Sea Disposal of Military Munitions

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

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Highlights

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

History of Sea Disposals

- **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)

- **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.)

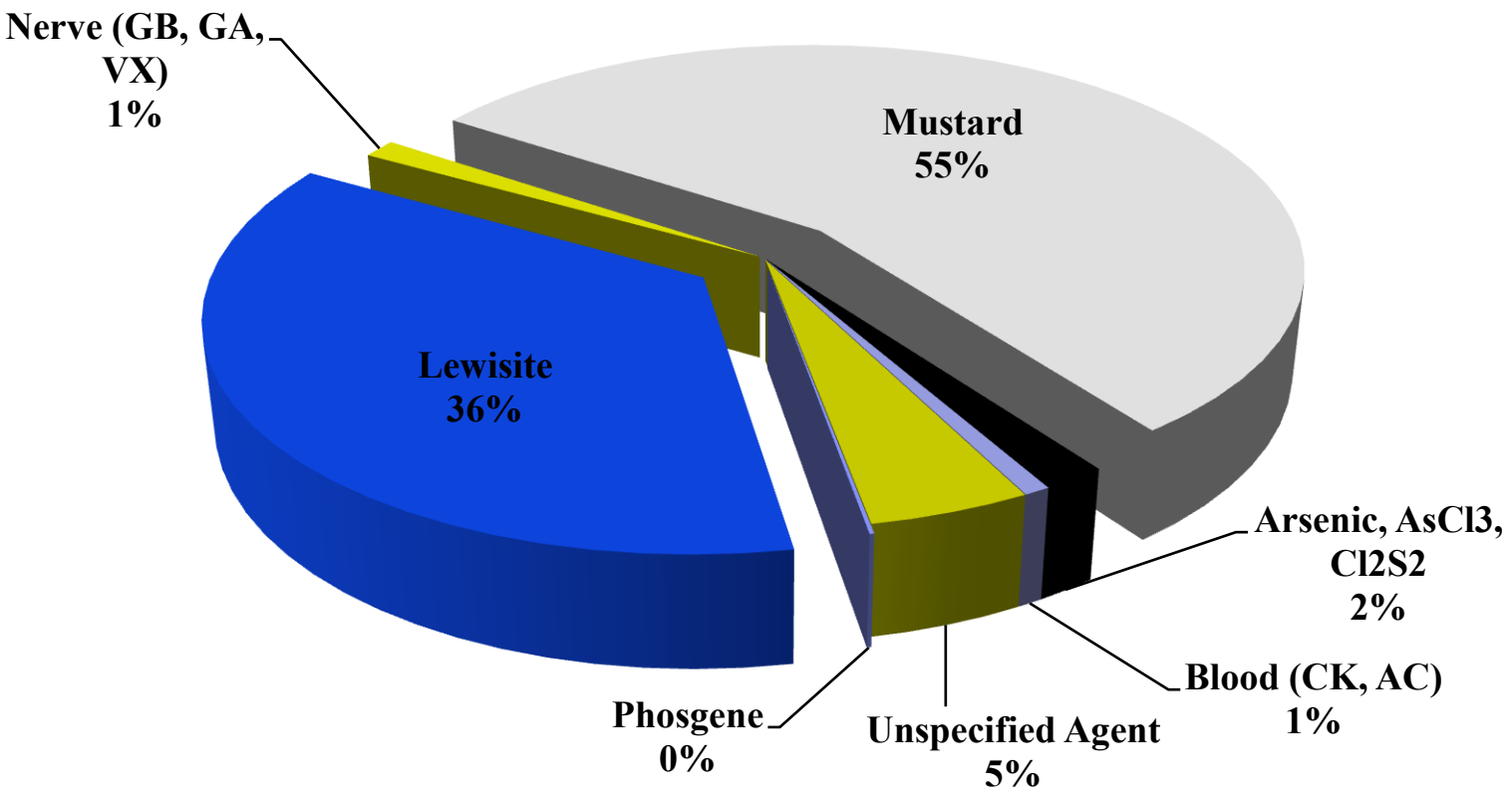
- **Research effects of sea disposals at representative sites**
  - Sampling and analysis of ocean water and seabed at or adjacent to military munitions
  - Investigate long-term effects of sea water on munitions
  - Investigate potential impacts of contamination on the ocean environment

