ENVIRONMENTAL DATA QUALITY IN THE MILITARY MUNITIONS RESPONSE PROGRAM

U.S. Army Engineering and Support Center, Huntsville

Andrew Schwartz

March 2018

"The views, opinions and findings contained in this report are those of the authors(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other official documentation."

US Army Corps of Engineers

U.S.ARMY

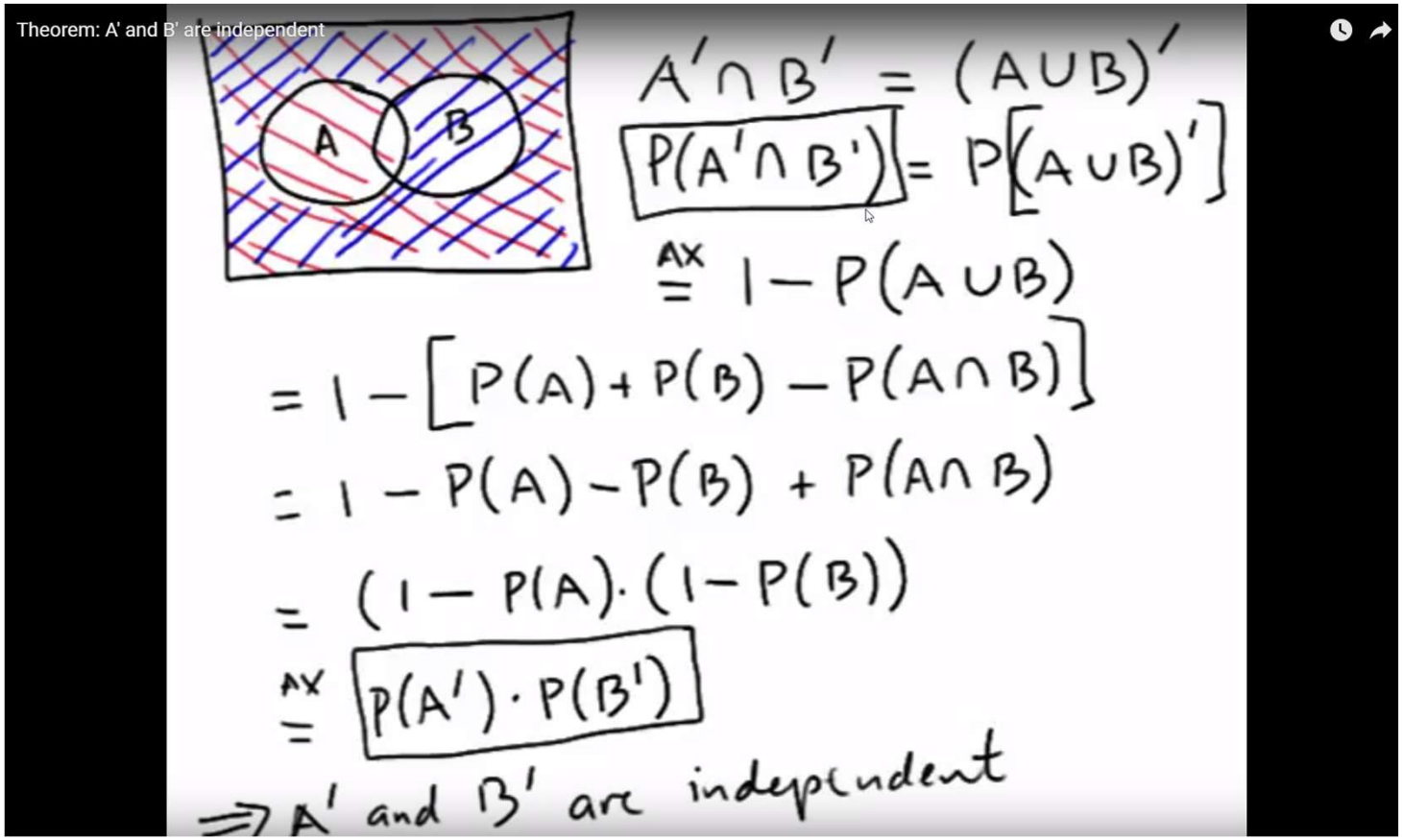
I started to put this presentation together two hours before I left for a one week vacation, and then I caught Enfluenza Type A+, which knocked me on my behind for most of a week, and then came here.

