
 - Components
 - Captured enemy CWM (WWII)



Public Law 109-364, Section 314 (NDAA)

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- **Archival Research of disposal sites in US coastal waters**
 - Number, size and probable locations of sites in US waters
 - Identify types of munitions at individual sites to extent possible
 - Report findings in Defense Environmental Programs Annual Report to Congress

- **Identification of navigational and safety hazards**
 - Provide information to allow National Oceanic and Atmospheric Administration (NOAA) to update nautical charts
 - Continue Public education efforts



Public Law 109-364, Section 314 (NDAA) (cont.)

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- **Research effects of sea disposals at representative sites**
 - Sampling and analysis of ocean water and seabed at or adjacent to military munitions
 - Investigate long-term effects of sea water on munitions
 - Investigate potential impacts of contamination on the ocean environment



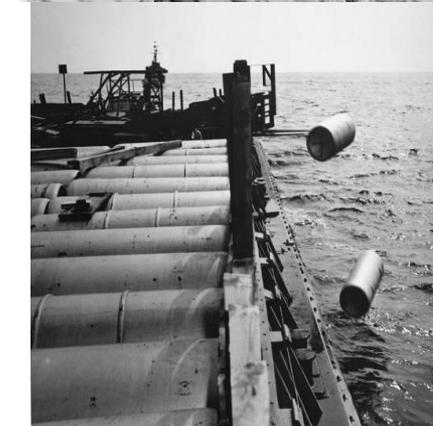
Results of Research



Archival Research

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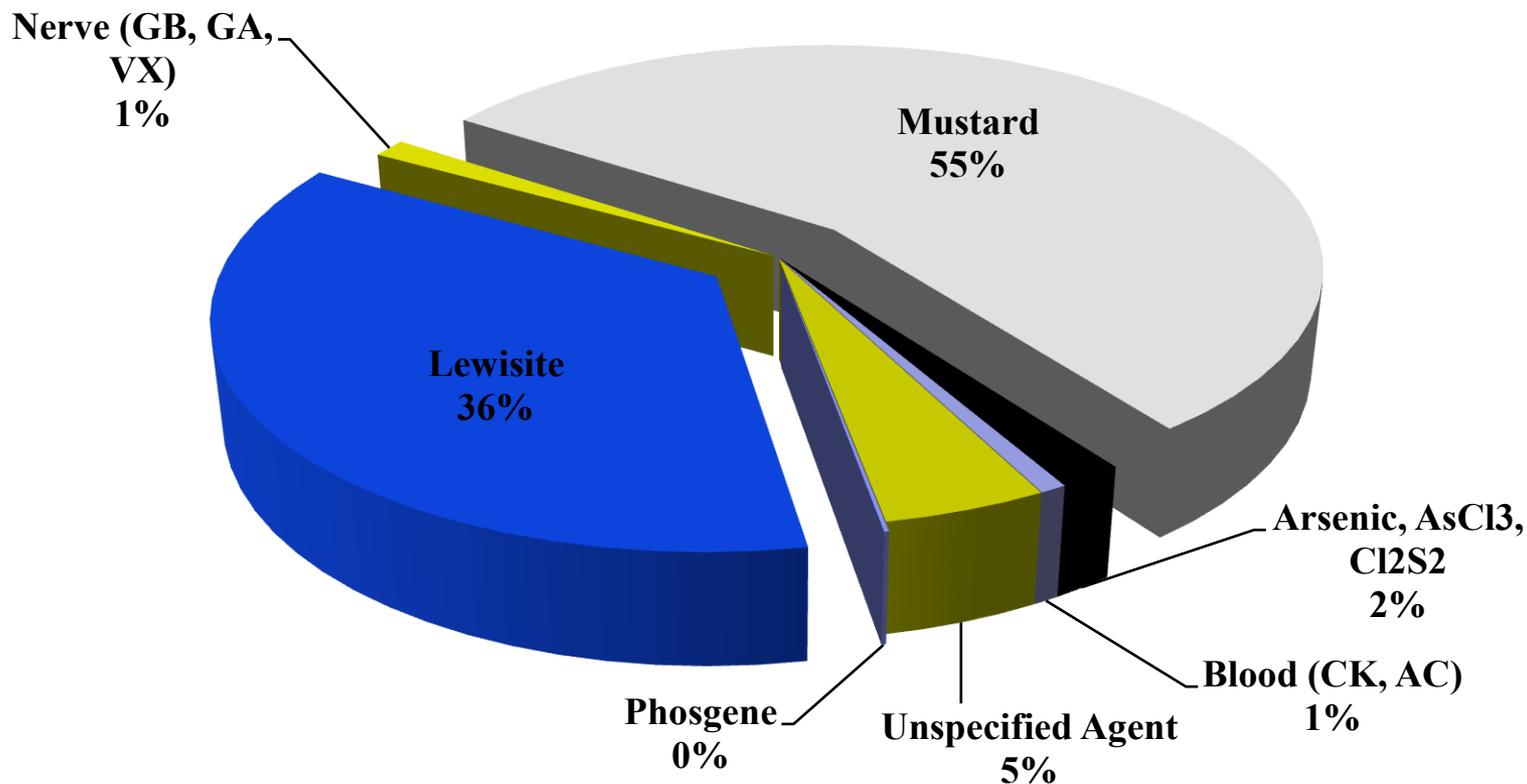
- **Initial effort focused on CWM**
- **DoD Annual Report to Congress (ARC) on Environmental Programs**
 - Initial effort's result reported in FY06 ARC
 - Interim updates reported annually in ARC
 - Final report due for FY09 ARC in 2010
- **Beginning to research conventional munitions disposals**
- **Over 1,000,000 documents reviewed**





