

# PUTTING THE HORSE BEFORE THE CART IN MUNITIONS RESPONSE FEASIBILITY STUDIES

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# TOPICS



- The overall FS process
- Quick look at General Response Actions
- Focus on Building Alternatives
- ~~Some quick notes on Detailed Analyses~~
- Some Observations from the EMCX



# FS PROCESS



1. Establish RAOs
2. Identify general response actions that can satisfy the remediation goals of the RAO
3. Identify and screen technologies or process options applicable to each general response action
4. Evaluate process options for effectiveness (to achieve one or more remediation goals), implementability, and relative cost
5. Assemble technologies/process options into remedial alternatives
6. Screen remedial alternatives, if necessary
7. Detailed analysis of remedial alternatives, which is divided in to:
  - a. Analyze remedial alternatives against seven of the nine evaluation criteria
  - b. Compare remedial alternatives against each other

Remedial Action Objective

Build Alternatives

Analyze Alternatives



# THE PROCESS THAT FOLLOWS....



Makes site specific remedial alternatives

Not generic alternatives like,

- No Action
- ~~LUCs~~
- ~~Surface & LUCs~~
- ~~Subsurface & LUCs~~
- ~~Subsurface~~ → UU/UE

These aren't alternatives, they are different words for the GRAs we have at our disposal

Per DERP, must have

- No Action
- An action that *includes* LUCs components
- And action that gets to UU/UE



# OVERALL ALTERNATIVE BUILD PROCESS



The overall process:

1. Starting from Remediation Goals, Identify General Response Actions (GRAs)
2. For each *GRA*, identify *Method(s) of Action*
3. For each *Method of Action*, what are the various *Technology Types* available to us?
4. For each *Technology Type*, what are the various *Process Options* available to us?
5. From the list of *Technology Types/Process Options*, what combinations can be used on various parts of the site to address each of various risk scenarios?  
→ For each *GRA*, each unique combination of *technology type/process options* and where they are applied within the site for each *GRA* = unique *remedial alternatives*

The list of *technology types/process options* for each *remedial alternative* is the list of its *remedial components* (or simply '*components*')

Each exposure described in the RAO needs to be addressed by one or more components that achieve the remediation goal



# THERE ARE SEVEN GRAS THAT CAN BE ESTABLISHED TO ACHIEVE SITE-SPECIFIC REMEDIATION GOALS FOR AN MRS



Table 11.2 Types of Actions for Terrestrial Munitions Response Sites		
Actions	Common Methods	Commonly Associated Outcomes that Contribute to Managing Risk
Treatment Actions	Geophysical detection, excavation, MEC disposal	Removes the source of hazard (MEC) to mitigate possible encounters. This method can result in recovering all MEC thereby eliminating the possibility of encounters for one or more exposure scenarios.
	Surface geophysical and/or visual detection, MEC disposal	Removes the source of hazard (MEC) at the surface to mitigate possible encounters. This method can result in removing all MEC within a surface interaction zone thereby eliminating the possibility of encounters for surface exposure scenarios. Note that these actions do not address subsurface MEC.
	Dig and Sift	Removes all sources of hazard (MEC) within the defined footprint and depth of soil, thereby eliminating the possibility of encounters for exposure scenarios within those boundaries.
Engineered Actions	Restrict or control access (e.g., fencing)	Intended to impede a user's ability to access the site, thus reducing the possibility for encounter with MEC
	Protective cover (usually soil, may include concrete, asphalt, or other material)	Introduces a barrier between the user and MEC intended to limit a user's ability to interact, either intentionally or unintentionally, with MEC.
Institutional Actions	On Site Public Awareness, (e.g., via signage, pamphlets, posted social media QR codes, etc)	Intended to modify user's behavior via passive measures to discourage interactions and take appropriate actions to recognize, retreat, and report if a munitions item is encountered.
	Focused User Training (e.g., focused site-specific explosives safety training)	Intended to train a focused set of users on site conditions, precautions, and to take appropriate actions to recognize, retreat, and report if a munitions item is encountered.
	Legal Restrictions (Zoning, Permits or Deed Restrictions)	Intended to manage access and/or activities allowed on a site to manage or control user's ability to interact with MEC during normal usage activities that do not include intrusive actions
	Onsite MEC support (e.g., MEC escort, anomaly avoidance)	Intended to manage or control potential exposure via active safety assistance to site activities to mitigate user's ability to interact with MEC during normal usage activities that include intrusive actions
	Periodic evaluations/inspections	Intended to verify existing remedy component or conditions remain in place and are functional to remain protective

