Lessons Learned: Implementing BMPs for Munitions Constituent Migration at Operational Ranges

Presenters: Jennifer Wilber, HQMC and Julie Dobschuetz, ARCADIS/Malcolm Pirnie

May 10, 2011
Agenda

- Selecting an appropriate range area
  - Potential MC Sources
    o Range Sources
    o Non-Range Sources
  - Range environmental conditions

- Potential BMP alternatives
  - High Explosives
  - Lead (Small Arms Ranges)
  - Mixed Use Ranges
Considerations of Potential Contributions to MC Detections

• Potential key factors for consideration:
  – Concentration of MC loading (where activity is heavy)
  – Availability of munitions loading to streams network (general proximity, but other factors contribute)

• Need to recognize potential for non-range sources for lead within watershed:
  – vehicle operation and traffic,
  – naturally present lead, and
  – lead contribution from non-small arms munitions (although typically small component)
Range Environmental Conditions

• Potential key factors for consideration:
  - Potential or actual MC concentrations
  - Streams network
  - Soil types
  - Topography (drainage, flow patterns)
  - Climate data (i.e. rainfall amounts)
  - Erosion potential
  - Threatened and endangered species habitat
  - Jurisdictional wetlands
BMP Selection

- Identification and evaluation to prevent and manage off-range MC
  - High Explosives
  - Lead
- Will vary based on site conditions
- Ability to implement influenced by
  - Upfront cost
  - Compatibility with current/future range use
  - Permitting requirements
  - Ongoing maintenance
- Combination of alternatives
  - May be most appropriate for an individual range or range complex
  - Mixed Use Ranges – feasibility of combining alternatives
BMP Alternatives for High Explosives
BMP Alternatives for HE

- Operational alternatives
- Land stabilization/erosion control
- Storm Water controls
- Source remediation
- In-Stream Treatment
### Operational Alternatives for HE

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Pros</th>
<th>Cons</th>
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<tbody>
<tr>
<td>Reduced MC loading rate</td>
<td>Effective, but...</td>
<td>...usually not compatible with intended range use.</td>
</tr>
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<td>Relocate target area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inert ordnance</td>
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## Land Stabilization/Erosion Control

### Alternative vs. Pros & Cons

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<tbody>
<tr>
<td>Vegetation/seeding</td>
<td>Effective at controlling soil-associated HE from smaller problem areas.</td>
<td>Ranges prone to Re-disturbance; HE soluble</td>
</tr>
<tr>
<td>Mulching/Erosion control blankets.</td>
<td></td>
<td></td>
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<tr>
<td>Regrading</td>
<td></td>
<td></td>
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<td>Silt fencing</td>
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Storm Water Controls for HE

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<td>Diversions/run-on controls</td>
<td>Effective, straightforward</td>
<td>Does not address direct precipitation</td>
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<tr>
<td>Detention basins</td>
<td>Effective at removing soil-assoc. MC</td>
<td>HE soluble; groundwater pathway; potentially large basins needed.</td>
</tr>
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<td>Filtration measures</td>
<td>Treat both dissolved and particulate HE</td>
<td>Clogging/maintenance; groundwater pathway</td>
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<tr>
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<td>Desert environs; maintenance</td>
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# Source Remediation - HE

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<td>Periodic UXO clearance</td>
<td>Can remove concentrated HE sources</td>
<td>High frequency not compatible with range ops.</td>
</tr>
<tr>
<td>Other soil remediation techniques</td>
<td>Can be effective.</td>
<td>Extensive sampling and testing; not compatible with active range ops.</td>
</tr>
</tbody>
</table>
BMP Alternatives for Lead
BMP Alternatives for Lead

- Operational alternatives
- Range engineering & maintenance
- Soil Treatments
- Storm Water controls
### Operational Alternatives for Lead

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<tr>
<td>Install bullet traps</td>
<td>Effective straightforward</td>
<td>Reconstruction; maintenance costs</td>
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<tr>
<td>Periodic lead removal &amp; recycling</td>
<td>Effective; straightforward. Relatively low cost</td>
<td>Range down time</td>
</tr>
<tr>
<td>Clay liner</td>
<td>Effectiveness unknown</td>
<td>May cause SW ponding and additional runoff and increase erosion</td>
</tr>
<tr>
<td>Vegetation</td>
<td>Reduce SW runoff</td>
<td>Limited effectiveness is arid environment w/o irrigation. Heavy use areas would be quickly disturbed.</td>
</tr>
<tr>
<td>Erosion control fabrics and increased slope stability</td>
<td>Good for small problem areas.</td>
<td>Heavy use areas quickly disturbed.</td>
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## Soil Treatments - Lead

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<tr>
<td>pH adjustments</td>
<td>Effective at controlling migration of dissolved lead</td>
<td>Necessary to combine with other alternatives such as erosion controls</td>
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<tr>
<td>Phosphate addition</td>
<td>Effective at binding lead in soils</td>
<td>Necessary to combine with other alternatives such as erosion control</td>
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## Storm Water Controls - Lead

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To prevent off-range migration of HE and lead at mixed use ranges, best options may be:

- Lime
- Run-on controls
- Detention basins
  - Safety considerations
  - Minimize interference with range use
  - May involve agency approvals for changes to drainage or detention basins
BMP Implementation

- **BMP during range design/re-design**
  - Minimizes interference with range use
  - Addresses any issues with NEPA, etc. within one project
  - Minimizes costs

- **BMP = range related** (e.g., operations, maintenance, etc.)
  - Scheduled regularly
  - Minimal to no NEPA concerns, depending on BMP

- **BMP = construction**
  - Coordination with range operations
  - Design documents
  - NEPA
BMP Effectiveness

- Ongoing assessment of effectiveness necessary
  - Monitoring drinking water wells
  - Surface water sampling during storm events
  - Normal part of sustainability activities
Summary of Lessons Learned

• Involve range operations staff early
• Range accessibility for assessment, study, and evaluation can be an issue due to training schedule
• Coordination with multiple installation personnel
• Ensure there is a plan for maintenance and monitoring – where is the funding coming from?
Summary of NEPA Lessons Learned

- Avoid NEPA issues, if possible, by working in already disturbed areas
- Be aware of jurisdictional areas and T&E habitat, both plant and animal
- Be thorough with initial agency coordination
- Be aware of cultural resources
Questions?

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