

Munitions and Explosives of Concern - Hazard Assessment

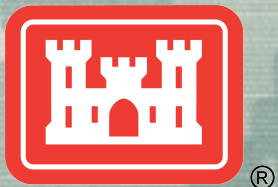
MEC HA: A Tool in the Decision Making Toolbox

Teresa Carpenter

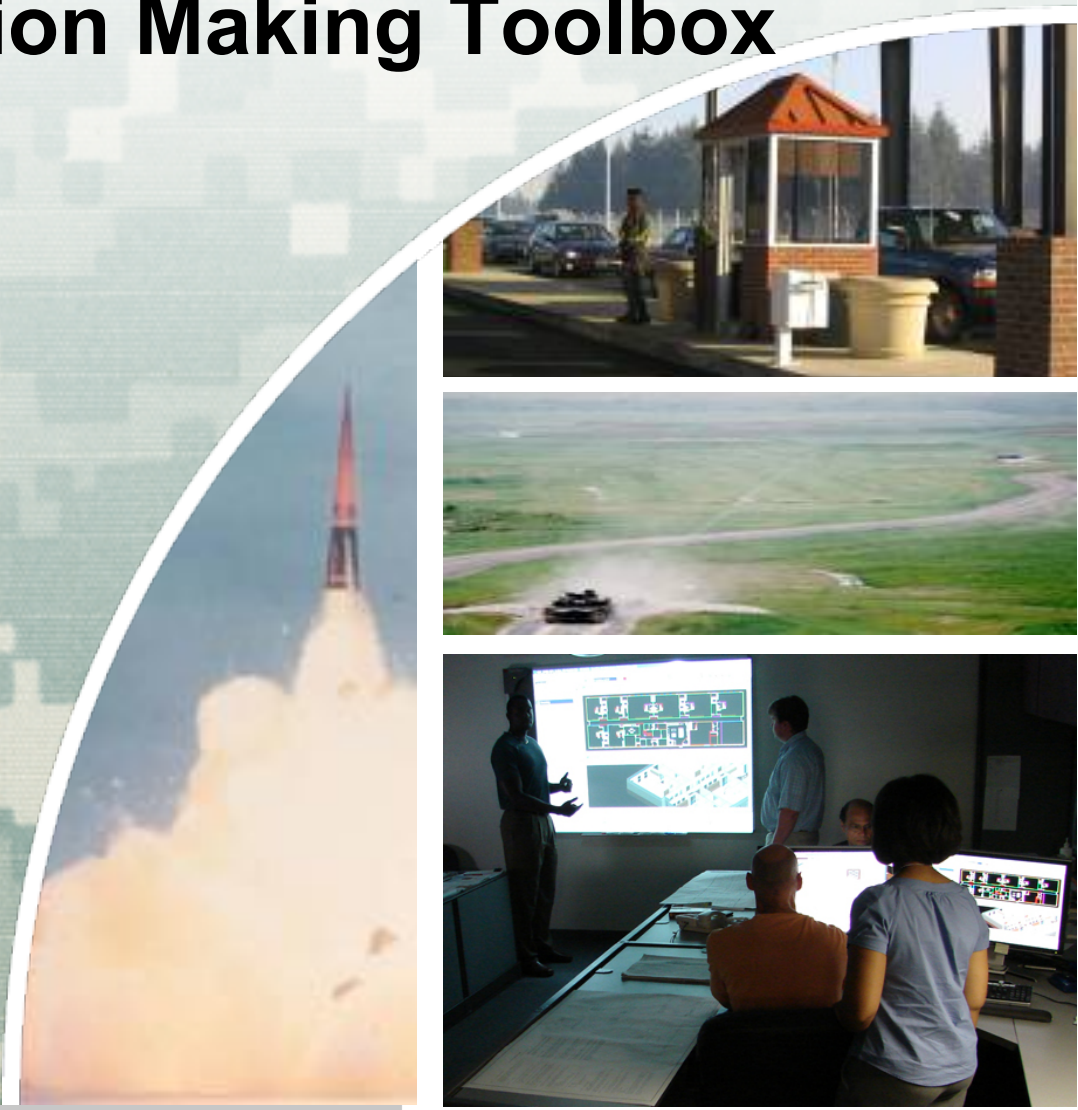
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US Army Corps of Engineers
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Presentation Overview

- Focus on application of MEC HA Methodology (so far) on MRS Decisions
 - ▶ When Application is Successful
 - ▶ Examples of Common Limitations in Practice
 - ▶ Suggestions for Optimization



Decisions are Difficult

- Intent of this talk
 - ▶ Increase perspective
 - ▶ Illustrate issues
 - ▶ Collaborate more effectively
 - ▶ Get better at what we do
 - ▶ Improve Process



Why MEC HA?

