USE OF DIGITAL GEOPHYSICAL MAPPING AND OTHER FIELD SURVEY DATA IN THE APPLICATION OF THE RISK MANAGEMENT METHODOLOGY (RMM) TO UNDERWATER RANGES

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PRESENTATION OVERVIEW

Focus on 4 Questions:

1. What risk assessment tools must be applied and what risk assessment evaluations must be performed for underwater ranges?

2. What information produced by digital geophysical mapping, other types of surveys, or a follow-up intrusive investigation is needed to support these risk assessment efforts?

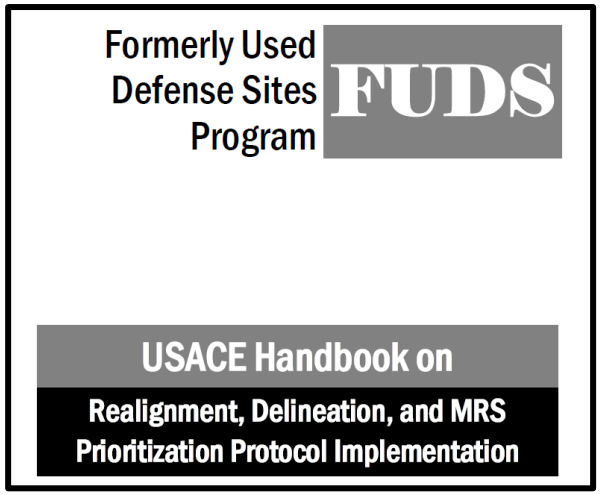
3. What field survey data is considered when establishing “Assessment Area” boundaries within an MRS for risk assessments and alternatives evaluation?

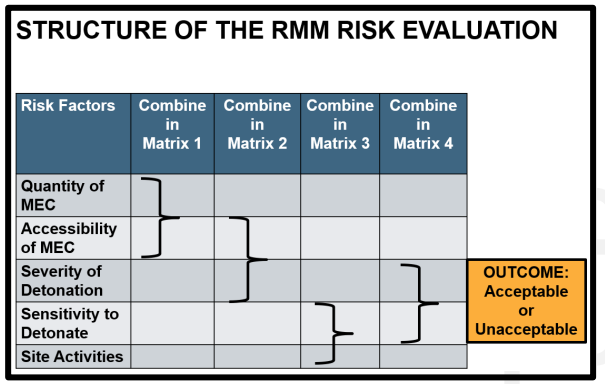
4. How can a better understanding of risk assessment as a field data end user impact geophysical data collection or data management?

① Two Main "Risk Assessment" Tools Applied to MRSs

- **Munitions Response Site Prioritization Protocol (MRSPP)**
  - Basis for assigning relative priorities for funding munitions response actions
  - Initial scoring or re-scoring of the Explosive Hazard Evaluation (EHE) Module after a removal action is completed or site conditions or area use changes significantly

- **Risk Management Methodology (RMM)**
  - Standard procedure applied to help differentiate and justify "Acceptable" vs. "Unacceptable" conditions relative to munitions-related hazards to the public





② MRSPP Scoring Factor Assignments Linked to Field Survey Data

(Note: MRSPP incorporates several other Scoring Factors as well)

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Most Hazardous

Munitions Type
(MRSPP Table 1)

- Sensitive
- High Explosive (Used or Damaged)
- Pyrotechnic (Used or Damaged)
- High Explosive (Unused)
- Propellant
- Bulk secondary high explosives, pyrotechnics, or propellant
- Pyrotechnic (Not Used or Damaged)
- Practice
- Riot Control
- Small Arms
- Evidence of No Explosives

Source of Hazard
(MRSPP Table 2)

- Former Range
- Former Munitions Treatment Unit (i.e., OB/OD)
- Former practice munitions range
- Former maneuver area
- Former burial pit or other disposal area
- Former industrial operating facility
- Former firing point
- Former missile or air defense artillery emplacement
- Former storage or transfer point
- Former small arms range
- Evidence of no munitions

Location of Munitions
(MRSPP Table 3)

- Confirmed Surface
- Confirmed subsurface, active
- Confirmed subsurface, stable
- Suspected (physical evidence)
- Suspected (historical evidence)
- Subsurface, physical constraint
- Small arms (regardless of location)
- Evidence of no munitions

Least Hazardous

② RMM Risk Factor Assignments Linked to Field Survey Data

(Note: RMM incorporates several other Risk Factors as well)

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Amount of MEC
(RMM Matrix 1)