Hopefully this will all make sense…

US Army Corps of Engineers.

U.S.ARMY

AGENDA: MUTUAL INDEPENDENCE OF SEED LOCATION AND SEED ENCOUNTER



US Army Corps of Engineers.

U.S.ARMY

WHAT 'ENVIRONMENTAL DATA QUALITY' IS NOT:

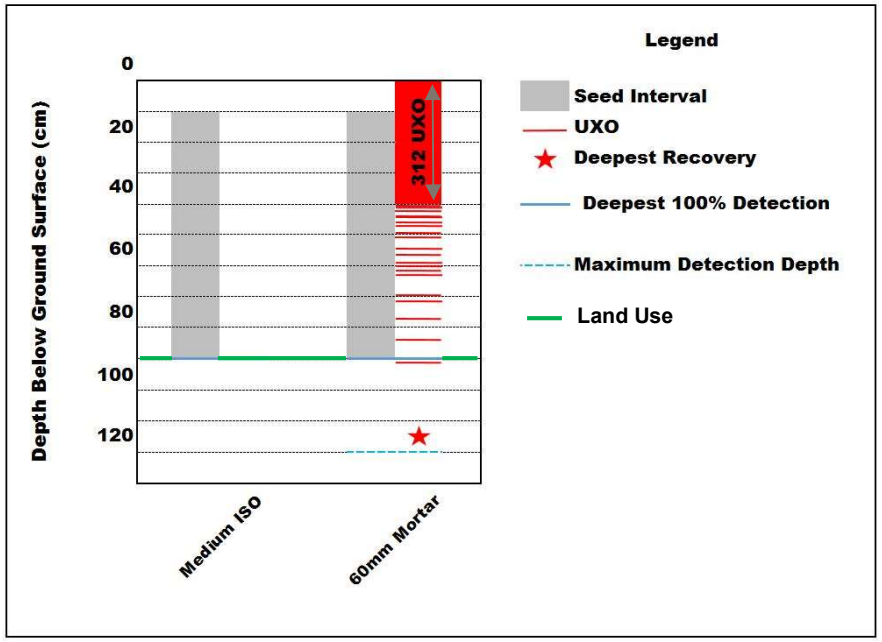
At the count of three I will snap my fingers, you will resweep 10%, and the grid will be cleared!

US Army Corps of Engineers.

U.S.ARMY

WHAT 'ENVIRONMENTAL DATA QUALITY' IS

Being able to say this is what we achieved with a high degree of confidence.