- CERCLA & NCP call for “Risk Assessment”
 - ▶ End of RI: Differentiate Acceptable from Unacceptable
 - ▶ Traditional risk assessments apply established cleanup standards
 - Not applicable to Explosive Concern
 - ▶ Need for consistent methodology for assessing Explosive Concern



Technical Working Group for Hazard Assessment

- Department of Defense
- U.S. Department of the Interior
- State PgMs from Association of State and Territorial Solid Waste Management Officials
- Tribal Association for Solid Waste and Emergency Response
- U.S. Environmental Protection Agency



Publication Numbers:
EPA: 505B08001
DoD: XXXXXXXXXX

**MUNITIONS AND EXPLOSIVES OF CONCERN
HAZARD ASSESSMENT METHODOLOGY**



**INTERIM
OCTOBER 2008**

Interim Methodology Document

[http://www2.epa.gov/fedfac/
munitions-and-explosives-
concern-hazard-assessment-
methodology-interim](http://www2.epa.gov/fedfac/munitions-and-explosives-concern-hazard-assessment-methodology-interim)



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DoD Trial Period

- January 2009 OSD requested DOD components apply MEC HA on trial basis:
 - ▶ 2 Two-year Trials (Four years)
 - ▶ January 2009-July 2013
- Evaluation of the trial period
 - ▶ November 2014 OSD Memo
 - ▶ Suggestion for Improvement and Optimization



Optimize

- “*you must empty-out the bathing-tub, but not the baby along with it.*”
- Emphasis on keeping the good



Wikipedia: Earliest record of the phrase from *Narrenbeschwörung* (*Appeal to Fools*) by [Thomas Murner](#), 1512,



The Heart of MEC HA

- Attempts to address a “*fundamental difference between assessing chronic environmental contaminant exposure risk and assessing **acute MEC explosive hazards.***”

Source: MEC HA Methodology: Interim 2008



The Heart of MEC HA

*“**Risks** from MEC explosive hazards are evaluated as being either **present or not present**. If the **potential for an encounter** with MEC exists, the potential that the encounter may result in death or injury also exists.”*

Source: MEC HA Methodology: Interim 2008





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ACQUISITION,
TECHNOLOGY
AND LOGISTICS

NOV 10 2014

Ms. Charlotte Bertrand
Acting Director, Federal Facilities Restoration and Reuse Office
United States Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Mail Code: 5106P
Washington D.C. 20460-0001

Dear Ms. Bertrand:

This letter transmits the Department of Defense's (DoD's) evaluation of the Munitions and Explosives of Concern Hazard Assessment (MEC HA). Based on the evaluation's results, DoD does not believe the MEC HA Methodology, in its current state, is an accurate or suitable tool for assessing explosives hazards associated with MEC known or suspected to be present at a Munitions Response Site (MRS). However, we recognize the utility of such a tool. To that end, DoD recommends several enhancements that it believes are essential to making the MEC HA Methodology a more useful tool.

In January 2009, the Office of the Deputy Under Secretary of Defense for Installations and Environment, Environment, Safety and Occupational Health Directorate (ODUSD(I&E)/ESOH) requested the DoD Components use and evaluate the MEC HA Methodology on a trial basis. Consequently, the DoD Components used the MEC HA during a four-year trial period from January 2009 to July 2013 at MRSs during both the remedial investigation and feasibility study phases. This letter outlines our recommendations for improving the MEC HA for future applications based on the DoD Components' experience during the trial period.



We have attached a summary of the issues and concerns that the DoD Components identified. The most notable issues DoD identified are as follows:

- **MEC HA Relative Scoring.** MEC HA scores do not adequately reflect the hazard posed by an encounter with different types of military munitions (e.g., 40mm High Explosive (HE), 105mm HE projectiles). Further, the MEC HA does not capture the full range of real world effects from an encounter with different types of MEC. For example, the MEC HA does not differentiate between an encounter with unexploded ordnance (UXO) where the likelihood of detonation and the degree of potential harm varies depending on the type of UXO, and discarded military munitions (DMM) that are less likely to detonate upon interaction. Nor does the MEC HA accurately account for the site-specific source-receptor exposure pathway. Additionally, the MEC HA gives less weight to protective measures such as land use controls (LUCs) or public outreach and education in explosives safety. As a result, DoD perceives the MEC HA is not an effective tool for assessing cleanup alternatives.