Types of CWM Disposals

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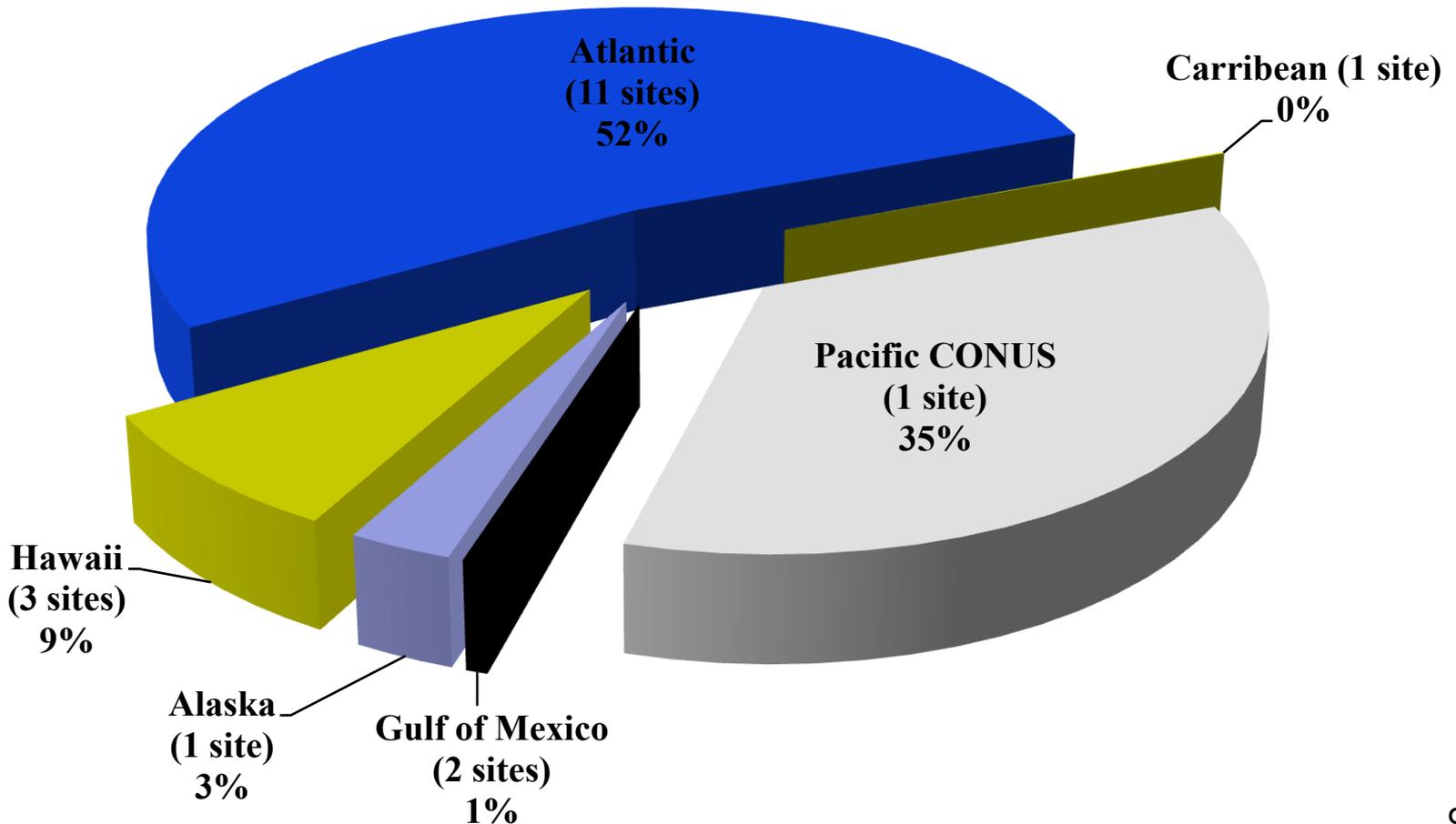