- Treatment actions
- Containment actions
- Institutional actions
- Treatment and containment actions
- Treatment and institutional actions
- Containment and institutional actions
- Treatment, containment, and institutional actions

The overall process:  
Starting from the RAO

1. → Identify GRAs  
→ *Method(s) of Action/GRA*  
→ *Technology Types/Method of Action*  
→ *Process Options/Technology Type*
2. Screen *Tech Types/Options*
3. Describe *Tech Types/Options*
4. Combine *Tech Types/Options to achieve the RG*
5. *Each combo = an alternative*



# GRAs → METHODS OF ACTION



Media	Remedial Action Objective	General Response Actions	Method Of Action
		Treatment Actions (sometimes referred to as "physical removals")	Inspections of the ground surface
			Subsurface geophysical detection & excavation
			Dig & sift/sorting
			Disposal
		Containment Actions	Restrict or control access
			Protective Covers
		Institutional Actions	Change Behavior
			Restrict or control access
		Treatment & Containment Actions	Treatment Component Methods
			Containment Component Methods
		Treatment & Institutional Actions	Treatment Component Methods
			Institutional Component Methods
		Containment & Institutional Actions	Containment Component Methods
			Institutional Component Methods
		Treatment & Containment & Institutional Actions	Treatment Component Methods
Containment Component Methods			
Institutional Component Methods			

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# GRAs → METHODS OF ACTION → TECHNOLOGY TYPES



Media	Remedial Action Objective	General Response Actions	Method Of Action
			Inspections of the ground surface
		<b>General Response Actions</b>	<b>Method Of Action</b>
			<b>Technology Types</b>
			<b>Process Options</b>
		(sometimes referred to as "physical removals")	excavation
			Dig & sift/sorting
			Disposal
		Containment Actions	Restrict or control access
			Protective Covers
		Institutional Actions	Change Behavior
			Restrict or control access
		Treatment & Containment Actions	Treatment Component Methods
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			Inspections of the ground surface			
		<b>General Response Actions</b>	<b>Method Of Action</b>	<b>Technology Types</b>	<b>Process Options</b>	
		(sometimes referred to as "physical removals")	excavation			
		<b>General Response Actions</b>	<b>Method Of Action</b>	<b>Technology Types</b>	<b>Process Options</b>	<b>Screening Comments</b>
		Containment Actions	Restrict or control access			
			Protective Covers			
		Institutional Actions	Change Behavior			
			Restrict or control access			
		Treatment & Containment Actions	Treatment Component Methods			
			Containment Component Methods			
		Treatment & Institutional Actions	Treatment Component Methods			
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				Inspections of the ground surface						
		General Response Actions	Method Of Action	Technology Types	Process Options					
		(sometimes referred to as "physical removals")	excavation							
		General Response Actions	Method Of Action	Technology Types	Process Options	Screening Comments				
		Containment Actions	Restrict or control access							
			Protection Covers							
		General Response Actions	Method Of Action	Technology Types	Process Options	Screening Comments	Effectiveness	Implementability	Cost	
		Treatment & Containment Actions		Treatment Component Methods						
				Containment Component Methods						
		Treatment & Institutional Actions		Treatment Component Methods						
				Institutional Component Methods						
		Containment & Institutional Actions		Containment Component Methods						
				Institutional Component Methods						
		Treatment & Containment & Institutional Actions		Treatment Component Methods						
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			Inspections of the ground surface						
		General Response Actions	Method Of Action	Technology Types	Process Options				
		(sometimes referred to as "physical removals")	excavation						
		General Response Actions	Method Of Action	Technology Types	Process Options	Screening Comments			
		Containment Actions	Restrict or control access						
		General Response Actions	Method Of Action	Technology Types	Process Options	Screening Comments	Effectiveness	Implementability	Cost
		Treatment Actions (sometimes referred to as "physical removals")	Inspections of the ground surface	Visual inspection	For each Technology Type, list all the Process Options (e.g., technology methods) that are available for remedial actions. See Table I-7	If "Potentially Applicable", state any pros and/or cons as they relate to the remediation goals. If not feasible or viable, provide brief justification.	Describe Effectiveness, Implementability and Cost in relative terms but in the context of site specific conditions		
				Instrument aided visual inspection					
				Systematic geophysical systems					
			Subsurface geophysical detection & excavation	Systematic geophysical systems					
				Uncontrolled geophysical systems					
				Sensor Positioning					
				Excavation & recovery					
			Dig & sift/sorting	excavation & recovery					
		Sift/Sort							
		Disposal	Intentional Detonation						
			Engineering Solutions						
		Restrict or control access	Physical Barriers Mechanisms	For each, list the Process Options available for remedial actions. See Table I-7	If "Potentially Applicable", state any pros and/or cons as they relate to the remediation goals. If not feasible or viable, provide brief justification.	Describe Effectiveness, Implementability and Cost in relative terms but in the context of site			
		Protective Covers	Physical Barriers Mechanisms						