- MEC is visible on surface / detected in the subsurface
- Area is a CMUA (HUA) where MEC is known or suspected to be present in surface and subsurface
- MEC presence based on physical evidence although the area is not a CMUA (HUA)
- MEC concentration below a project-specific threshold
- MEC presence based on isolated historical discoveries
- A response action has been conducted to physically remove surface but not subsurface MEC
- MEC concentration is below a project-specific threshold
- MEC presence is suspected based only on historical evidence of munitions use
- A response action has been conducted to physically remove surface and subsurface MEC but some residual hazard remains
- MEC concentration is below a project-specific threshold
- Investigation revealed no evidence of MEC
- A response action has been conducted that will achieve unlimited use/unrestricted exposure (UU/UE)

Severity Associated with Specific Munitions Items
(RMM Matrix 2)

- **Catastrophic/Critical:** May result in one or more deaths, permanent total or partial disability, or hospitalization
- **Modest:** May result in one (or more) injury resulting in emergency medical treatment, without hospitalization
- **Minor:** May result in one or more injuries requiring first aid or medical treatment
- **Improbable:** No injury is anticipated

Sensitivity: Susceptibility to Detonation
(RMM Matrix 3)

- **High** (classified as sensitive)
- **Moderate** (High explosives or pyrotechnics)
- **Low (**Propellant or bulk secondary explosives)
- **Not Sensitive**

Most Hazardous

Least Hazardous

② Applying the RMM to a Water Range

- **RMM initially developed to evaluate the explosive hazards on upland sites**
- **Water range environments are dynamic and are generally more varied than terrestrial sites**
- **Assumptions / Interpretations for applying the RMM to a water range:**

1. "Surface" and "Subsurface" are defined relative to the seafloor beneath the water column
2. A single encounter with a munitions item could be hazardous (don't need repeated interactions)
3. "Accessibility" should reflect:
   - Ease of getting into the water area
   - Getting to the seafloor where the explosive items are located
   - Effects of the dynamic underwater environment that would be transporting and exposing/burying items
4. "Sensitivity to Detonation" of items that have been in a seawater environment for many years is difficult to predict
   - Exposure and degradation may either make the items more likely to detonate upon contact or render them unable to detonate
5. Water above/surrounding a detonating item would affect the consequences of a detonation to a nearby individual
   - The dispersion of fragmentation will be tamped by the water
   - The propagation distance of the pressure wave from the detonation will be greater leading to greater potential for biological damage
6. Matrix-to-Matrix Risk Factor Combination relationships to "Acceptable" or "Unacceptable" outcomes is no different than for terrestrial applications

② DGM-Related Information Needed to Assign Scoring / Risk Factors

- **Location of the Individual Item**
  - Horizontal position (to acceptable accuracy)
  - Vertical water depth and depth below sediment surface
  - Nature / Composition of the seafloor
  - Sensitive ecological characteristics / Physical barriers or challenges
- **Relationship of the Item to Nearby Finds**
  - Observations included in a Weight-of-Evidence evaluation of historical use
  - Meaning of calculated/modeled MEC and MD densities
  - CMUA vs. NCMUA / HUA vs. LUA characteristics
- **Representativeness of the Data**
  - Stable or active marine environment (e.g., currents, tides, storms) and age of the data relative to subsequent significant storms
  - How much “coverage” to take credit for (acres effectively surveyed)
- **MEC or Not MEC (determined after intrusive investigation)**
  - Type (Make/Mod)
  - Condition

