MEC RISK ASSESSMENT

Risk Scenarios and the Risk Management Methodology

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RISK

⚠ DANGER
Explosive Hazard
Do NOT touch!

AGENDA

❖ Risk Management Methodology Overview

– The basics of the RMM

❖ Feeding the risk assessment

– What data are needed?

❖ Exposure assessment

– Developing risk scenarios

❖ Other stuff

– Common RMM mistakes

– OSD RMM update

RISK MANAGEMENT METHODOLOGY OVERVIEW

❖ RMM is the recommended method

– *Decision Logic to Address Risks Associated with Explosive Hazards, and to Develop RAOs for MRSs* (i.e., Risk Management Methodology)

• Established as interim guidance on 3 Jan 2017 for a two-year trial period

– Has been extended to Mar 2022 (and beyond…)

• Purpose

– RI baseline risk assessment

– FS development

• Uses decision matrices to guide PDTs through risk management process

• Now being updated by Office of the Secretary of Defense (OSD)

Baseline MEC risk assessment

Risk Scenarios support development of Remediation Goals
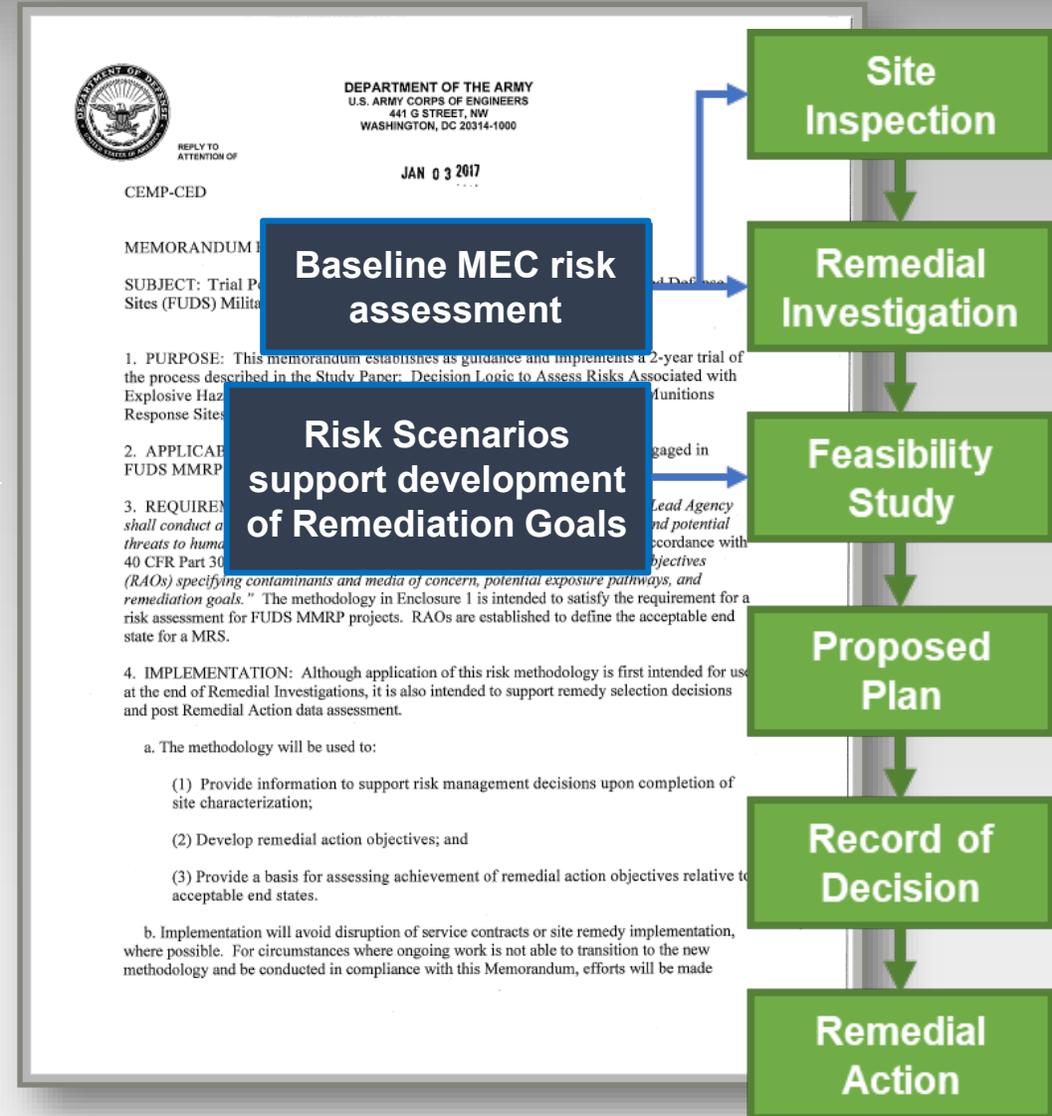
RISK MANAGEMENT METHODOLOGY OVERVIEW

❖ Why use the RMM?

– Consistent tool to support risk-based decisions at MRSs

– Evaluates MEC exposure pathway

Source → Encounter → Interaction → Incident

and the likelihood receptors will

- Encounter MEC
- Interact with MEC
- Experience a harmful incident

– Considers site-specific factors that influence risks from MEC exposure

❖ How to use the RMM

– Project teams can use the RMM to

- Facilitate discussion
- Build consensus on risk management decisions

RISK MANAGEMENT METHODOLOGY MATRICES

❖ Considers three primary risk factors
  – Likelihood of encounter (Matrix 1)
    • Amount of MEC
    • Access conditions (frequency of use)
  – Severity of incident (Matrix 2)
    • Likelihood of encounter (from Matrix 1)
    • Munitions severity
  – Likelihood of detonation (Matrix 3)
    • Likelihood to impart energy
    • Munitions sensitivity

❖ And then helps the project team draw conclusions (Matrix 4)
  – Based on the three factors, is overall site risk *acceptable* or *unacceptable*?

❖ These are being modified slightly by OSD
  – More on this later
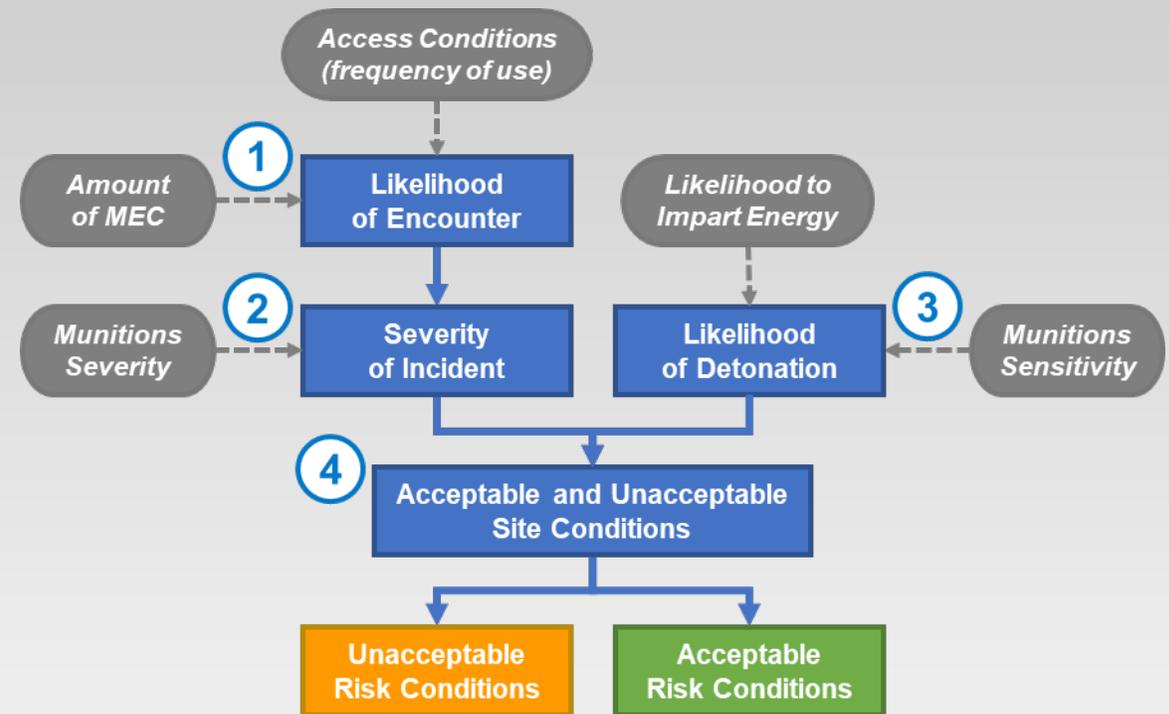
INITIAL DATA NEEDS