# BUILD *SITE-SPECIFIC* ALTERNATIVES



## Assessment Area 1

**Assessment Area #1  
 Risk Scenario #1: HUA&LUA  
 on trails**

General Response Actions			Alternative Name									
Method Of Action	Common Process Options		#1 No Action <sup>2</sup>	#2-AGC on trails, surface only in woods <sup>3</sup>	#4-AGC Non-AGC DGM on trails, surface only w/ analog in woods <sup>3</sup>	#5-AGC on trails and in woods <sup>3</sup>	#5-AGC on trails, surface only in woods, Public Awareness & anomaly avoidance <sup>3</sup>	#6-AGC on trails and in woods & Anomaly Avoidance for new trail construction <sup>3</sup>	#7-AGC on trails and in woods & UXO support for new trail construction <sup>3</sup>	#8-AGC on trails and in woods to depth of detection w/ Search under tree root balls <sup>4</sup>	#9-Institutional Actions Only	
Not Applicable			X									
Treatment Actions	Surface Removal	Instrument-aided visual inspections		X	X							
	Geophysical detection & excavation	Advanced geophysical classification		X		X				X		
		Land borne non-AGC DGM man-portable (mag or EMI)				X				X		
		LiDAR-SLAM		X	X	X				X		
Disposal	Manual & Mechanized-		X	X	X				X			
	BIP or Explosively generated plasma jet		X	X	X				X			
Treatment & Institutional Actions	Surface Removal	Instrument-aided visual inspections					X					
	Geophysical detection & excavation	AGC Person-portable or towed by person					X	X	X			
		SLAM					X	X	X			
	Disposal	Manual or small mechanized excavator					X	X	X			
BIP or Explosively generated plasma jet						X	X	X				
Change Behavior	Signage, pamphlets, internet web site	School programs				X						
		Anomaly Avoidance				X	X					
	UXO support								X			
												X