Results of Research

Archival Research

- **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**

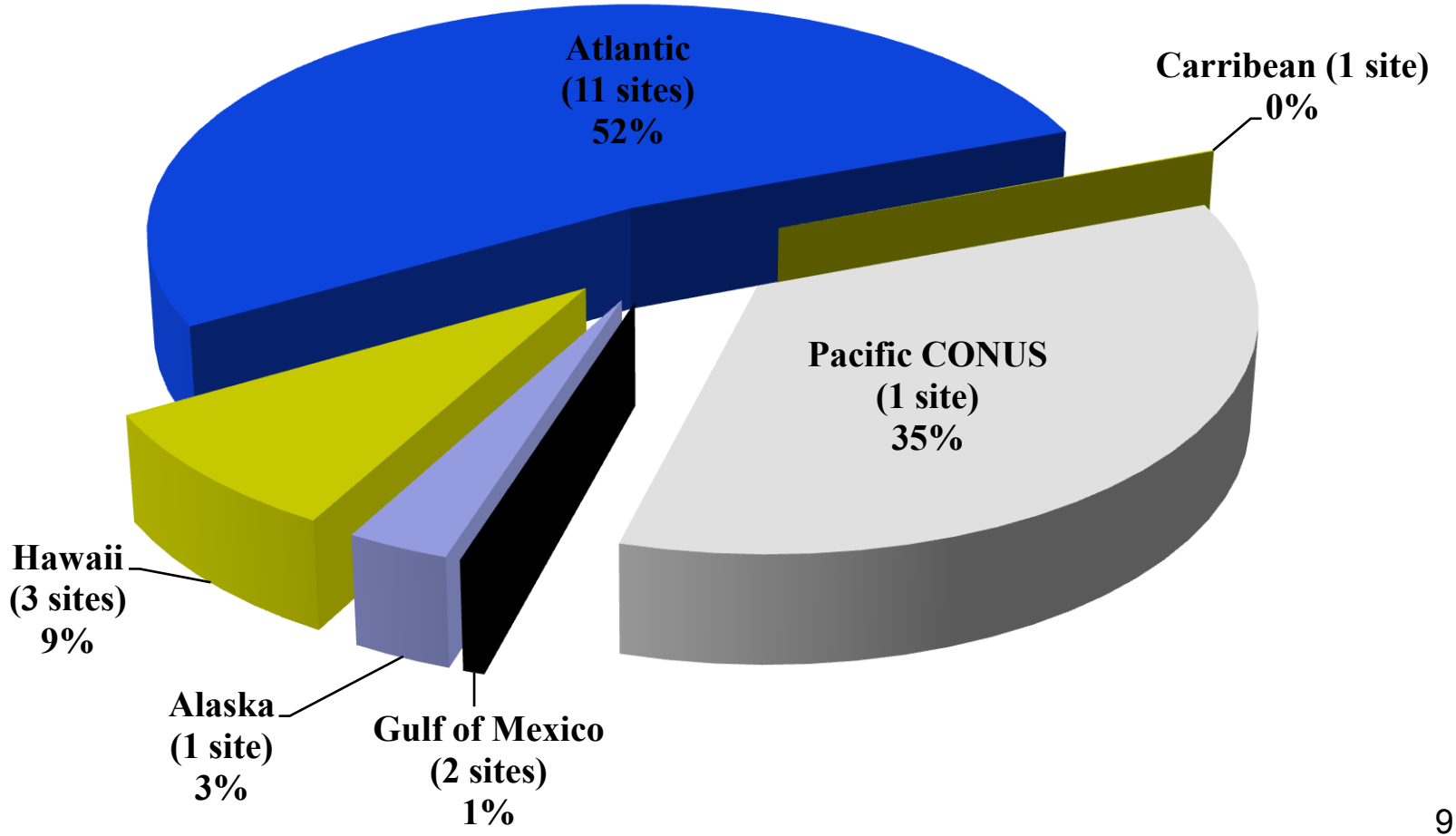
Types of CWM Disposals



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

Data from the Draft FY08 Defense Environmental Programs Annual Report to Congress