What data are needed to support the MEC Risk Management Methodology?

DATA NEEDS: LIKELIHOOD OF ENCOUNTER (MATRIX 1)

❖ Data needs for
  – *Amount of MEC*
    • MEC presence and anomaly density
      – HUA, LUA, or NEU?
    • Intrusive results
      – MEC types and vertical profile
    • Other observations or data, such as duration of use
    • **SOURCES**
      – RI results, site history
  – *Access conditions (frequency of use)*
    • Land use information
      – Receptors and associated activities
      – Frequency
    • **SOURCES**:
      – Stakeholder interviews, institutional analysis
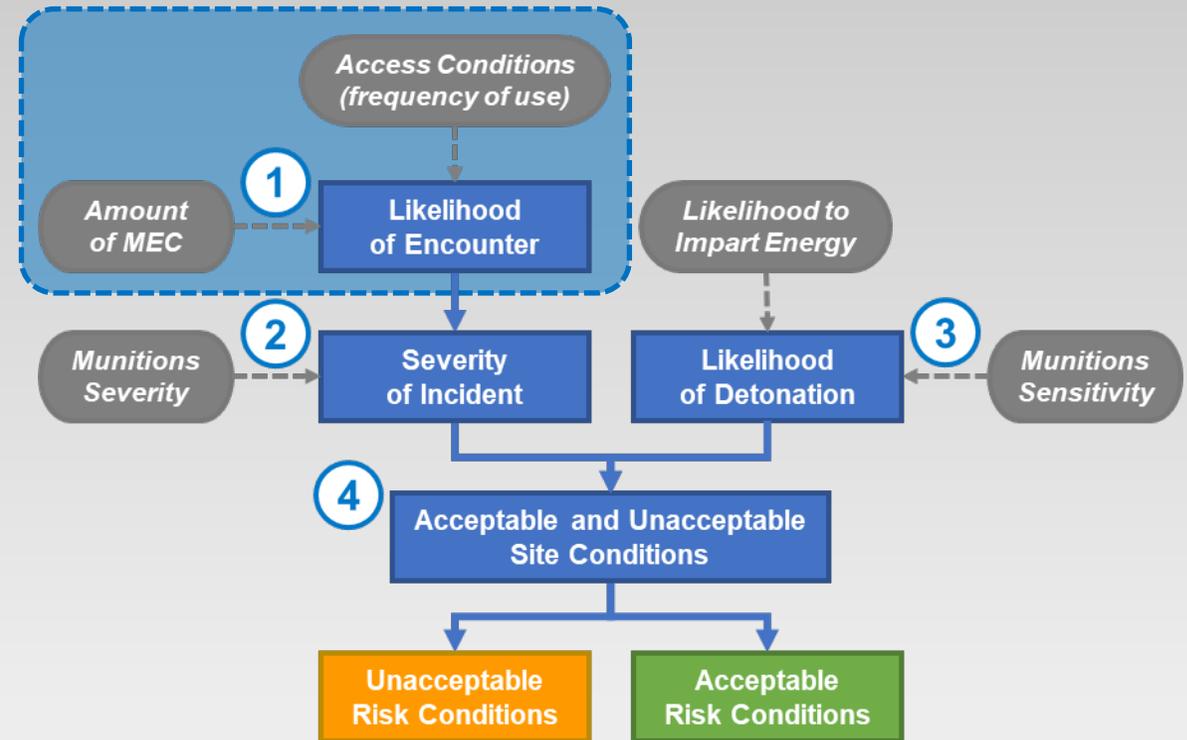
DATA NEEDS: SEVERITY OF INCIDENT (MATRIX 2)