NO
REMEDIAL ACTION
OBJECTIVE (RAO)!!

- **MEC HA as a Risk Assessment Method.** The MEC HA Methodology does not meet the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requirements for a baseline risk assessment. The MEC HA does not quantify explosives hazards, and objective criteria are not available for comparison to the MEC HA scores. Therefore, project teams must rely on professional judgment rather than the MEC HA to evaluate acceptable versus unacceptable risk from explosive hazards, and then determine whether a remedy is protective and meets the other CERCLA remedy criteria.
- **MEC Input Factors.** MEC HA input factors do not account for some real world conditions (e.g., the presence of underwater military munition (UWMM) at an MRS) that are of increasing concern to the states.



MEC HA Structure

MEC HA addresses:

- ***Sensitivity***: The likelihood that an MEC item will function should a receptor interact with it.
- ***Accessibility***: The likelihood that a receptor will be able to interact with an MEC item.
- ***Severity***: The potential severity of the result should an MEC item function.



Nine Input Factors

- **Severity**

- ▶ Energetic Material Type
- ▶ Location of Additional Human Receptors

- **Accessibility**

- ▶ Site Accessibility
- ▶ Potential Contact Hours
- ▶ Amount of MEC
- ▶ Minimum MEC Depth Relative to Maximum Receptor Intrusive Depth
- ▶ Migration Potential

- **Sensitivity**

- ▶ MEC Classification
- ▶ MEC Size



MEC HA Technical Framework Structure

Explosive Hazard Component	Input Factor	Maximum Score	Weight
Severity	Energetic Material Type	100	10%
	Location of Additional Human Receptors	30	3%
	<i>Category total</i>	<i>130</i>	<i>13%</i>
Accessibility	Site Accessibility	80	8%
	Potential Contact Hours	120	12%
	Amount of MEC	180	18%
	Minimum MEC Depth/ Maximum Intrusive Depth	240	24%
	Migration Potential	30	3%
	<i>Category total</i>	<i>650</i>	<i>65%</i>
Sensitivity	MEC Classification	180	18%
	MEC Size	40	4%
	<i>Category total</i>	<i>220</i>	<i>22%</i>
	Total Score	1000	100%



Weighting

*“The weight assigned to an input factor represents the **percentage of the maximum score** for that input factor when compared with the **sum of the maximum scores** of all input factors.”*

Source: MEC HA Methodology: Interim 2008



MEC HA Technical Framework Structure

Explosive Hazard Component	Input Factor	Maximum Score	Weight
Severity	Energetic Material Type	100	10%
	Location of Additional Human Receptors	30	3%
	<i>Category total</i>		<i>130</i>
Accessibility	Site Accessibility	80	8%
	Potential Contact Hours	120	12%
	Amount of MEC	180	18%
	Minimum MEC Depth/ Maximum Intrusive Depth	240	24%
	Migration Potential	30	3%
<i>Category total</i>		<i>650</i>	<i>65%</i>
Sensitivity	MEC Classification	180	18%
	MEC Size	40	4%
<i>Category total</i>		<i>220</i>	<i>22%</i>
Total Score		1000	100%

Green total – Factors that will not change	320	32%
Yellow Total – Factors unlikely to change	60	6%
Blue Total – Factors affected by clearance	420	42%
Orange Total – Factors affected by land use	200	20%



MEC HA Score

- Includes weighting, scoring, and combining input factors
 - ▶ Relative numeric approach, similar to the EHE module of the MRSPP
 - ▶ Additive, rather than multiplicative, as other probability analyses
- Output – Hazard Levels (1 through 4)



Hazard Levels Descriptions

- **Hazard Level 1:** **highest** hazard potential
- **Hazard Level 2:** **high** hazard potential
- **Hazard Level 3:** **moderate** hazard potential
- **Hazard Level 4:** **low** hazard potential



MEC HA Hazard Levels

The Hazard Level score ranges are:

- ***Hazard Level 1:***   **840 - 1000**
- ***Hazard Level 2:*** **725 - 835**
- ***Hazard Level 3:*** **530 - 720**
- ***Hazard Level 4:*** **125 - 525**

Where do we want to go??
What is the Remedial Action Objective??