③ Establishing "Assessment Areas" for Public Hazard Assessment

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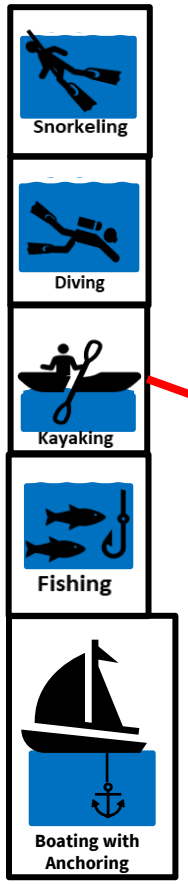
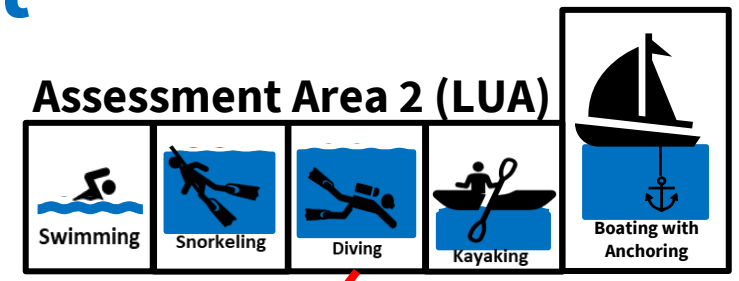
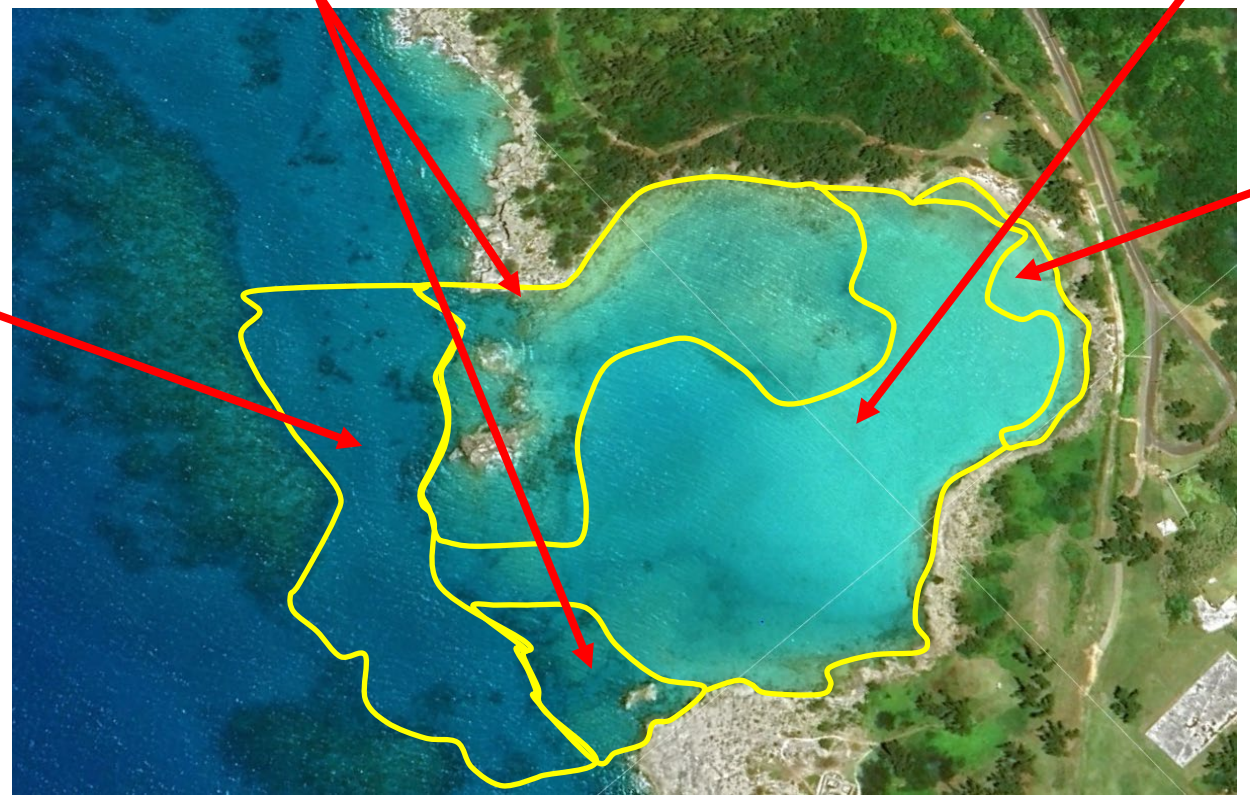
Assessment Area 4 (HUA)



Assessment Area 3 (HUA)

Assessment Area 2 (LUA)





Assessment Area 1 (LUA)

Assessment Area boundaries established in consideration of several factors:

- **MEC and MD presence/absence**
- **Anticipated public activities/interactions with the sea floor and any items present**
- **Physical features of the area**

