Further evaluation of areas where there are high density anomalies associated with impact areas where military munitions with sensitive fuzes were fired.

Track 3 Impact Area Munitions Response Area

Former Fort Ord, California.

Acronyms

- AGC: advanced geophysical classification
- BLM: Bureau of Land Management
- DGM: digital geophysical mapping
- EMI: electromagnetic induction
- HE: high explosive
- MSFFS: Munitions with Sensitive Fuzes Field Study
- MRA: Munitions Response Area
- MRS: Munitions Response Site
- ROD: Record of Decision
- UXO: unexploded ordnance

Track 3 ROD

- "…subsurface removal will be conducted in selected areas identified to address specific risk and/or land use needs."
- An example of such an area is "areas where there are high density anomalies associated with impact areas where military munitions with sensitive fuzes (all-ways-acting or piezoelectric fuzes, or 40mm grenade launcher high explosive [HE] or 40mm practice projectiles M382 series or M407 series [or any other 40mm practice series projectiles containing enough explosives to rupture the projectile]) were fired."

(OE-0647)

Studies in progress

- **DGM data density analysis**, with the goal of identifying techniques that could be used to address the risks in lieu of the large-scale excavation and sifting.
- Refining the preliminarily-identified areas for further evaluation.
- More specifically defining **the risks to be addressed**.

The risks to be addressed

- In the Impact Area MRA, all ground-disturbing activities require construction support. Public access will be restricted to designated areas such as the regularly maintained fuel break roads, where subsurface removal has been conducted.
- The “further evaluation” areas occur inside work units, off of fuel breaks. Designated reuse activities are mostly surface activities such as habitat monitoring and weed management. Receptors in the off-fuel-break areas are limited to workers and trespassers.
- **Worker** activities are either
  - Intrusive with construction support (no additional mitigation is required) or
  - Non-intrusive. To support the long-term reuse by BLM, additional mitigation (e.g., additional removal action or institutional controls) would be evaluated to address **the risk to BLM workers from potentially encountering sensitive fuze-type UXO that could have become exposed from erosion or changes in site conditions**.
- **Trespassers** are typically found transiting on fuel break roads or bike riding. Intrusive activities are associated with illegal camps. The selected remedy includes access management measures such as the perimeter fence and security patrols. Continuation of an access management program similar to the MRS Security Program is the appropriate mitigation for this receptor type.