MEC HA in Action

- Evaluate a baseline score relative to score for remedial alternatives
 - ▶ Promote consistent approach for assessing remedial alternatives
 - ▶ Provides a basis for communication



Table 2-5. Scores for Input Factor Categories

Input Factor	Input Factor Category	Score		
		Baseline Concentration	Surface Concentration	Subsurface Concentration
Energetic Material Type	High Explosives and Low Explosive Fillers in Fragmenting Rounds	100	100	100
	White Phosphorus	70	70	70
	Pyrotechnic	60	60	60
	Propellant	50	50	50
	Spotting Charge	40	40	40
	Incendiary	30	30	30
Location of Additional Human Receptors	Inside the MRS or inside the ESQD arc surrounding the MRS	30	30	30
	Outside of the ESQD arc	0	0	0
Site Accessibility	Full Accessibility	80	80	80
	Moderate Accessibility	55	55	55
	Limited Accessibility	15	15	15
	Very Limited Accessibility	5	5	5
Potential Contact Hours	Many Hours	120	90	30
	Some Hours	70	50	20
	Few Hours	40	20	10
	Very Few Hours	15	10	5
Amount of MEC	Target Area	180	120	30
	Open Burning/Open Detonation (OB/OD) Area	180	110	30
	Function Test Range	165	90	25
	Burial Pit	140	140	10
	Maneuver Areas	115	15	5
	Firing Points	75	10	5
	Safety Buffer Areas	30	10	5
	Storage	25	10	5
	Explosive-Related Industrial Facility	20	10	5

- 1.
- 2.
- 3.
- 4.
- 5.



Table 2-5. Scores for Input Factor Categories

Input Factor	Input Factor Category	Score		
		Baseline Condition	Surface Cleanup	Subsurface Cleanup
6. Minimum MEC Depth Relative to the Maximum Receptor Intrusive Depth	Baseline Condition: MEC located surface and subsurface; After Cleanup: Intrusive depth overlaps with subsurface MEC	240	150	95
	Baseline Condition: MEC located surface and subsurface; After Cleanup: Intrusive depth does not overlap with subsurface MEC	240	50	25
	Baseline Condition: MEC located only subsurface; Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth	150	N/A*	95
	Baseline Condition: MEC located only subsurface; Baseline Condition or After Cleanup: Intrusive depth does not overlap with minimum MEC depth	50	N/A*	25
7. Migration Potential	Possible	30	30	10
	Unlikely	10	10	10
8. MEC Classification	Sensitive UXO	180	180	180
	UXO	110	110	110
	Fuzed Sensitive DMM	105	105	105
	Fuzed DMM	55	55	55
	Unfuzed DMM	45	45	45
	Bulk Explosives	45	45	45
9. MEC Size	Small	40	40	40
	Large	0	0	0

*N/A – Not Applicable: Surface cleanups for MEC would not be appropriate for site conditions where MEC is all in the subsurface.



CASE STUDIES

- M-1
- M-2
- F-1
- Br-1
- K-1
- BI-1



MEC HA Works When:

- ▶ Significant **Presence of Explosive Concern** and
- ▶ Defined **Receptor and Pathway** such that
- ▶ **Potential for Encounter** is Likely
- ▶ To Support Alternatives Analysis



Example 1

M-1



Site M-1: Presence of MEC

- Conceptual Site Model
 - ▶ 1870 Acres
 - ▶ RI Results
 - 13 76mm APHE
 - 2.36-inch Rockets
 - 105mm Smoke Canister
 - 155mm HE
 - ▶ Clearly Defined PRESENCE
 - on surface
 - likely subsurface



Site M-1: Receptors & Pathway

- Activities / Use
 - ▶ 10,000 people per year
 - ▶ Full Accessibility
 - ▶ Recreational (i.e., camping, hunting, hiking, lake access)
- Defined Exposure Pathway

Potential for Encounter is Likely
Unacceptable Hazard



Example 1 Summary - MEC HA Hazard Level Determination

Site ID:	Example 1: M-1		
Date:	2014		
		Hazard Level Category	Score
a. Current Use Activities		1	920
b. Future Use Activities			
c. Response Alternative 1: NOFA		1	920
d. Response Alternative 2: Surface Cleanup with ICs		2	750
e. Response Alternative 3: Surface and Subsurface Cleanup with ICs		3	575
f. Response Alternative 4: UU/UE		4	505
Characteristics of the MRS			
Is critical infrastructure located within the MRS or within the ESQD arc?			Yes
Are cultural resources located within the MRS or within the ESQD arc?			Yes
Are significant ecological resources located within the MRS or within the ESQD arc?			Yes



Acceptable?