Approximately 27,000 metric tons (30,000 tons) of chemical agent was disposed in US waters



Location of Sea Disposals

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Graph based on net agent weight, FY08 draft data



Navigation and Safety Hazards

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- DoD and NOAA are working together
- Research and field work is used to update nautical charts
- DoD developed explosives safety materials for commercial and recreational activities (See www.denix.osd.mil/uxosafety)
- NOAA distributed explosives safety materials to permitted vessels

**WARNING!
DON'T FORGET**

- Munitions are dangerous, and may not be easily recognizable!
- Limit handling to reduce risk of an explosion!
- Never bring a munition into port!

REMEMBER THE 3RS

RECOGNIZE! Recognize when you may have found a munition.
RETREAT! If you find a munition, limit handling and carefully put it back in the sea.
REPORT!

- Record the GPS coordinates where the munition was returned to the sea.
- Immediately notify the USCG of the coordinates and describe the munition.

EMERGENCY CONTACTS:

- At sea: Use Channel 16 (156.800MHz)
(or call 800-424-8802)
- On shore: Call 911 (Local law enforcement)

Maritime Industry
3RS EXPLOSIVES SAFETY GUIDE



Representative Site Research

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- **Examination of corrosion of recovered sea disposed CWM**
- **Modeling of munitions migration**
- **Determining potential fate of chemicals in the marine environment**



Conceptual Site Model

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Source - Characteristics

- Quantity of munitions
- Condition of munitions
- Chemical and physical composition of media

Transport/Degradation Pathway

- Release rate
- Dissolution
- Adsorption/desorption
- Photolysis
- Microbial transformation

Source - Distribution

- % corrosion/concretion with time
- % buried with time
- net vertical/horizontal movement

Exposure Pathway

- surface water contact, ingestion
- sediment contact, ingestion
- Receptors: benthic infauna,
 benthic epifauna,
 pelagic fauna,
 waterfowl



Corrosion - Findings

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- **Six 75mm mustard rounds**
- **Recovered from Atlantic during clamming**
- **Measure corrosion following treatment and decontamination**
- **Disposed sometime between 1919 and 1970**
- **General indication of corrosion**

Number	GMID	Average Shell Wall Thickness		Maximum Depth of Localized Corrosion Measured
		Measured in the 303 Mil (0.303 Inch) Original Thickness Region	Minimum Shell Wall Thickness Measured	
1	DAF-06-004	298 mils (0.298 inch)	295 mils (0.295 inch)	20 mils (0.020 inch)
	DAF-06-008	296 mils (0.296 inch)	290 mils (0.290 inch)	
	DAF-06-009	269 mils (0.269 inch)	237 mils (0.237 inch)	
2	DAF-06-005	297 mils (0.297 inch)	291 mils (0.291 inch)	20 mils (0.020 inch)
	DAF-06-006	291 mils (0.291 inch)	275 mils (0.275 inch)	
3	DAF-06-007	291 mils (0.291 inch)	283 mils (0.283 inch)	20 mils (0.020 inch)



Corrosion - Findings (cont.)

As recovered



Pitting from Molten Copper

Attack Due to Dissimilar Metal



Circumferential Attack

End Grain Attack

I-185-041; Fig 9.ppt
11/15/06

- Immersion time was between 36 and 87 years
- Calculated time to perforation 130 to 310 years, worst case





Fate & Transport of Munitions Constituents

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- **Data shows that energetic compounds tend to be rapidly eliminated**
- **Chemical agents generally degrade over time into less toxic materials**
- **Rate of degradation varies from minutes to years based on the agent involved and environmental conditions**
- **Mustard can form polymers and remain on seafloor for extended period**
- **Metals from casings or arsenical fills will also persist**



Conclusions

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- **Conclude archive research in Fiscal Year 2010**
- **Continue to update NOAA nautical charts**
- **Laboratory studies on release rates, corrosion, fate and transport ongoing**
- **Next step – selection and evaluation of representative sites**



Questions?

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For more information, please contact:

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