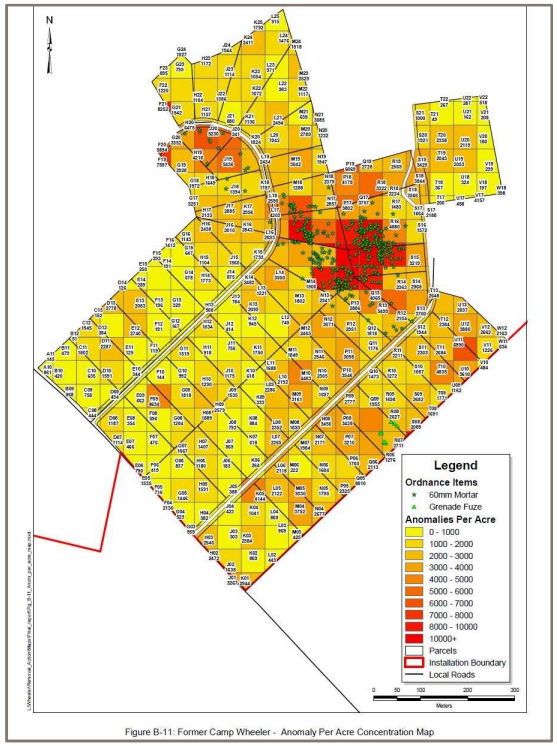


Figure B-11: Former Camp Wheeler - Anomaly Per Acre Concentration Map

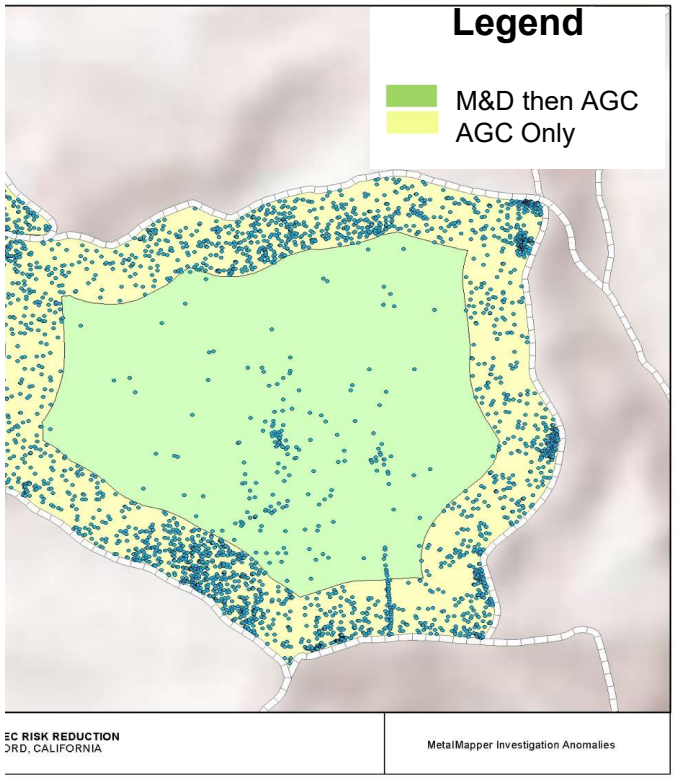
US Army Corps of Engineers.

U.S.ARMY

"THIS IS WHAT WE ACHIEVED"

Two simple but critical elements:

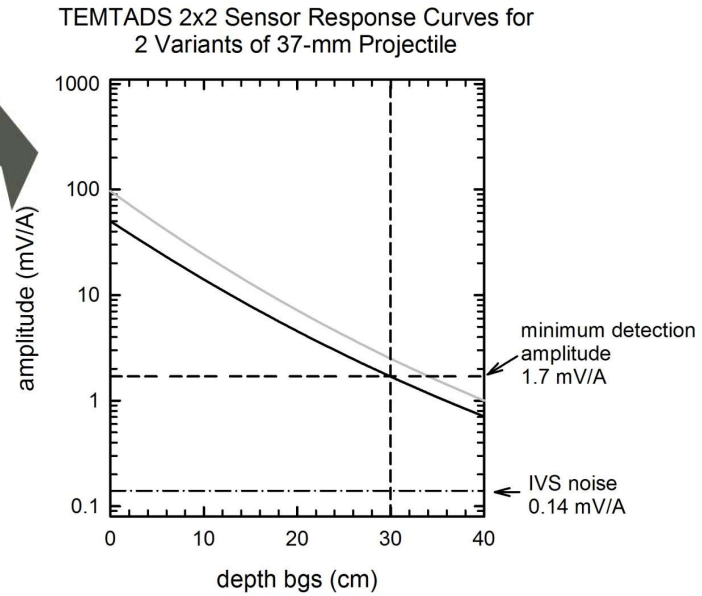
1- Show where we looked for MEC



2- If at any time MEC was under* the sensor, it was detected

$$V(t) = \mu_0 n_R n_T I_0 C_R \cdot C_T B(t)$$

EMI Dipole Model



US Army Corps of Engineers.