## Assessment Area 2

**Assessment Area #2  
 Risk Scenario #2: LUA off trails**

General Response Actions			Alternative Name									
Method Of Action	Common Process Options		#1 No Action <sup>2</sup>	#2-AGC on trails, surface only in woods <sup>3</sup>	#4-AGC Non-AGC DGM on trails, surface only w/ analog in woods <sup>3</sup>	#3-AGC on trails and in woods <sup>3</sup>	#5-AGC on trails, surface only in woods, Public Awareness &					
Not Applicable			X									
Treatment Actions	Surface Removal	Instrument-aided visual inspections		X	X							
	Geophysical detection & excavation	Advanced geophysical classification		X		X						
		Land borne non-AGC DGM man-portable (mag or EMI)				X						
		LiDAR-SLAM		X	X	X						
Disposal	Manual & Mechanized-		X	X	X							
	BIP or Explosively generated plasma jet		X	X	X							
Treatment & Institutional Actions	Surface Removal	Instrument-aided visual inspections					X					
	Geophysical detection & excavation	AGC Person-portable or towed by person					X					
		SLAM					X					
	Disposal	Manual or small mechanized excavator					X					
BIP or Explosively generated plasma jet						X						
Change Behavior	Signage, pamphlets, internet web site	School programs					X					
		Anomaly Avoidance				X						
	UXO support						X					
								X				
Institutional Actions	Change Behavior	Signage, pamphlets, internet web site										
		School programs										
		Anomaly Avoidance										
		UXO support										
Restrict or control access	Local ordinances											
	Deed restrictions											
	Use permits											

The overall process:  
 Starting from the RAO

- Identify GRAs  
 → Method(s) of Action/GRA  
 → Technology Types/Method of Action  
 → Process Options/ Technology Type
- Screen Tech Types/Options
- Describe Tech Types/Options
- Combine Tech Types/Options to achieve the RG
- Each combo = an alternative

<sup>1</sup> DERP Requirement  
<sup>2</sup> Required by the NCP  
<sup>3</sup> Excludes search under tree root balls  
<sup>4</sup> Can support ULRUE

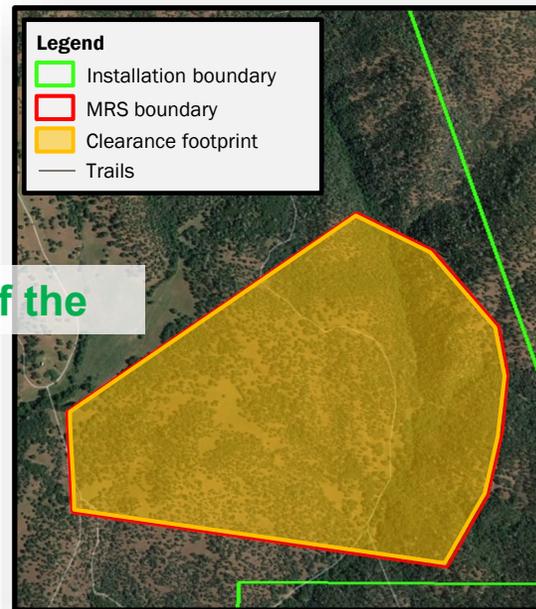


# DIFFERENCES BETWEEN REMEDIAL ALTERNATIVES

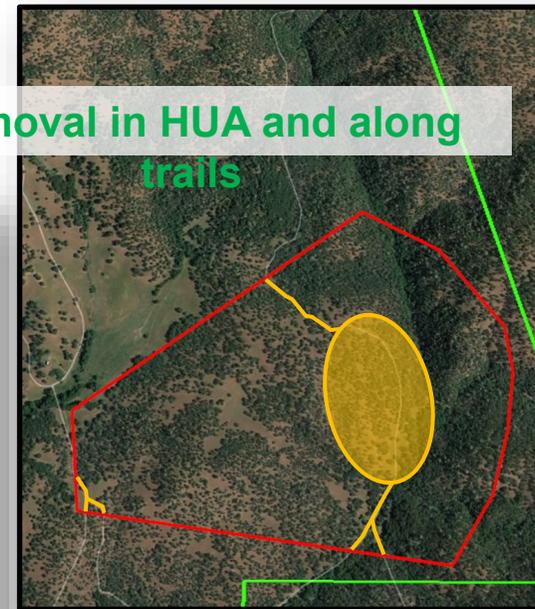


- ❖ Differences don't need to be extreme
  - i.e., LUCs only vs. MEC removal
- ❖ Alternatives can include differences in
  - *MEC removal footprint(s)*