- For the project goal:
Does a reduction to 575
reflect an acceptable
hazard?



MEC HA Technical Framework Structure

Explosive Hazard Component		Input Factor	Maximum Score	Weight
Severity	G	Energetic Material Type	100	10%
	Y	Location of Additional Human Receptors	30	3%
<i>Category total</i>			<i>130</i>	<i>13%</i>
Accessibility	O	Site Accessibility	80	8%
	O	Potential Contact Hours	120	12%
	B	Amount of MEC	180	18%
	B	Minimum MEC Depth/ Maximum Intrusive Depth	240	24%
	Y	Migration Potential	30	3%
<i>Category total</i>			<i>650</i>	<i>65%</i>
Sensitivity	G	MEC Classification	180	18%
	G	MEC Size	40	4%
<i>Category total</i>			<i>220</i>	<i>22%</i>
Total Score			1000	100%

G	Green total – Factors that will not change	320	32%
Y	Yellow Total – Factors unlikely to change	60	6%
B	Blue Total – Factors affected by clearance	420	42%
O	Orange Total – Factors affected by land use	200	20%



MEC HA Technical Framework Structure

Explosive Hazard Compon't	Input Factor	Baseline Score	Wt	Selected Altn'tv	Wt	UU/UE Altn'tv	Wt
Severity	Energetic Material Type	100	10.9%	100	17.4%	100	19.8%
	Location of Additional Human Receptors	30	3.3%	30	5.2%	30	5.9%
Category total		130	14.1%	130	22.6%	130	25.7%
Accessibility	Site Accessibility	80	8.6%	80	13.9%	80	15.8%
	Potential Contact Hours	40	4.3%	10	1.7%	10	2.0%
	Amount of MEC	180	19.6%	30	5.2%	30	5.9%
	Minimum MEC Depth/ Maximum Intrusive Depth	240	26.0%	95	16.5%	25	4.9%
	Migration Potential	30	3.3%	10	1.7%	10	2.0%
Category total		570	62.0%	225	39.2%	155	30.6%
Sensitivity	MEC Classification	180	19.6%	180	31.3%	180	35.6%
	MEC Size	40	4.3%	40	7.1%	40	7.9%
Category total		220	23.9%	220	38.2%	220	43.5%
Total Score		920	100%	575	100%	505	100%

Example 2: M-2



Site M-2: Presence of MEC

- Conceptual Site Model
 - ▶ Target Area (MRA)
 - ▶ 1997: TCRA on 381 acres (impact areas)
 - ▶ 2010: surface clearance on 345.5 acres; 170 MEC items
 - 2.36-inch rockets,
 - M9 rifle grenades, and
 - MK II hand grenades
 - ▶ 2013 RI:
 - Delineation. MRS 1
 - Undifferentiated frag/low levels MD identified
 - no MEC



Site M-2: Receptors & Pathway

- Activities / Use
 - ▶ 10,000 people per year
 - ▶ Full Accessibility
 - ▶ Recreational (i.e., camping, hunting, hiking, lake access)



Example 2 Summary - MEC HA Hazard Level Determination

Site ID:	Example Site M-2		
Date:	2014		
		Hazard Level Category	Score
a. Current Use Activities		1	950
b. Future Use Activities			
c. Response Alternative 1: NOFA		1	950
d. Response Alternative 2: Surface Cleanup with ICs		2	780
e. Response Alternative 3: Subsurface Cleanup with ICs		3	585
f. Response Alternative 4: UU/UE		4	515
Characteristics of the MRS			
Is critical infrastructure located within the MRS or within the ESQD arc?			Yes
Are cultural resources located within the MRS or within the ESQD arc?			Yes
Are significant ecological resources located within the MRS or within the ESQD arc?			Yes



But wait, we have already conducted surface and subsurface clearance !??



Site M-2: Alternatives 3 vs. 4

- Alternative 3: 585 Level 3
- Alternative 4: 515 Level 4

70 points? Where is it?