❖ Data needs for

  – *Likelihood of encounter*

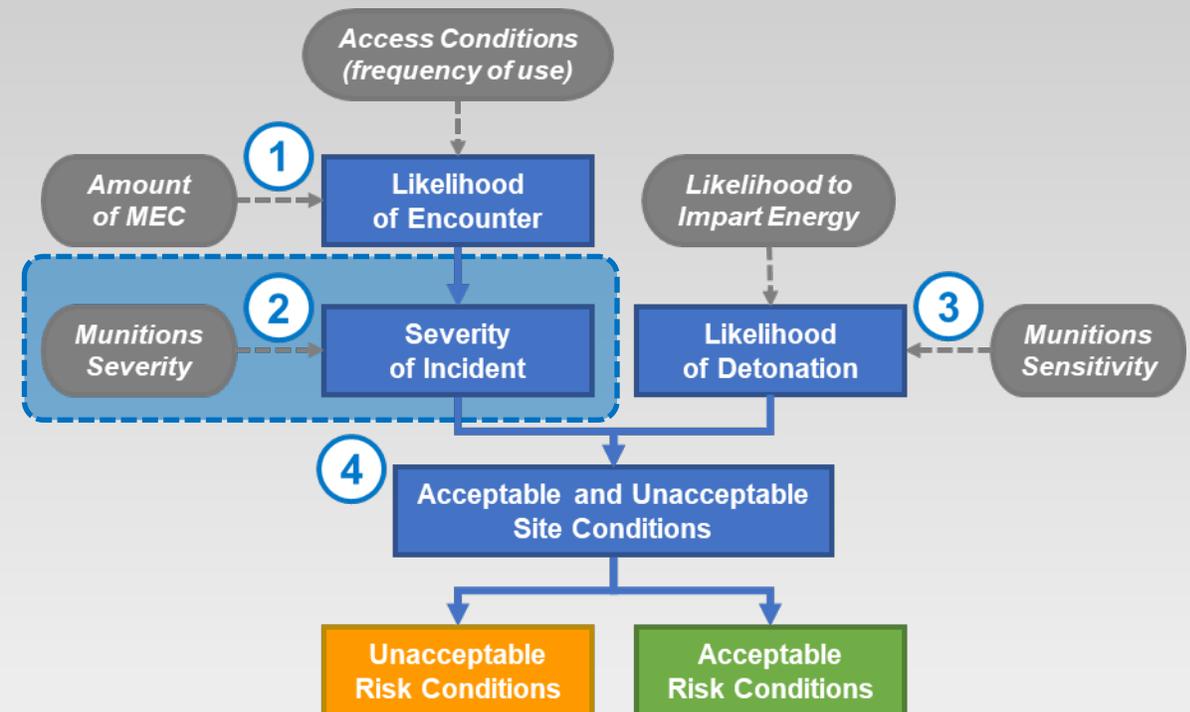 • **SOURCE**: Output from Matrix 1

  – *Munitions severity*

  • Munitions data

  • **SOURCES**
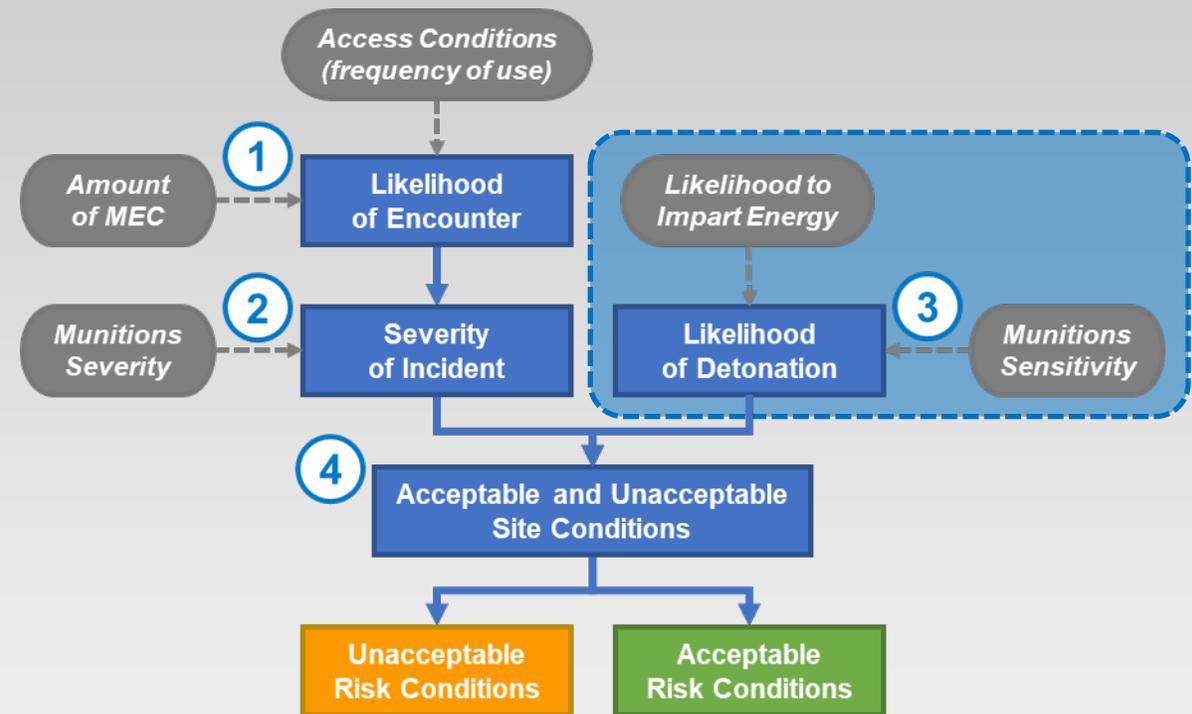   – OESS and UXO tech input
    – Munitions data sheets

DATA NEEDS: LIKELIHOOD OF DETONATION (MATRIX 3)

❖ Input Factors

– *Likelihood to impart energy*

• Land use information

– Receptors and associated activities

– Frequency

• **SOURCES**

– Stakeholder interviews, institutional analysis

– *Munitions sensitivity*

• Munitions data

• **SOURCES**

– OESS and UXO tech input

– Munitions data sheets

DETAILED LAND USE DATA ARE NEEDED

General Site Description: Describe historic munitions use followed by the current site description. Include acreage, type of former site and describe general current use (residential, commercial/industrial, agricultural, recreational, etc.).

1. *User Populations (Potential Receptors):* Onsite or adjacent populations, include current and reasonably anticipated future users, including seasonal users and visitors that could reasonably access and use the site.

2. *Frequency and Duration of Site Use:* Describe the frequency of use; the potential duration (e.g., number of hours, days) of activities by user (e.g., residents, workers, recreational users) to estimate the potential contact hours at a site each year. This may include seasonal variations.

3. *Outdoor Activities:* List potential current and future activities (e.g., gardening, farming, grazing) and/or recreational activities (e.g., swimming, boating, hiking, camping). Activities should match with the receptors (e.g., residents, maintenance crews, farmers, recreational users) identified in Factor 2.

| *Horizontal Coverage of Land Use*	*Vertical Land Use*
4. **Spatial coverage of potential site activities that would traverse the site.**	5. **Depth and Energy associated with site activities that may interact with an item.**
Describe scale of EACH receptor and activities identified Discuss the likely coverage of the site over a year. Consider barriers (natural or manmade) to access; populations that could reasonably or are known to access the site and ease of access over a year.	Describe depth of activities identified in Factors 3. Consider energy associated with intrusive activities (handheld trowels and shovels versus use of farming equipment)

DATA COLLECTION FOR MEC RISK ASSESSMENT

❖ Take advantage of SPP

- – Meetings give access to stakeholders
- – ROE process provides other opportunities

❖ **ALL data** required to complete RMM should be included in DQOs

- – **Including** data on possible receptors and activities (i.e., land use), as well as terrain and accessibility issues

❖ AND the plan for collecting these data should be documented in the QAPP

- – Include a definable feature of work for risk assessment data

PLAN AHEAD

Include ALL requirements in DQOs, not just MEC and DGM...
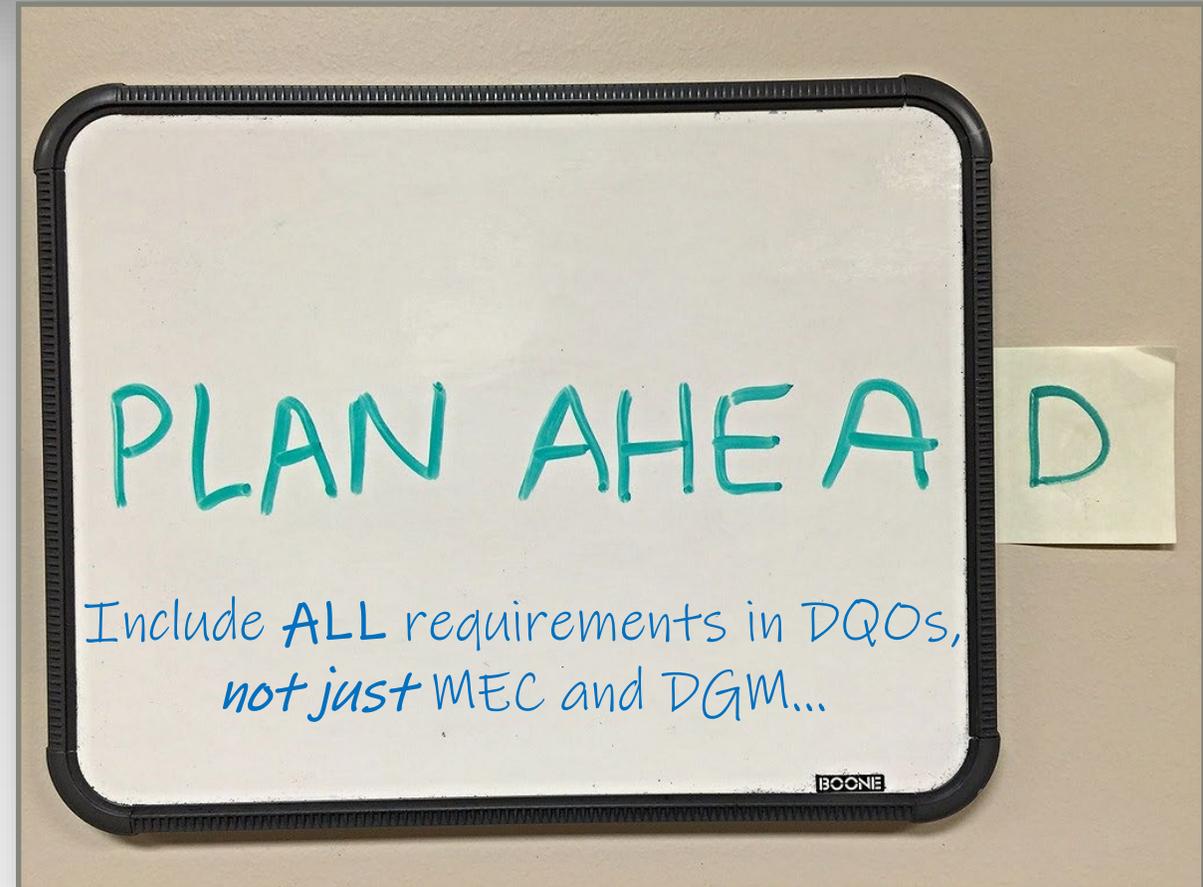
MEC EXPOSURE ASSESSMENT