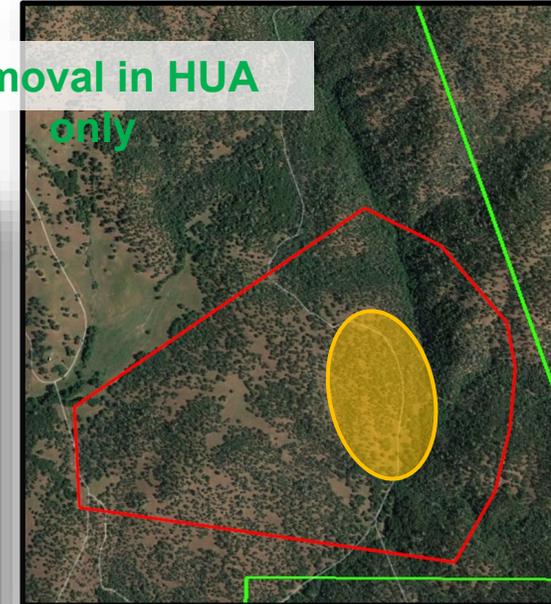
Removal over 100% of the MRS



Removal in HUA and along trails



Removal in HUA only



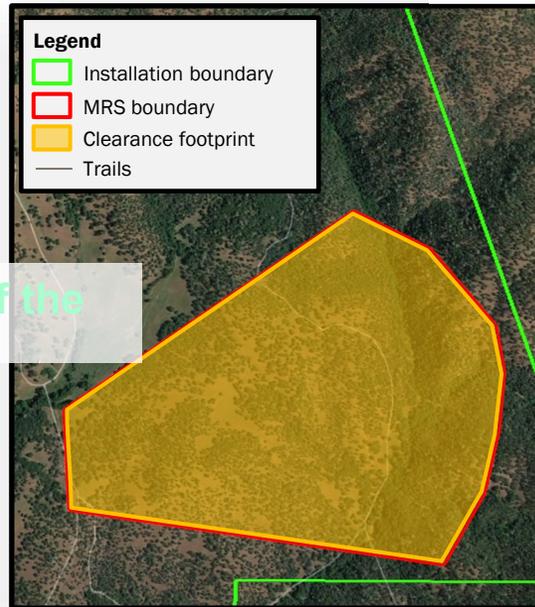


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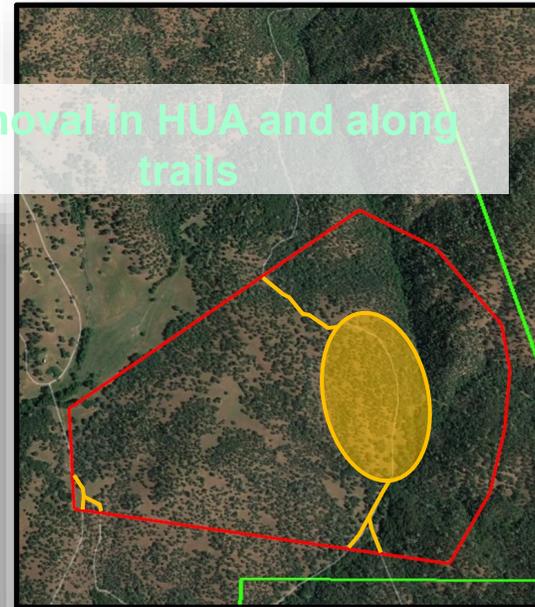


- ❖ Differences don't need to be extreme
  - i.e., LUCs only vs. MEC removal
- ❖ Alternatives can include differences in
  - MEC removal footprint(s)
  - **Where/how technologies are applied**