Alternatives 3 vs. 4

Minimum MEC Depth Relative to the Maximum Intrusive Depth Input

Factor Categories

Current Use Activities

The shallowest minimum MEC depth, based on the 'Cased Munitions Information' Worksheet:

0 ft

The deepest intrusive depth:

1 ft

The table below is used to determine scores associated with the minimum MEC depth relative to the maximum intrusive depth:

Baseline Condition: MEC located surface and subsurface.
After Cleanup: Intrusive depth overlaps with subsurface MEC.

Baseline Condition: MEC located surface and subsurface,
After Cleanup: Intrusive depth does not overlap with subsurface MEC.

Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.

Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth does not overlap with minimum MEC depth.

Baseline Conditions	Surface Cleanup	Subsurface Cleanup
240	150	95
240	50	25
150	N/A	95
50	N/A	25



Recommendations @ M-2

1. Baseline Score after TCRA or NTCRA is same as an area with no previous action.
 - ▶ “Amount of MEC” not scored as a result of characterization: Baseline Scored as a “Target Area.”
 - ▶ Training & Focused Discussion in Methodology Document
2. Calculated Reduction versus defining project remediation goal and “acceptability” is unclear.
3. Evaluation of UU/UE after the physical remedy



Example 3: Br-1



Site Br-1: Presence of MEC

- Conceptual Site Model
 - ▶ 280 Acre Target Area
- 2006 NTCRA Phase I
 - ▶ MEC/MD
 - 2.36-inch Rockets HE & Practice
- 2007-2010 NTCRA Phase II
 - ▶ MEC/MD
 - 2.36-inch Rockets HE & Practice
 - 60mm Mortar HE
- 2011 RI recovered no MEC/MD



Site Br-1: Receptors & Pathway

- Activities / Use
 - ▶ Residential
 - ▶ 100,000 to 999,999 receptor-hrs/yr

Presence is NOT clearly defined.

Receptors present, but

Pathway is UNCLEAR.

Where is the Probability for Encounter???



Br-1 Summary - MEC HA Hazard Level Determination

Site ID:	Example 3: Br-1	Hazard Level Category	Score
Date:			
a. Baseline Hazard		4	445
b. Response Alternative 1: NOFA		4	445
c. Response Alternative 2: Institutional Controls		4	445

Characteristics of the MRS

Is critical infrastructure located within the MRS or within the ESQD arc?	Yes
Are cultural resources located within the MRS or within the ESQD arc?	No
Are significant ecological resources located within the MRS or within the ESQD arc?	No



Recommendations @ Br-1

1. Training & Focused Discussion in Document for Baseline Score after TCRA or NTCRA- credit taken at baseline.
2. Need to focus baseline to be a “Risk Assessment”
 - ▶ Establish “Probability of Encounter”- then severity
 - ▶ Determine Acceptable or Unacceptable
 - ▶ Alternative analysis only occurs for unacceptable hazard.



Recommendations @ Br-1 (Continued)

- Methodology text needs to include:
 - ▶ Discussion of Remediation goal and “acceptability” for a Baseline risk determination
 - ▶ For Alternatives analysis
 - Consideration of ICs if removal does not meet acceptable goal
 - Evaluation of UU/UE after the physical remedy



Example 4: F-1



Site F-1: Presence of MEC

- Conceptual Site Model

- ▶ 326 Acre Target Area (with Burial Pit)

- ▶ 2012 RI Results

- MEC

- ▷ 60mm Mortar HE

- ▷ 2.36 Rocket HEAT

- ▷ M9 Rifle Grenade HE

- MD

- ▷ MD was primarily related to 2.36" Rockets

- ▷ Burial Pit with large concentration of MD (2.36 Rockets)

- ▶ **Clearly Defined PRESENCE**



Site F-1: Receptors & Pathway

- Activities / Use
 - ▶ 100,000 to 999,999 receptor hrs/yr
 - ▶ Full Accessibility
 - ▶ Residential, light agricultural (tilled plots and pastures), light commercial, and recreational.

Potential for Encounter is Likely

Unacceptable Hazard



Example 2 Summary - MEC HA Hazard Level Determination

Site ID:	Example Site F-1	Hazard Level Category	Score
Date:	2013		
a. Current Use Activities		1	950
b. Future Use Activities			
c. Response Alternative 1: NOFA		1	950
d. Response Alternative 2: Institutional Controls		1	925
e. Response Alternative 3: Surface Cleanup		2	755
f. Response Alternative 4: Surface Cleanup with ICs		2	755
g. Response Alternative 5: Surface/Subsurface Cleanup with ICs		4	490



Characteristics of the MRS

Is critical infrastructure located within the MRS or within the ESQD arc?	No
Are cultural resources located within the MRS or within the ESQD arc?	No
Are significant ecological resources located within the MRS or within the ESQD arc?	No

“Category Descriptions do not include LUCs.