How do we organize and use the data for the MEC Risk Management Methodology?

3 EASY STEPS TO COMPLETE THE RISK ASSESSMENT

1. **ESSENTIAL** first step
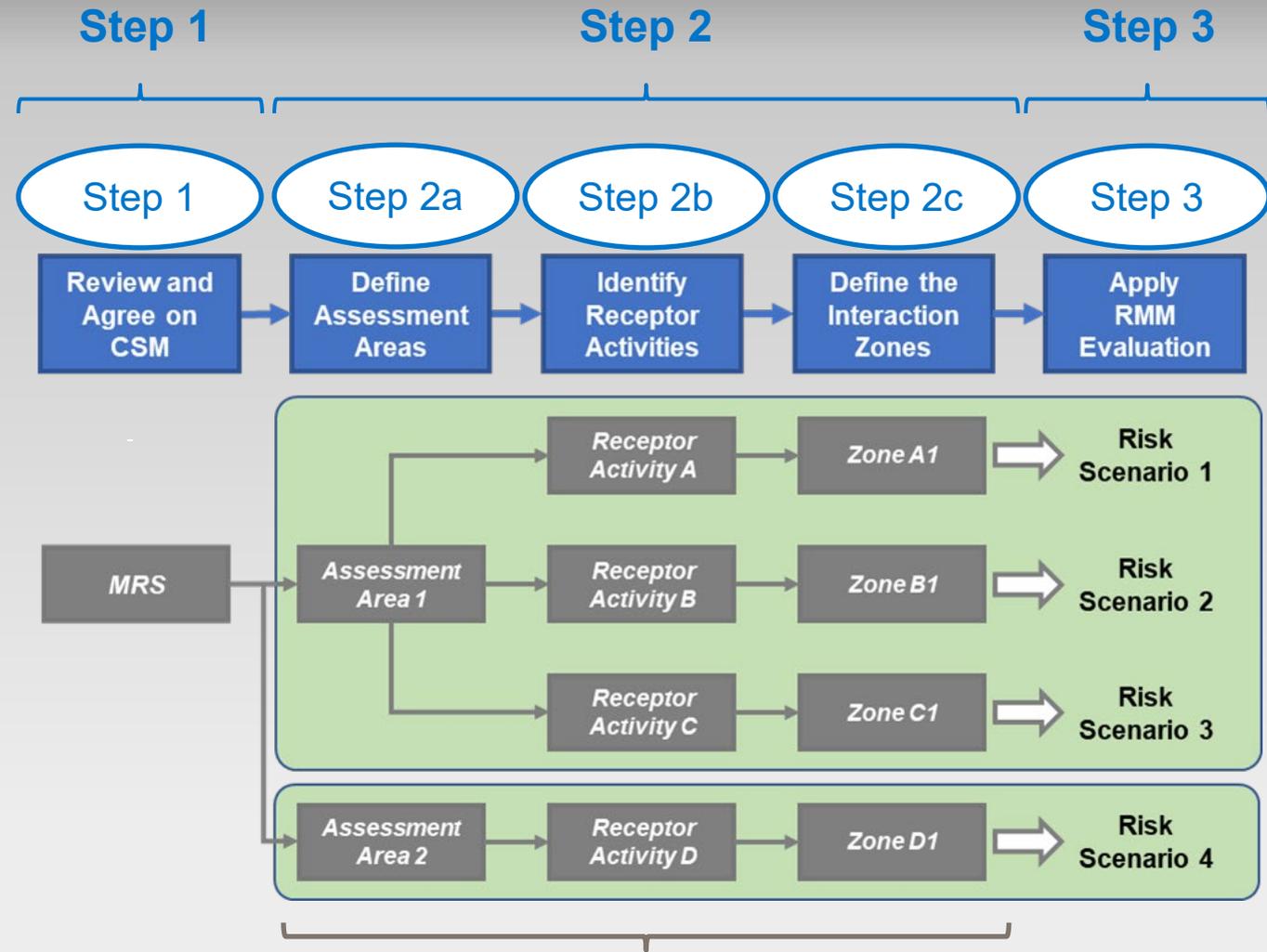   - Review the CSM
   - Achieve PDT consensus
2. Develop *Risk Scenarios*
   - Define Assessment Areas
   - Identify Receptor Activities
   - Define Interaction Zones
3. Apply RMM Evaluation (or similar) to *each risk scenario*
   - Risk assessed for all receptors and their activities
   - Supports realistic site-specific remediation goals

Develop Site-specific Risk Scenarios

STEP 1: TRY TO ACHIEVE CONSENSUS ON THE CSM

❖ The CSM is the project foundation
 – What we know about the MRS guides the investigation AND our conclusions
❖ General information needed for MRS
 – Munitions characteristics
  • HUAs, LUAs, and NEUs
  • Known/suspected MEC
  • Estimated vertical extent of MEC
 – Land use information
  • Land use activities
   – Horizontal coverage and frequency
   – Intrusive activities, depth, and frequency
 – Depth profiles (i.e., vertical CSM)
  • Compare estimated vertical extent of MEC to depth of intrusive activities

If team members are still asking lots of "what if" questions, then you probably <u>don't</u> have consensus

STEP 2: DEVELOP RISK SCENARIOS

❖ **The risk scenarios provide the basis of the RMM evaluation**

– Each reflects a unique combination of circumstances describing potential risk conditions for associated receptors