③ DGM-Related Information Needed to Establish "Assessment Area" Boundaries

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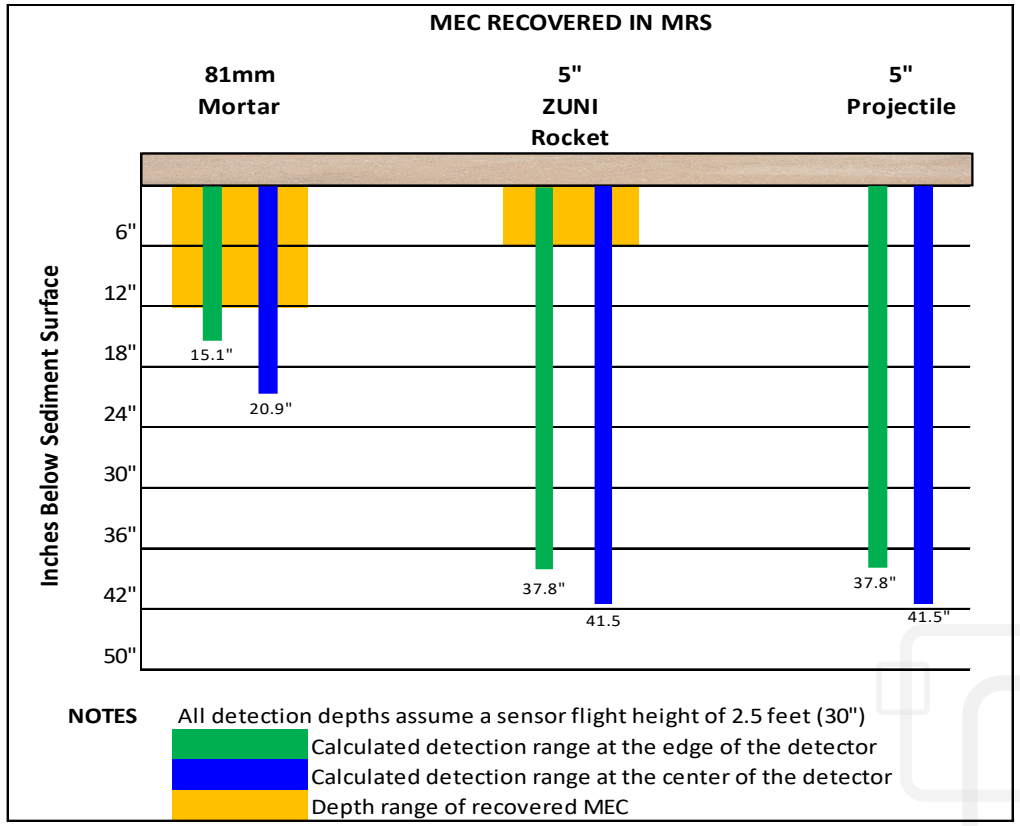
DGM / Intrusive Investigation-Related Factors

- MEC Presence / Absence
- MEC Type Observed
- MEC Density
- MD Presence / Absence
- MD Density
- DGM Response Strength and Spatial Density
- Method of Surveying (Grids vs. Transects)
- Amount of DGM Coverage Taken Credit For
- Depth of Detection of Various Items
- Obstacles to Mapping or Intrusive Investigation
- Water Depth
- Potential for sediment/item migration

Example Vertical Conceptual Site Model



④ "End User" Recommendations for Designing Field Data Collection/Management Systems

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- ✓ Establish preferred database codes prior to the field work and apply them consistently (*e.g., projectile, projo, Projectile/Bomb*)
- ✓ Resolve all MPPEH entries before turning the data over to end users
- ✓ Store findings by coordinates (not subarea names) so that the items can be later sorted and associated with Assessment Area boundaries that may be re-adjusted
- ✓ Produce a geo-referenced photo log of the survey and intrusive investigation work as part of the database
- ✓ Don't mix numbers and text in the same database cell that must be used in calculations
- ✓ If a "Depth Below Seafloor" is expressed using depth ranges (i.e., 13"-18") instead of a specific measurement (i.e., 16") ensure the depth ranges have relevance to the rest of the project (e.g., FS remedial alternative removal depths)
- ✓ Finalize characterization data base ASAP so that the knowledge of the field teams is not lost

④ Other Information Often Requested from the Field Investigation Personnel by Risk Assessors

- Public or commercial activities observed while the data was being collected
- Approximate number of the public using the area and the frequency and duration of the activities observed
- Preferred locations where certain activities were performed
- Whether the public was following or disregarding any warnings or prohibitions already established
- General condition of the MEC items found
- Whether any discovered items were judged to be “Unsafe to Move”

Summary

- Risk assessors are among the first end users to critically evaluate the full set of data collected during DGM surveys
- Risk assessors must apply a broad range of information developed from the DGM and intrusive investigations relating to what munitions were found, where, and in what condition to build our Conceptual Site Models (CSMs)
- Risk assessors need consistent and well documented data to do their job
- Since risk assessors were not on the boats, they must rely on the geophysics and field data records produced by others when interpretation of the data is necessary
- Understanding the types of risk assessments performed and the limited options sometimes available for risk factor assignments based on the field data should promote improved data collection and management to better support end uses of the data

Thank you