- *...A project team can choose to run multiple iterations of the MEC HA with different Site Accessibility categories to reflect the effects of LUCs. This will help determine the impact of accessibility changes on the overall hazard assessment.”*

Source: MEC HA Methodology: Interim 2008



Focus on Engineering Controls

- *“If planned future land use controls for the MRS will change accessibility characteristics, ...Site Accessibility ...may change as well.”*
 - ▶ **Change in engineering controls**, such as installation or removal of fencing
 - ▶ The removal of heavy vegetation that impedes access to the MRS
 - ▶ The construction of a road to the area containing the MRS where one does not currently exist



Signs and Education

Table 4-5. Input Factor Categories: Site Accessibility

Category	Category Description	Required Information
Full accessibility	A site with no barriers to entry, including sites with signage but no fencing.	<ul style="list-style-type: none"> • Boundary of MRS • Location and type of fencing • Terrain and topography within and surrounding MRS • Location of transportation routes or access points to MRS • Location of any guarded areas
Moderate accessibility	A site with some barriers to entry, such as barbed wire fencing or rough terrain.	
Limited accessibility	A site with significant barriers to entry, such as unguarded chain-link fences or requirements for special transportation (e.g., boats or all-terrain vehicles) to reach the site.	
Very limited accessibility	A site with guarded chain-link fences, or terrain that requires special skills and equipment (e.g., mountain climbing) to access.	



Recommendations @ F-1

- Include guidance discussion of institutional controls to include:
 - ▶ Deed Restrictions – as existing for the Baseline, and new for alternatives analysis
 - ▶ Education
 - ▶ Signage
 - ▶ Other institutional controls
- Include scoring criteria for same.



Example 5: K-1



Site K-1: Presence of MEC

- Conceptual Site Model
 - ▶ 900+ acre Target Area
 - ▶ Artillery (Mk I 150mm, HE)



Site K-1: Receptors & Pathway

- Activities/Use: Natural Area Reserve
 - ▶ Full Accessibility selected- Trail Hiking/beach access at the boundary;
 - Very Limited Accessible – Remainder of the MRS due to terrain
 - ▶ Some Hours – Limited portion of the MRS
 - Very few – Remainder of the MRS
 - ▶ Future land use – development not anticipated



Example 1 Summary - MEC HA Hazard Level Determination

Site ID: Example 1		Hazard Level Category	Score
Date: 2014			
a. Current Use Activities		2	795
b. Future Use Activities			
c. Response Alternative 1: LUCs		2	795
d. Response Alternative 2: Limited surface removal		4	525
e. Response Alternative 3: Full surface removal		4	525
Characteristics of the MRS			
Is critical infrastructure located within the MRS or within the ESQD arc?		Yes	
Are cultural resources located within the MRS or within the ESQD arc?		Yes	
Are significant ecological resources located within the MRS or within the ESQD arc?		Yes	



Depth

The deepest intrusive depth:

The table below is used to determine scores associated with the minimum MEC depth relative to the maximum intrusive depth:

0 ft

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240	150	95
Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.	240	50	25
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.	150	N/A	95
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth does not overlap with minimum MEC depth.	50	N/A	25



Recommendations @ K-1

- Guidance of addressing access limitations for different portions of an MRS, to allow determination of acceptable versus unacceptable hazard for each area within an MRS without necessitating delineation.
- Flexibility for actual depth resulting from RI, rather than assumed surface and subsurface
- Focus on **PROBABILITY OF ENCOUNTER**



Example 6: BI-1



Site BI-1: Presence of MEC

- Conceptual Site Model
 - ▶ 13 Acre Rocket Range AT Target Area
 - ▶ 2 Acre Rifle Grenade Target Area
- 2013 Remedial Investigation
 - ▶ MEC/MD
 - M9A1 Rifle Grenades HE
 - M17 2.25in Fragmentation Rifle Grenade
 - M11 Rifle Grenade Body
 - M7 2.36-inch Practice Rocket
 - M6A3 Anti-Tank Rocket HE