U.S.ARMY

*In the detectable range

“HIGH DEGREE OF CONFIDENCE”

- In-Line Spacing ✓
- Across-Line Spacing ✓
- Coverage ✓
- Background Noise ✓
- Interference Sources ✓
- Tx Current ✓
- Rx Settings ✓
- Instrument Averaging Functions ✓
- Anomaly Selection Methodology ✓
- Positioning Accuracy ✓
- Anomaly Resolution ✓
- Inversion Model ✓
- Classification Match Metrics ✓

We can quantitatively QC each of these until we are blue in the face…

But what do people really want to know?

US Army Corps of Engineers.

U.S.ARMY

HOW DEEP CAN YOU DETECT? WHAT DID YOU MISS?

Before we embraced the EMI Dipole Model:

- Clean-up Statement (as explained by many in USACE between mid '90s to about 2010):
  - ➢ We didn't know what was there before we came
  - ➢ We recovered what we recovered
  - ➢ We don't know what we left behind
- Words commonly used
  - ➢ GPO
  - ➢ 10% QC sweep
  - ➢ 10% QA sweep
  - ➢ Failure is missing a piece of metal 37mm or longer in any dimension
  - ➢ The site will be cleared using a combination of geophysics and mag and flag
  - ➢ EE/CA, TCRA, NTCRA

After we embraced the EMI Dipole Model:

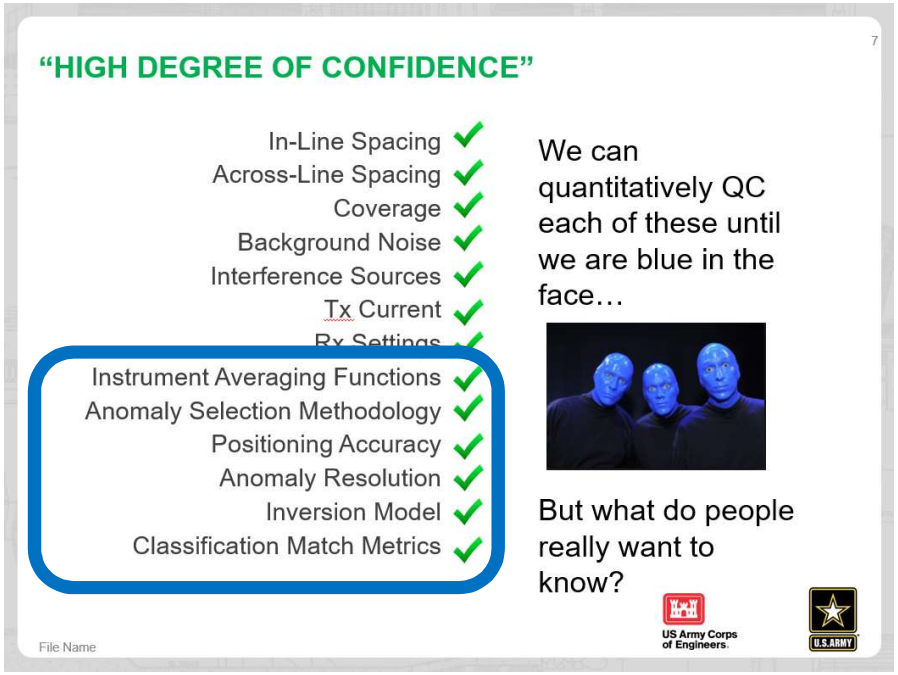
- Clean-up Statement:
  - ➢ If MEC was there, and
  - ➢ the metal detector went over it, and
  - ➢ our system was working, then
  - ✓ We detected & recovered it
- Words Commonly Used:
  - ➢ DAGCAP
  - ➢ CERCLA Remedial Action
  - ➢ Remedial Action Objectives
  - ➢ QAPP
  - ➢ Horizontal CSM
  - ➢ Vertical CSM
  - ➢ QC Seeds
  - ➢ Validation Seeds

US Army Corps of Engineers.