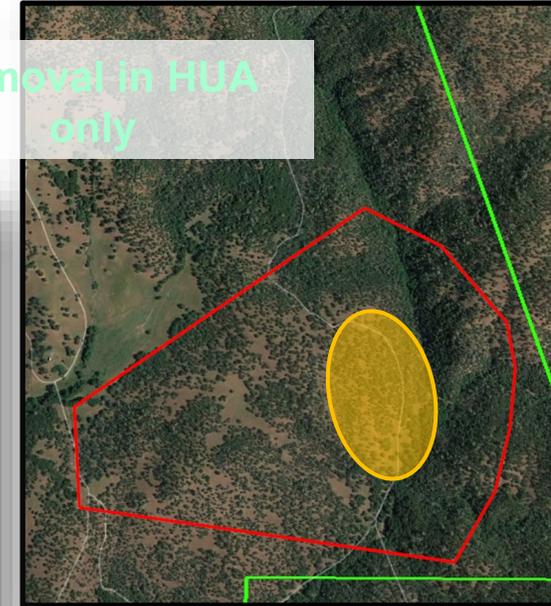
Removal over 100% of the MRS



Removal in HUA and along trails



Removal in HUA only



e.g., detection using digital magnetometers with reduced brush clearing followed by handheld AGC cueing, versus dynamic AGC requiring more extensive brush clearing



# SOME OBSERVATIONS

## AGREEING ON GRAs IS AMONG THE HARDER PARTS OF THE PROCESS



REMEDIAL ACTION OBJECTIVE				
CONTAMINANT and MEDIA	POTENTIAL EXPOSURE PATHWAY(S) <sup>(1)</sup>			REMEDIAL GOAL
	Assessment Area(s)	Receptors and Exposure Pathways	Interaction Zone(s)	
<i>Known or suspected MEC items and medium/depth</i>	<i>MEC exposure location (i.e., assessment area)</i>	<i>Receptors and exposure pathways addressed</i>		
<u>In Soil (to a depth of 14 inches bgs):</u> <ul style="list-style-type: none"> <li>Rocket, 2.36-inch, HEAT and practice</li> <li>Grenade, Hand, Practice and Training</li> <li>60mm flares</li> </ul>	Trails incl. 15m buffer - HUA and LUA	Recreational users: 25,000 visitors/year		
Woods - HUA off trails	Recreational users: infrequent, estimated less than 5/year			
	Woods - LUA off trails	Recreational users (hiking, walking); infrequent, estimated less than 5/year	Surface only	

General Response Actions	Method Of Action
 Treatment Actions (sometimes referred to as "physical removals")	Inspections of the ground surface
	Subsurface geophysical detection & excavation
	Dig & sift/sorting
	Disposal
 Containment Actions	Restrict or control access
	Protective Covers
 Institutional Actions	Change Behavior
	Restrict or control access
 Treatment & Containment Actions	Treatment Component Methods
	Containment Component Methods
 Treatment & Institutional Actions	Treatment Component Methods
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 Containment & Institutional Actions	Containment Component Methods
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 Treatment & Containment & Institutional Actions	Treatment Component Methods
	Containment Component Methods
	Institutional Component Methods



# AND SOME MORE OBSERVATIONS



## Using the term UU/UE

- Do use if it applies to entire MRS
- Do not use in all other scenarios
  - Can explain areas may be exempt from certain remedy components

## What is and what is not protective

- How does a sign or pamphlet “protect” someone from unintentional interactions?
- Is the fence intended to keep everyone out or act a deterrent?
- How would leaving easily recoverable MEC unrecovered impact your protectiveness assessment? [This relates mostly to old peak-picking DGM and analog removals but is very relevant to current proposed uses of analog where DGM is doable.]

## Alternative component descriptions

- If not specified otherwise we assume it applies to all risk scenarios, everywhere

## All viable alternatives must be provided to the decision makers

- Treatment everywhere ≠ Treatment excluding roads & trees ≠ Treatment in high use areas only, etc...
- ***If Institutional Action by itself is a viable GRA then Treatment only GRA is very likely to be more effective***



# QUESTIONS?