Site BI-1: Receptors & Pathway

- Site Activities / Use
 - ▶ Limited Accessibility
 - ▶ Very Low Contact Hours
 - <10,000 receptor-hrs/yr



Example BL-1 Summary - MEC HA Hazard Level Determination

Site ID:	Example 1: BL-1		
Date:	2014		
		Hazard Level Category	Score
a. Current Use Activities		2	810
b. Future Use Activities			
c. Response Alternative 1: NOFA		2	810
d. Response Alternative 2: ICs		2	810
e. Response Alternative 3: Surface with ICs		3	655
f. Response Alternative 4: Subsurface ...with ICs ??		4	435
Characteristics of the MRS			
Is critical infrastructure located within the MRS or within the ESQD arc?			Yes
Are cultural resources located within the MRS or within the ESQD arc?			No
Are significant ecological resources located within the MRS or within the ESQD arc?			Yes



Weighting

- Driven by MEC Classification
 - ▶ 2.36 inch HE anti-tank rocket fragments
 - ▶ rifle grenades (M9A1 and M17) fragments
- Contact hours - 1,288hrs/yr for the MRS
- Limited Accessibility defined
 - ▶ “Low” **Potential for Encounter**
 - ▶ Not clearly reflected by the baseline score of 810, relative to other Target areas?
 - ▶ So what will be acceptable in remedy?



Summary



Remember

- *“A good ~~pilot~~[Environmental Scientist] is compelled to evaluate what's happened, so he can apply what he's learned.”*



-Viper



The Heart of MEC HA

- *“Risks from MEC explosive hazards are evaluated as being either **present or not present**. If the **potential for an encounter** with MEC exists, the potential that the encounter may result in death or injury also exists.”*

Defining:

POTENTIAL for ENCOUNTER.



Limitation

- No matter what remedy is selected, the reduction of score is limited.
 - ▶ Energetic Material type
 - ▶ MEC Classification
 - ▶ MEC Size

Score is Not a
Probability of Encounter



Limitation

- Baseline should be the first and only score resulting from the RI
 - ▶ *Defining Levels 1 through 4 does not differentiate **Acceptable versus Unacceptable***
 - ▶ *Does not help PDT determine need to move forward or not; Usually decided w/o MEC HA*

Score does not start with
Probability of Encounter



Limitation

- Without differentiating Acceptable and Unacceptable,
(a Baseline Risk Assessment)
 - ▶ *Undefined remediation goals*

Probability of Encounter



Limitation

- Amount of MEC:
 - Selected as “type” of range, rather than the distribution resulting from the RI.
 - Example: Target Areas:
 - Once Probability of Encounter is Established, assess Sensitivity and severity.
 - But in a “Target Area:, Not all MEC are NOT created equal.
 - Need a better way to make support better assumptions on “amount” for real world.



Limitation

- Document LUCs focuses on Engineering Controls, and does not clearly acknowledge behavioral modifications from signage, deed restrictions, or other Institutional Controls (ICs).



Limitation

- Methodology document seems to imply some flexibility in use of the tool, but static value structure does not give credit or flexibility in score reduction
 - ▶ Inconsistency in application/interpretation
 - ▶ Most Decisions are outside of MEC HA.
 - Acceptable or Unacceptable?
 - ▶ Additive nature, rather than multiplicative
 - as probabilities are usually determined



Limitations

- Weighting
 - ▶ Factors weighted heavily on the TYPE of munitions without accounting first for the **probability of encounter**
 - ▶ Chapter 5.1 of the Methodology
 - HL 3 – implies this is usually indicative of sites where surface cleanup already conducted
 - HL 4 – implies this is usually indicative of sites where subsurface cleanup already conducted

But we are just finishing the RI...



Suggestions

- Focus of scoring to establish “**probability of encounter**”
 - ▶ presence + receptor/pathway input factors
- Then, assess the **sensitivity** of MEC and **severity** for an unintentional detonation with respect to the **probability**.
(define risk)
- Finally, Differentiate between Acceptable and Unacceptable



Final Message

- Let's Continue to Work Together to:
 - ▶ Optimize
 - ▶ Keep the Good
 - ▶ Fix the Ugly
 - ▶ Not Start all Over
 - ▶ Make it better



Ultimate Goal: Improve our Decision Process to Feasibly Optimize Protectiveness



COMMENTS / QUESTIONS?



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