– Current and future land uses

❖ **Each risk scenario includes**

– Assessment Area

– Receptor Activity
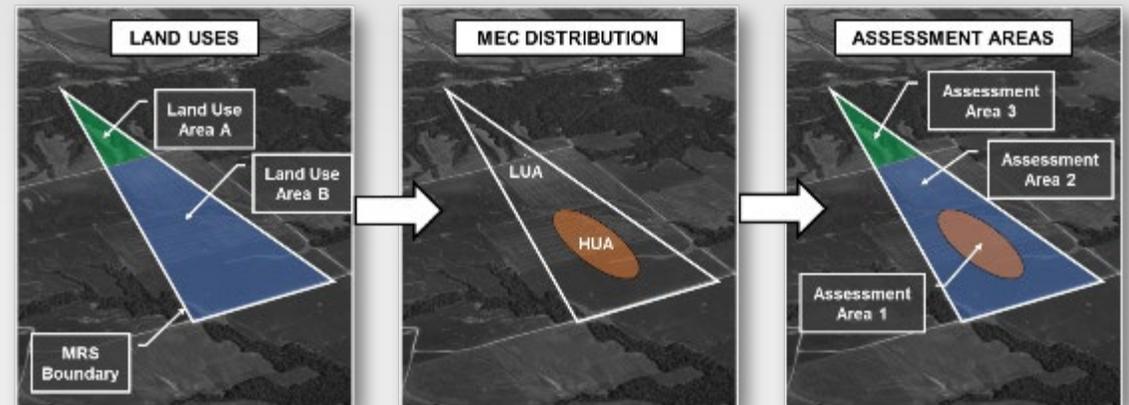
– Interaction Zone

Develop Site-specific Risk Scenarios

Preparatory Step	Purpose
STEP 2a Define Assessment Areas	Describe discrete parts of the MRS based on similar levels of risk using data on land use and known or suspected MEC
STEP 2b Identify Receptor Activities	Describe the different land use activities taking place within each assessment area
STEP 2c Define Interaction Zones	Look at the depths of potential interaction with known or suspected MEC for each receptor activity

STEP 2a: DEFINE ASSESSMENT AREAS

❖ Assessment areas
  – Different areas of an MRS
    • Different MEC characteristics
    • Different expected quantities
      – e.g., HUA (many) or LUA (very few to maybe none)
    • Different land uses or activities that are conducted in different areas or at different frequencies

❖ In general, site is divided by likelihood of MEC and activity type(s)

❖ Normally, assessment areas do not overlap
  – There may be multiple receptor activities within each assessment area

❖ **NOTE**: assessment areas may influence the remedial alternatives you design

	Types of Activity	
Likelihood of MEC Presence	High likelihood, Lots of activity	High likelihood, Little activity
	Low likelihood, Lots of activity	Low likelihood, Little activity

LAND USES — Land Use Area A, Land Use Area B, MRS Boundary

MEC DISTRIBUTION — LUA, HUA

ASSESSMENT AREAS — Assessment Area 1, Assessment Area 2, Assessment Area 3

STEP 2b: IDENTIFY RECEPTOR ACTIVITIES

❖ Receptor Activities

– Types and frequencies of land use activities

  • Driven by different activities in *different* areas

  • Address different activities occurring in the same area

– Activities may have varied

  • Exposure "extents"

  • Frequencies

  • Different intrusive depths

  • Time periods (i.e., current/future)

❖ This may lead to further refinement of assessment areas

❖ May influence the remedial alternatives you design
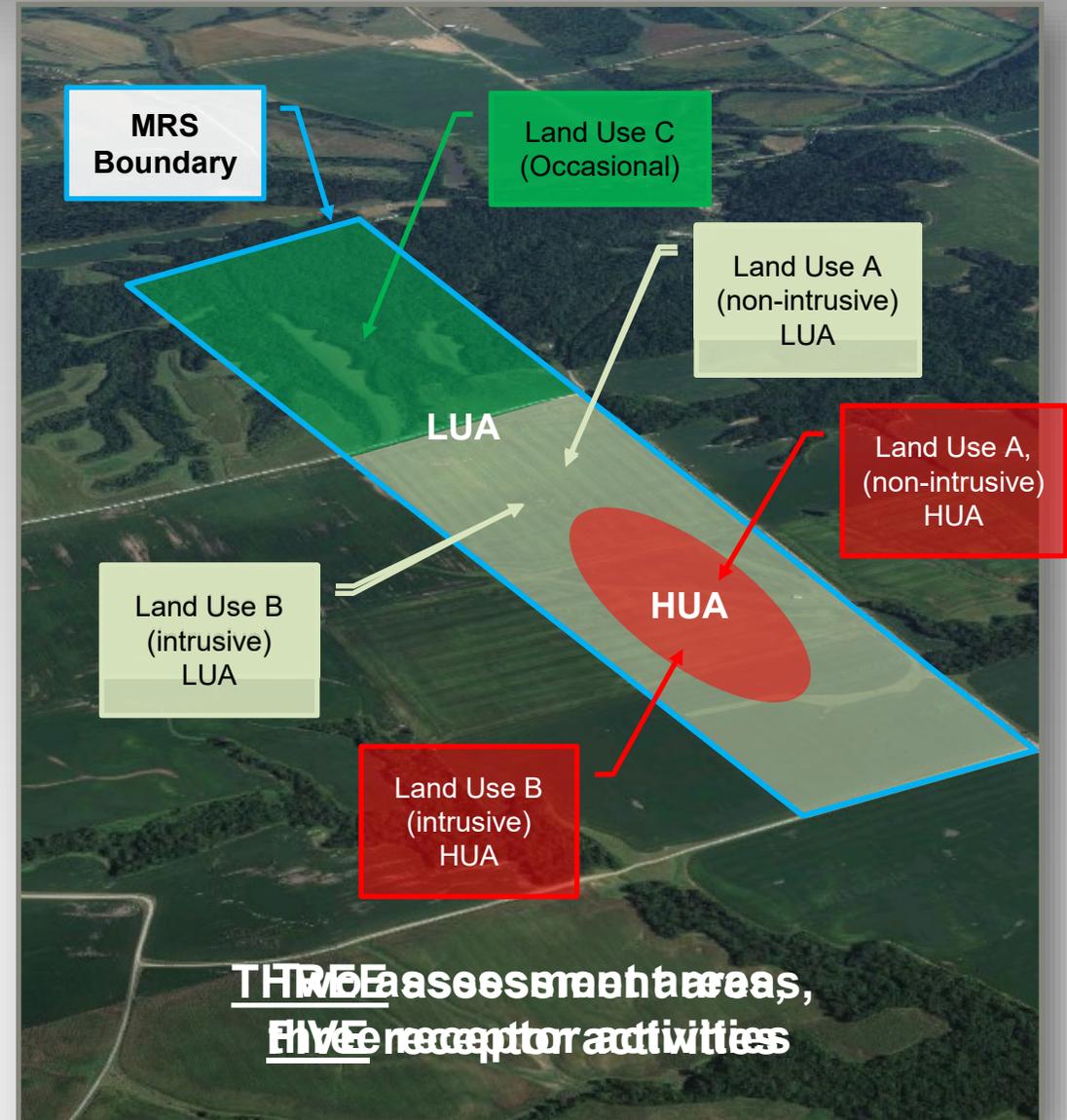
STEP 2b: IDENTIFY RECEPTOR ACTIVITIES – DATA

General Site Description: **Describe historic munitions use followed by the current site description. Include acreage, type of former site and describe general current and reasonably anticipated future use (residential, commercial/industrial, agricultural, recreational, etc.).**

1. *User Populations (Potential Receptors):* Onsite or adjacent populations, include current and reasonably anticipated future users, including seasonal users and visitors that could reasonably access and use the site.

2. *Frequency and Duration of Site Use:* Describe the frequency of use; the potential duration (e.g., number of hours, days) of activities by user (e.g., residents, workers, recreational users) to estimate the potential contact hours at a site each year. This may include seasonal variations.