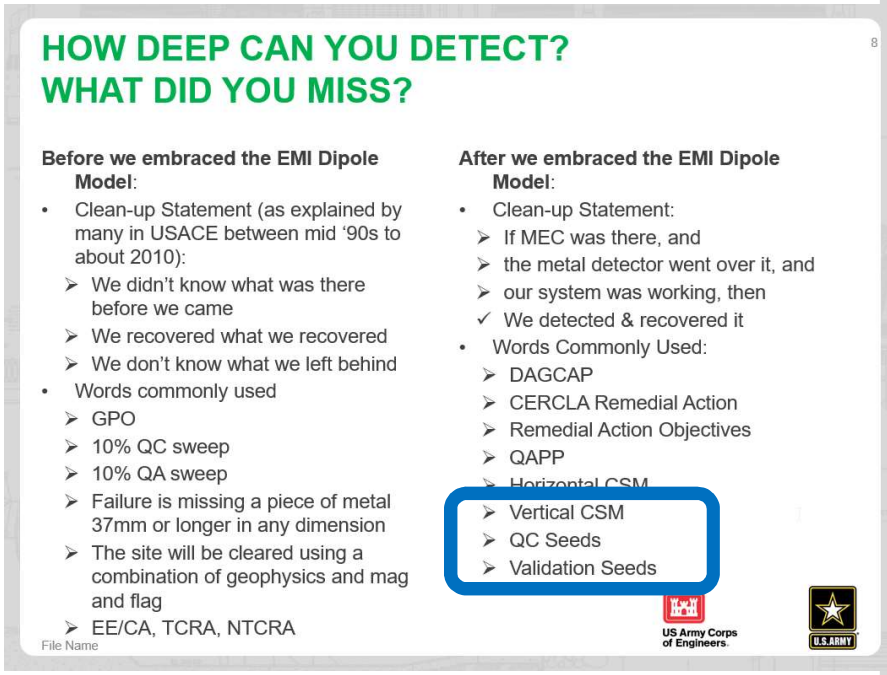
U.S.ARMY

SEEDING

From Slide #7



From Slide #8



US Army Corps of Engineers

U.S.ARMY

FOCUS ON SEEDING

Who Should Do It
When
How Much

- Current Guidance does not specify
- EM 200-1-15: Quality Requirements Tables 11-3 through 11-6
- Commonly thought as contractor “QC” & government “QA”
- Need to think
  - “Single Blind”
  - “Double Blind”

US Army Corps of Engineers.

U.S.ARMY

SEEDING: WHEN

Two types of “When”:

1. The “Before Work Begins When”:
   - Remedial Actions & Removal Actions: Always
   - Remedial Investigations: Final Decisions→Always; Otherwise, not so much
   - Feasibility Studies: For costing (i.e. analog)
2. The “After An Analog Validation Failure When”

   Two schools of thought:

   i. Keep redoing the area until all seeds are recovered

   ii. Re-seed to maintain high degree of testing

US Army Corps of Engineers.

U.S.ARMY

SEEDING: HOW MUCH

Digital Methods: Minimum 1 each QC and Validation per system per day

Analog Methods: 5-6 Validation per system per day

Environmental Quality Tests And Their MMRP Quality Analogues			
Environmental Chemistry Quality Test	**Purpose**	**Blind Seeding Analogue**	**Purpose**
Performance Test Sample	Assess capability to detect target analytes within acceptable criteria	**QA (Government) seeding**	Assess capability to detect MEC within acceptable depth intervals
Matrix Spike	Assess performance of the method to detect target analytes in the presence of interferences caused by the sample matrix	**Seeding in the presence of interference sources, such as nearby clutter, external noise, or variable background**	Assess performance of the detection method in the presence of interference sources
Laboratory Control Sample	Determine if the system is running properly	**QC (contractor) seeding**	Determine if the MEC detection and recovery system is running properly
Laboratory Fortified Blank	Evaluate sensitivity and bias to detect low concentrations (at the QL) of specific compounds	**Seeding at or near the maximum required reliable detection depth**	Assess ability to consistently detect deep MEC at the predicted reliable detection depth

