



Environment, Energy Security
& Sustainability

SYMPOSIUM & EXHIBITION

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

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May 10, 2011

Report Documentation Page				Form Approved OMB No. 0704-0188	
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1. REPORT DATE 10 MAY 2011		2. REPORT TYPE		3. DATES COVERED 00-00-2011 to 00-00-2011	
4. TITLE AND SUBTITLE Lessons Learned: Implementing BMPs for Munitions Constituent Migration at Operational Ranges				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) ARCADIS/Malcolm Pirnie,630 Plaza Drive, Suite 200 ,Highlands Ranch,CO,80129				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES Presented at the NDIA Environment, Energy Security & Sustainability (E2S2) Symposium & Exhibition held 9-12 May 2011 in New Orleans, LA. U.S. Government or Federal Rights License					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 23	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

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

Alternative	Pros	Cons
Reduced MC loading rate	Effective, but...	...usually not compatible with intended range use.
Relocate target area		
Inert ordnance		



Land Stabilization/ Erosion Control



Alternative	Pros	Cons
Vegetation/ seeding	Effective at controlling soil- associated HE from smaller problem areas.	Ranges prone to Re-disturbance; HE soluble
Mulching/ Erosion control blankets.		
Regrading Silt fencing		



Storm Water Controls for HE



Alternative	Pros	Cons
Diversions/run-on controls	Effective, straightforward	Does not address direct precipitation
Detention basins	Effective at removing soil-assoc. MC	HE soluble; groundwater pathway; potentially large basins needed.
Filtration measures	Treat both dissolved and particulate HE	Clogging/maintenance; groundwater pathway
Vegetative measures	Treat both dissolved and particulate HE	Desert environs; maintenance



Source Remediation - HE

Alternative	Pros	Cons
Periodic UXO clearance	Can remove concentrated HE sources	High frequency not compatible with range ops.
Other soil remediation techniques	Can be effective.	Extensive sampling and testing; not compatible with active range ops.





BMP Alternatives for Lead

BMP Alternatives for Lead

- Operational alternatives
- Range engineering & maintenance
- Soil Treatments
- Storm Water controls



Operational Alternatives for Lead

Alternative	Pros	Cons
Reduced MC loading rate	Effective, but...	...usually not compatible with intended range use.
Relocate target areas		
Inert ordnance		



Range Engineering & Maintenance - Lead

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



Soil Treatments - Lead

Alternative	Pros	Cons
pH adjustments	Effective at controlling migration of dissolved lead	Necessary to combine with other alternatives such as erosion controls
Phosphate addition	Effective at binding lead in soils	Necessary to combine with other alternatives such as erosion control



Storm Water Controls - Lead



Alternative	Pros	Cons
Diversions/run-on controls	Effective, straightforward	Does not address direct precipitation
Detention basins	Effective at removing soil-assoc. MC	Potential groundwater pathway
Filtration measures	Treat both dissolved and particulate lead	Clogging/maintenance; groundwater pathway
Vegetative measures	Treat both dissolved and particulate lead	Desert environs; maintenance



BMP Alternatives for Mixed Use Ranges

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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