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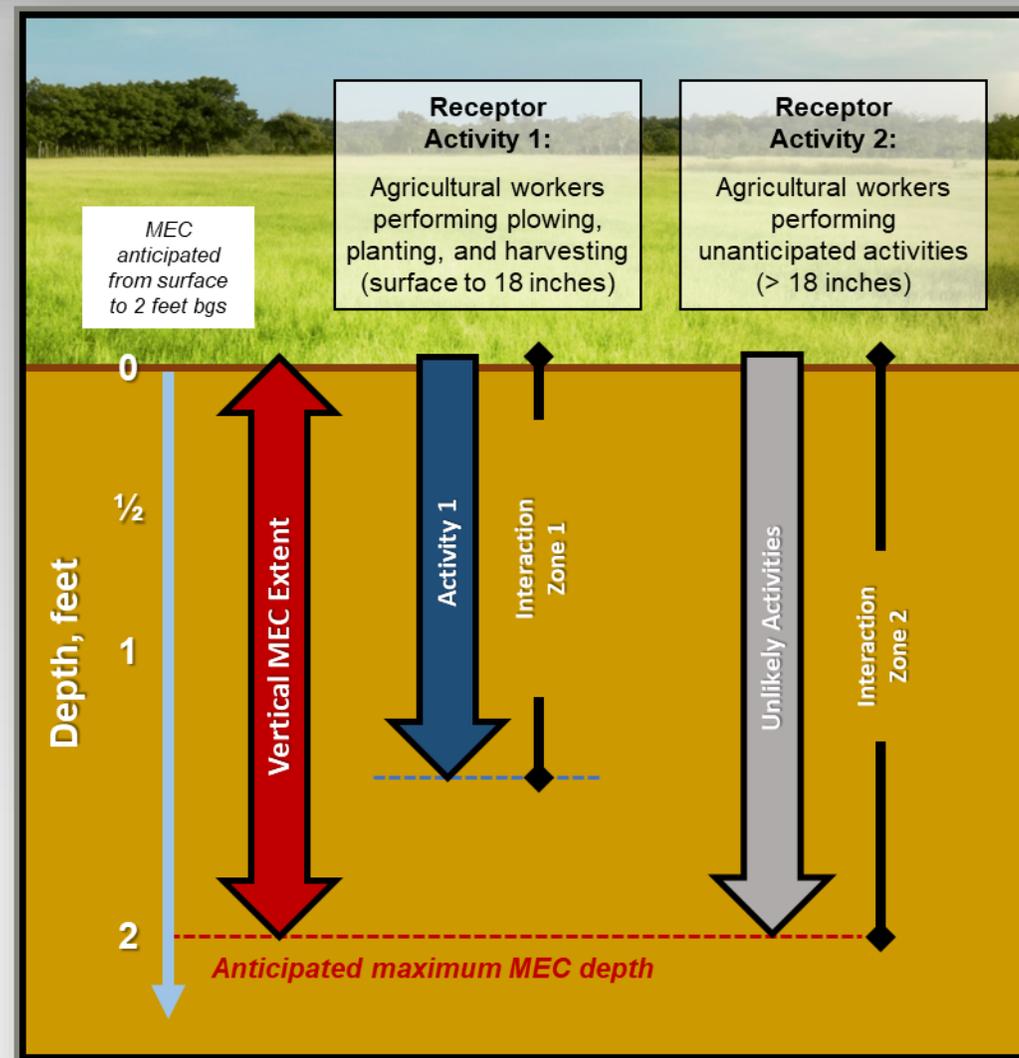| *Horizontal Coverage of Land Use*	*Vertical Land Use*
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STEP 2c: DEFINE THE INTERACTION ZONES

❖ Describe the depths of potential interaction for each receptor activity

– May be "surface only"

• Consider what that means

❖ Unique interaction zones should be defined for each receptor activity

– Anticipated vertical MEC extent

– Land use depths *and frequencies*

❖ Note: interaction zone is a ***volume***

– Describes the interaction depth over an assessment area

(V = interaction depth x risk scenario area)

MEC anticipated from surface to 2 feet bgs

Receptor Activity 1: Agricultural workers performing plowing, planting, and harvesting (surface to 18 inches)

Receptor Activity 2: Agricultural workers performing unanticipated activities (> 18 inches)

Depth, feet

Vertical MEC Extent

Activity 1

Interaction Zone 1

Unlikely Activities

Interaction Zone 2

Anticipated maximum MEC depth

HYPOTHETICAL EXAMPLE

❖ Example MRS
  – Practice Bombing Range
    • HUA and LUA
  – Land use
    • NW Area – Crops/agriculture
    – Activity A – Crop picking
      » 30 people for one month/year
      » Surface use only
    – Activity B – Plowing
      » Four people for two weeks/year
      » Intrusive to 60cm bgs
    • SE Quarter – Park/recreation
    – Activity C – Hiking/walking
      » 500 people for four hours/year
      » Surface use only
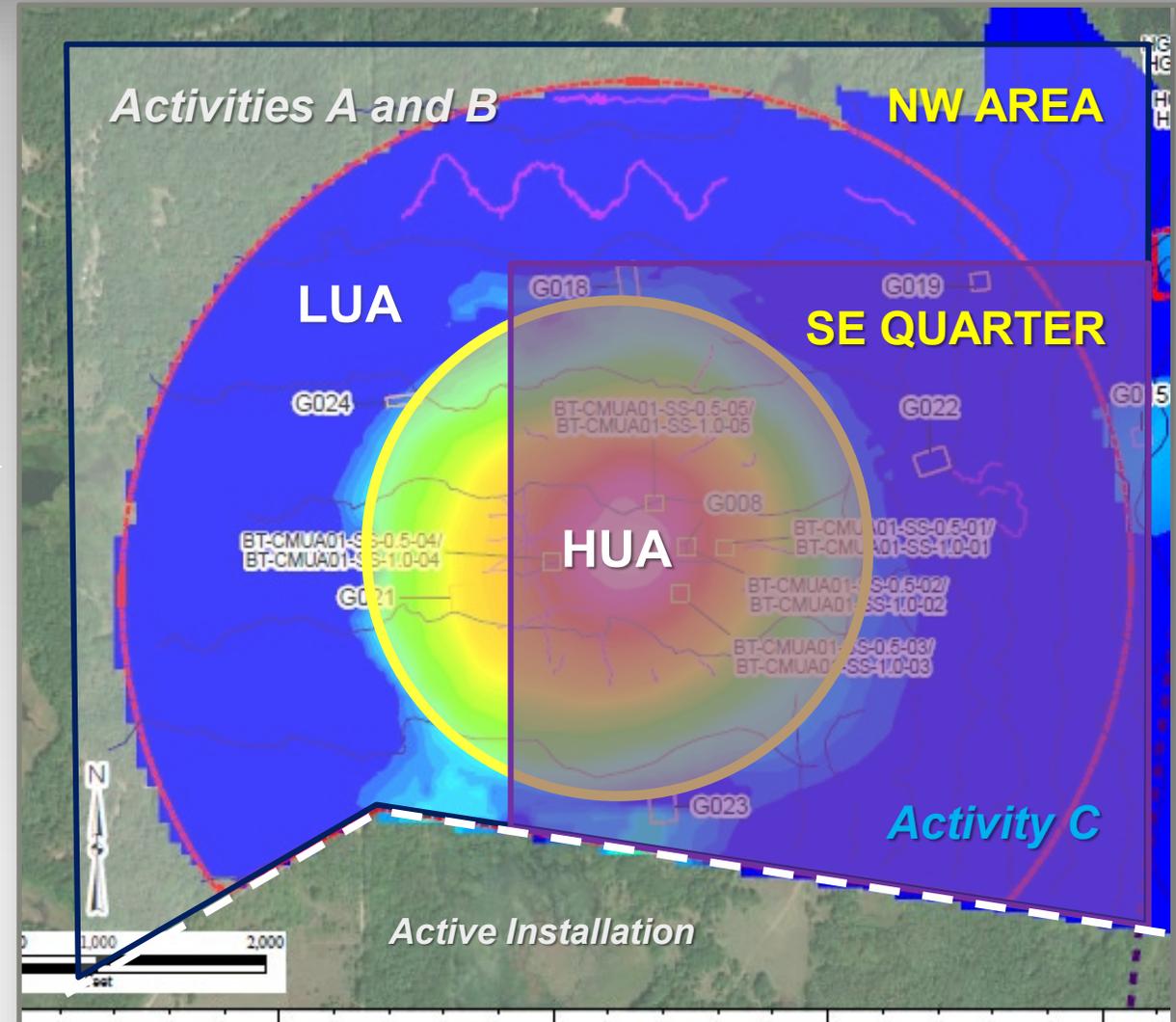
POSSIBLE RISK SCENARIOS