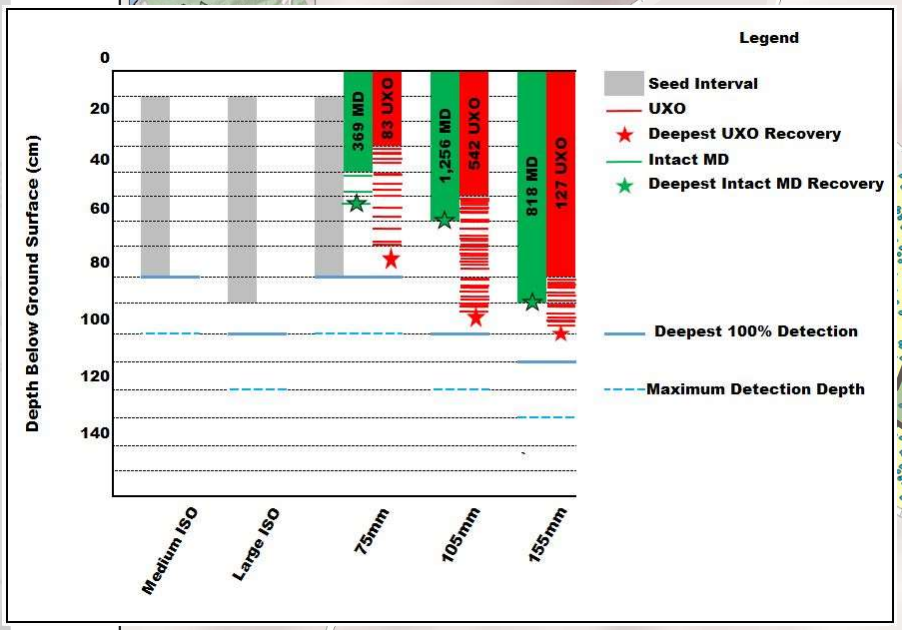
US Army Corps of Engineers

U.S.ARMY

WHY ALL THIS SEEDING
DATA USABILITY ASSESSMENT TO SUPPORT THIS:

Vertical CSM & Coverage Map

→If it was there, and everything was working, then it is no longer there



of Engineers.

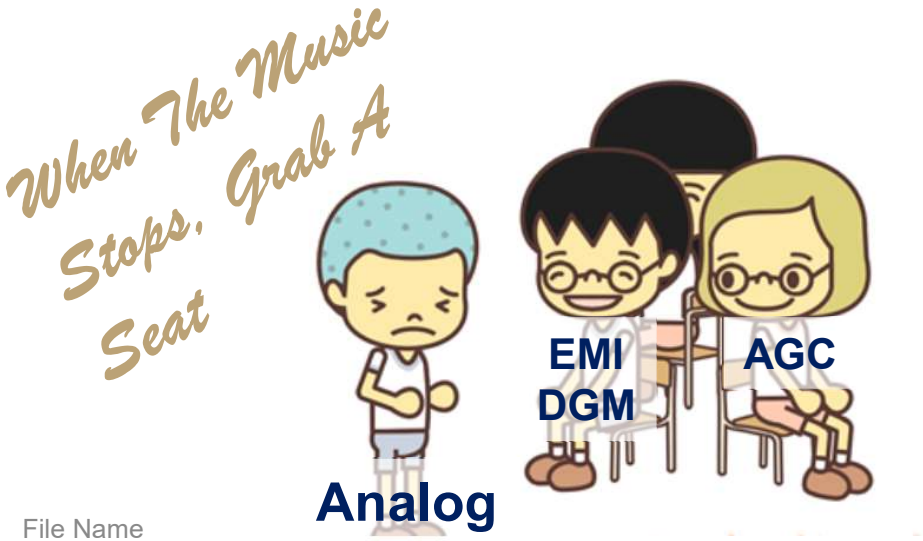
U.S.ARMY

SUMMARY
GOAL OF ENVIRONMENTAL DATA QUALITY

Produce data appropriate for its intended use that is defensible and reproducible

We Can Do This:

- Based On Complete Knowledge Of System Performance
- Needs-Driven Design
- Quality Management Systems



The Consequence Of Environmental Data Quality

US Army Corps of Engineers.

U.S.ARMY

THANK YOU

US Army Corps of Engineers.

U.S.ARMY