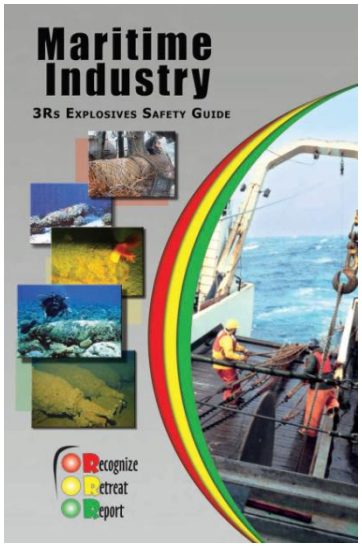
Location of Sea Disposals



Graph based on net agent weight, FY08 draft data

Navigation and Safety Hazards

- **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**



Representative Site Research

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

Conceptual Site Model

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

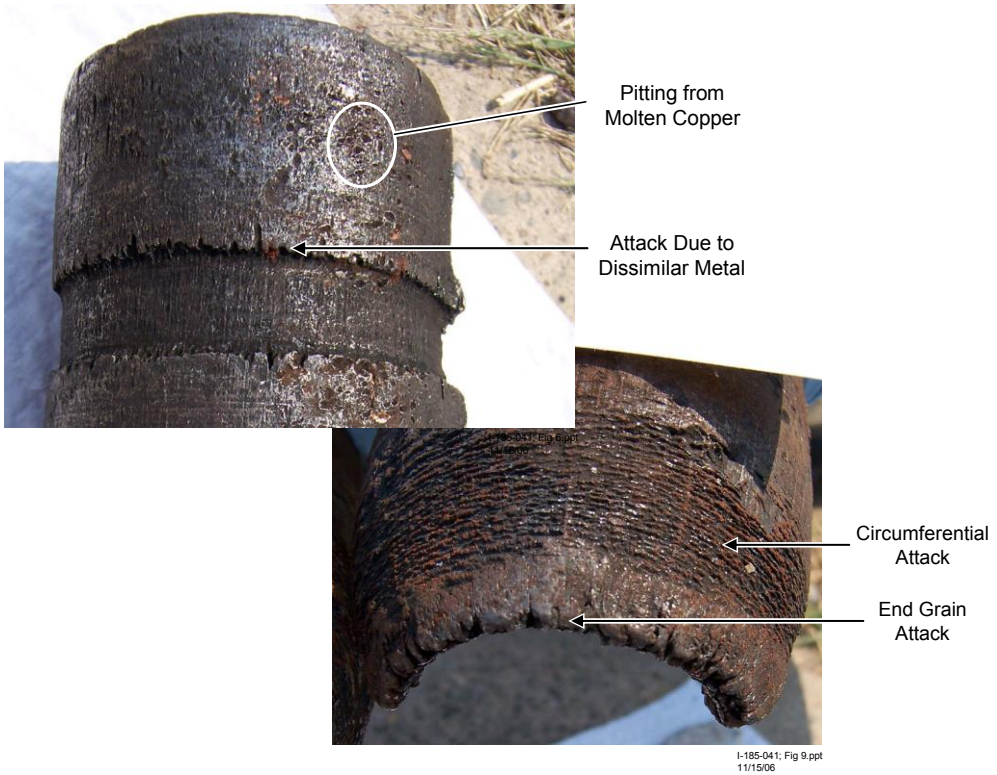
- **Six 75mm mustard rounds**
- **Recovered from Atlantic during clamming**
- **Measure corrosion following treatment and decontamination**
- **Disposed sometime between 1919 and 1970**
- **General indication of corrosion**

Number	GMID	Average Shell Wall Thickness Measured in the 303 Mil (0.303 Inch) Original Thickness Region	Minimum Shell Wall Thickness Measured	Maximum Depth of Localized Corrosion 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

After treatment



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

Fate & Transport of Munitions Constituents

- **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 for polymers and remain on seafloor for extended period**
- **Metals from casings or arsenical fills will also persist**

Conclusions

- **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?

For more information, please contact:

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