| Assessment Area *(MEC distribution/land use activities)*	Receptor Activity *(receptor type, activity, frequency)*	Interaction Zone *(depth assoc. with activity)*	Risk Scenario
HUA, Crops/agriculture	Agricultural workers, crop picking, 30 people for one month/year	Surface only	1
	Agricultural workers, plowing, four people for two weeks/year	Surface to 60cm bgs	2
LUA, Crops/agriculture	Agricultural workers, crop picking, 30 people for one month/year	Surface only	3
	Agricultural workers, plowing, four people for two weeks/year	Surface to 60cm bgs	4
HUA, Park/recreation	Recreational users, hiking/walking, 25,000 people for four hours/year	Surface only	5
LUA, Park/recreation	Recreational users, hiking/walking, 25,000 people for four hours/year	Surface only	6

STEP 3: APPLY RMM EVALUATION

❖ Purpose

– Framework *for the PDT to evaluate* risks from explosive hazard

- NOT a black box!

– Help to identify areas of acceptable and unacceptable risk

- Remedial response or NFA?

– Highlight risk drivers

- Facilitates development of remedial alternatives for FS

❖ RMM has been addressed in prior M2S2 webinars

– Not going into detail today
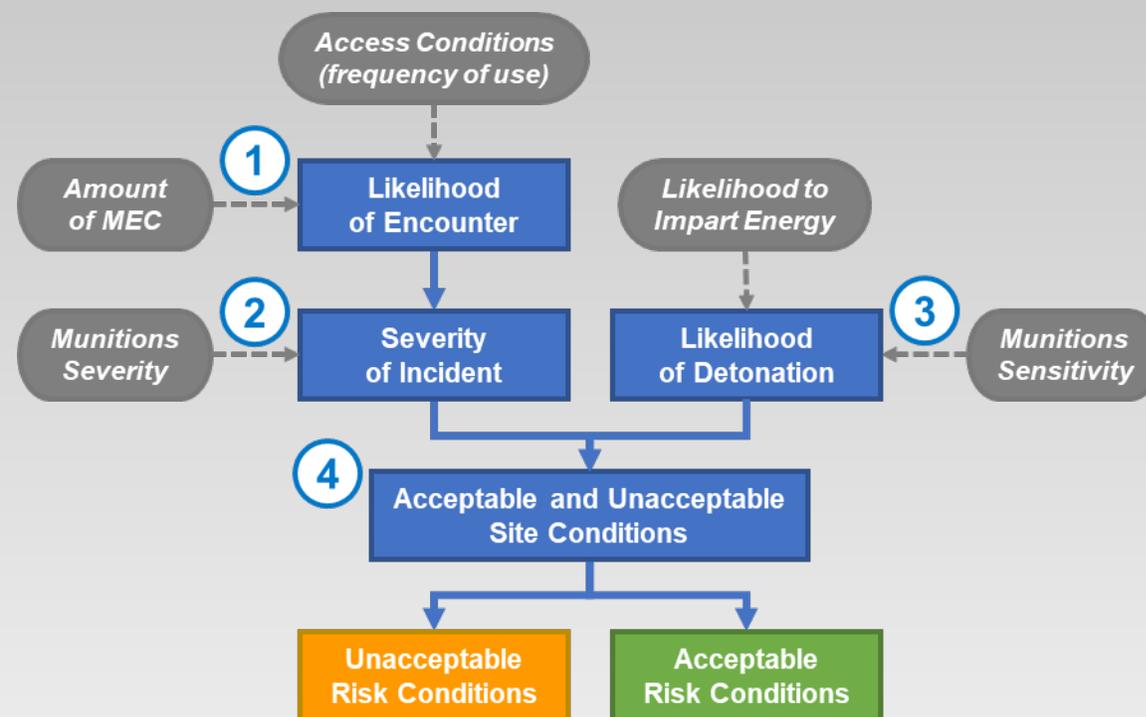
COMMON MEC RISK ASSESSMENT MISTAKES

Prepare for the soapbox(es)!

COMMON MISTAKES – INSUFFICIENT PDT DISCUSSION

❖ **MEC risk assessment is QUALITATIVE!**

- RMM is a framework to help *the PDT evaluate* risks from explosive hazards
- PDT must collaborate on the process, including inputs

❖ We're doing it **WRONG…**

- … if the *1st time* the PDT sees the MEC risk assessment is the RI Report
- … if the *1st time* the regulator sees the MEC risk assessment is the RI Report

❖ Decision makers should be involved in the process in a meaningful way

USE the SPP meetings throughout the project!

COMMON MISTAKES – ONLY ONE RISK SCENARIO

❖ It is possible to evaluate risk using a single risk scenario

– Must be absolute worst case

❖ **HOWEVER**

– This is likely NOT the *best way* to do it

- Potentially ignores multiple risk pathways
- Does not tell the whole story

❖ Most MRSs likely should have at least two or three risk scenarios

– Complex MRSs may have many more

❖ Risk scenarios help to support RAOs, which guides alternative development

– It's *worth the time* to develop and evaluate a range of scenarios

Using too few risk scenarios may not describe the situation clearly enough to support sound risk management decisions

COMMON MISTAKES – NOT ENOUGH LAND USE DATA

❖ Land use data included in PAs and/or SIs is typically general

– e.g., "land use is recreational"

❖ This is insufficient for RMM evaluation with making multiple assumptions

❖ Critical to have data to support meaningful risk scenarios

– Specific activity descriptions

– Numbers of people involved

– Horizontal coverage (areas)

– Frequencies

– Intrusive depths

❖ Plan to collect this information and then collect it!

Insufficient Data

COMMON MISTAKES – "RMM MADE ME DO IT!"

❖ RMM does NOT have a will of its own
  – RMM does not *determine* risk

❖ RMM is a framework to help *the PDT evaluate* risks from explosive hazards
  – Tool to help the PDT and stakeholders
  – *Guides discussion and helps them reach consensus on risk*
  – The PDT choses the inputs
  – **The PDT makes the decision** using RMM, *not the other way around*

❖ In other words…
  – *RMM is NOT a "black box"!*

"Don't worry… RMM says everything is fine!"

"NO ONE CAN BE TOLD WHAT THE MATRIX IS… YOU HAVE TO SEE IT FOR YOURSELF…"

Upcoming changes and the DoD Risk Management Methodology Matrix Trilogy

THE NEW PROPOSED RMM MATRICES

❖ OSD is working on improvements with the Munitions Response Dialogue
  – Simplify RMM
    • Reduced matrices to three
      – Likelihood of Encounter (Matrix 1)
      – Likelihood of Interaction (Matrix 2)
      – Risk of Harmful Incident (Matrix 3)
    • Aligns better with MEC exposure pathway
  – Provide list of MEC "hazard codes" developed by Army
    • Standardize munitions inputs
  – Provide more examples to guide project teams in using the RMM
    • Clearer guidance on how to use the method

CONNECTION TO MEC EXPOSURE PATHWAY
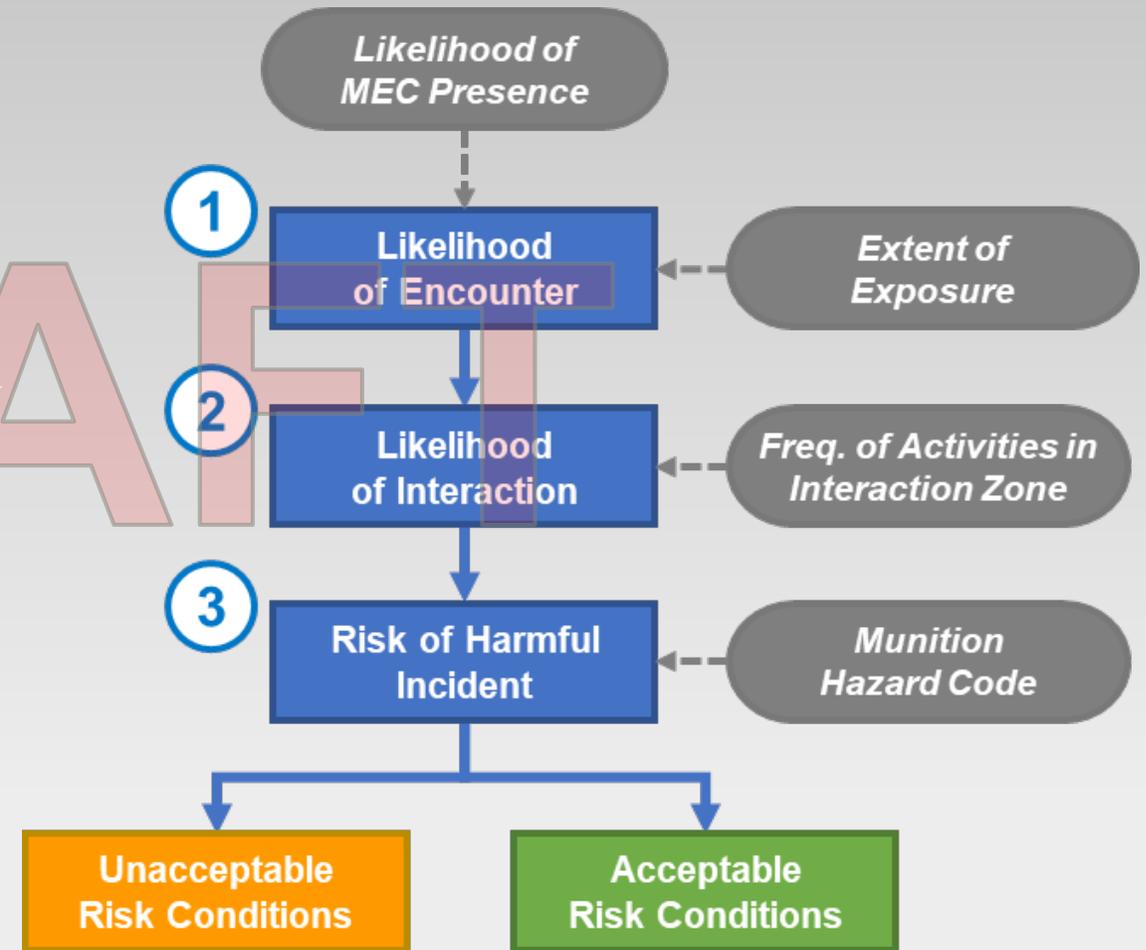
❖ Concurrent EM 200-1-15 update has allowed better link to RMM

– Risk assessment and RAO development have been associated with MEC exposure pathway

Source → Encounter → Interaction → Incident

– Three RMM matrices *also* link to the MEC exposure pathway

❖ This connection is designed to help clarify how that exposure pathway is:

– Related to site-specific risk drivers

– Addressed by remediation goals

– Mitigated by components of alternatives
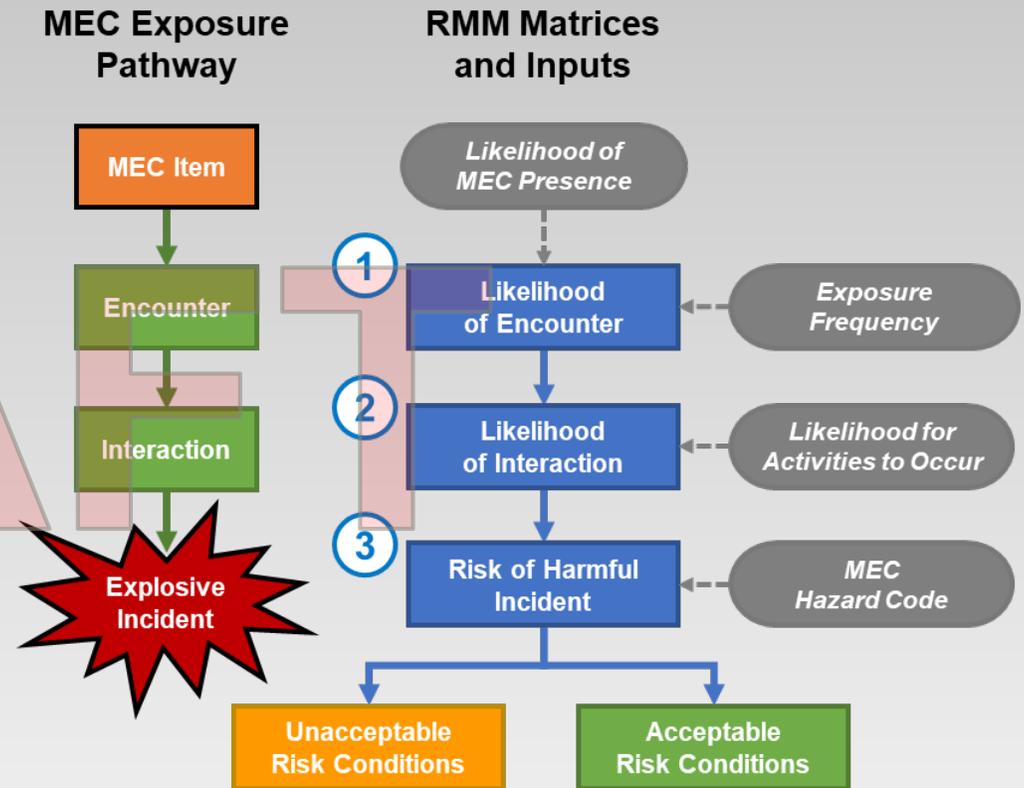
FINAL THOUGHTS

Let's review…

FINAL THOUGHTS

❖ Collect land use data

– Detail is needed for risk assessment

– *Include in data collection plan*

❖ Vertical profiles are really important

– Support risk scenarios and RAOs

– Supports remedial alternative development and evaluation

❖ Develop appropriate risk scenarios

– Better risk assessments

– Facilitates RAOs

– Supports remedial alternative development

❖ RMM is NOT a black box!

– The whole PDT must be involved in building consensus on inputs

– That means the whole PDT is making the risk conclusions/decisions

• Not just the contractor

• Certainly not RMM itself!

QUESTIONS?