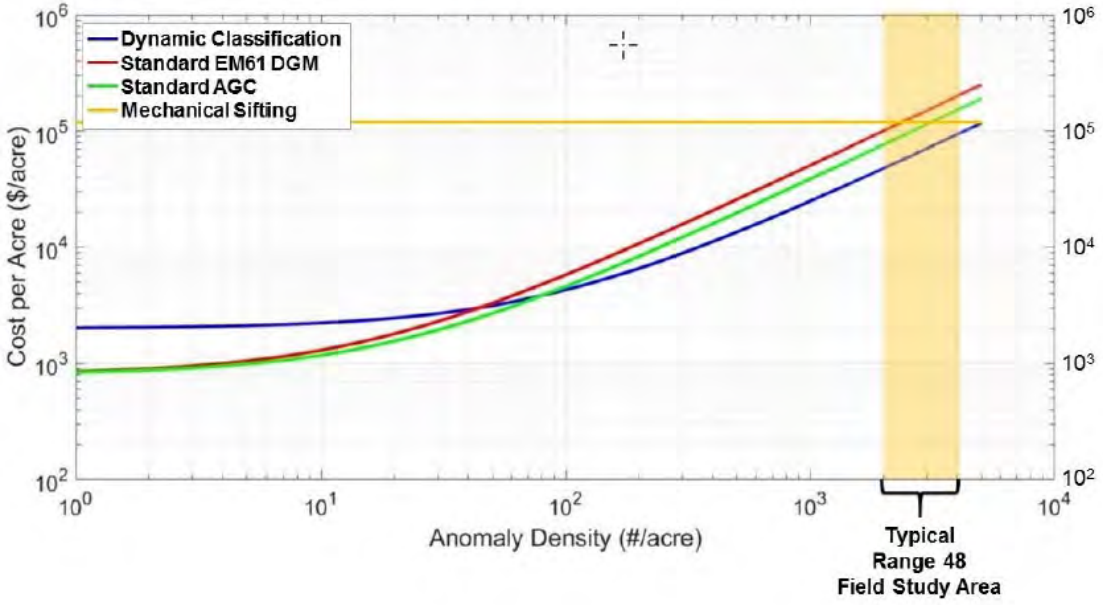
DGM Data Density Analysis

Background and Objectives

As part of the effort to develop alternatives to sifting, the performance and capabilities of advanced electromagnetic induction (EMI) systems (also referred to as “advanced geophysical classification” or AGC) were demonstrated. Report: Munitions with Sensitive Fuzes Field Study (MSFFS) (OE-0960A)

MSFFS report provided the following key conclusions:

- EMI/AGC sensors can successfully detect and classify MEC items in areas with anomaly densities up to 2,900 anomalies/acre
- Efficacy of AGC (i.e. high clutter rejection rate) decreases above 2,100 anomalies/acre
- AGC can still be useful in planning and conducting MEC remediation in areas above 2,900 anomalies/acre (depending on objectives)
- Differences in resolution between the EM61 and advanced EMI sensors result in apparent density differences (~1.5x EM61 anomalies = AGC anomalies)



Primary Objective: Evaluate areas where anomaly densities are conducive to AGC and areas where we need to do “something else first” (e.g. 6-inch analog removal, sifting, etc.)

Areas to be Evaluated

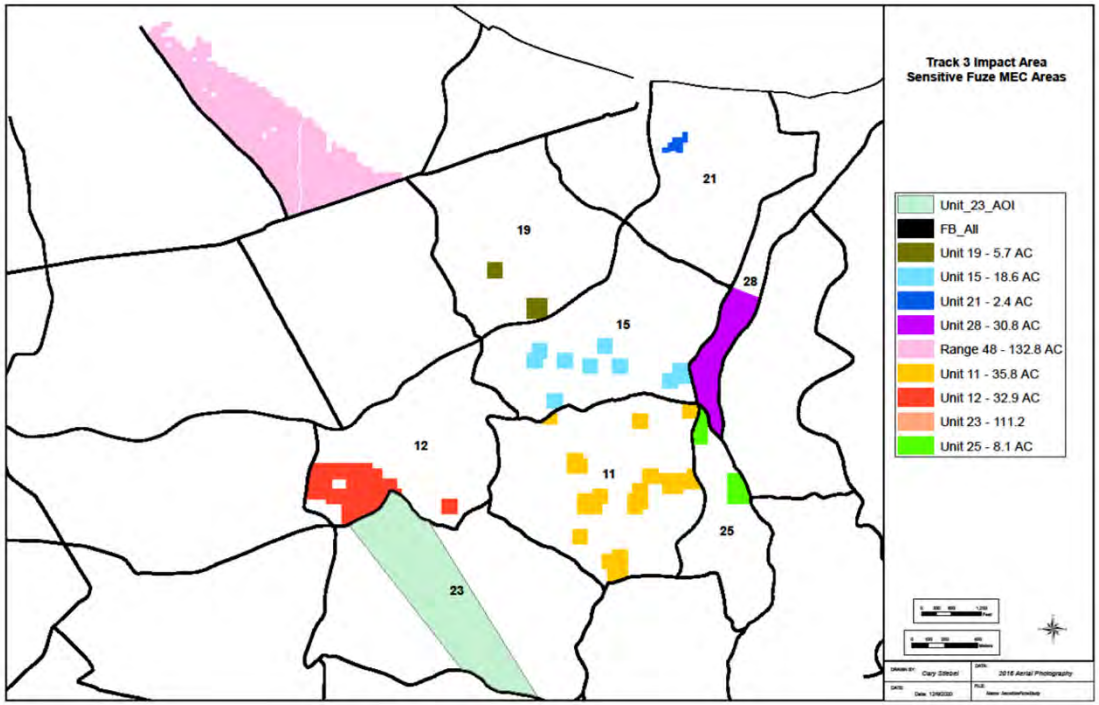
Under Track 3 ROD: "…subsurface removal will be conducted in selected areas identified to address specific risk and/or land use needs."

Areas where both:

1. UXO of sensitive fuze-type were recovered during surface removal

2. DGM data show a high density of subsurface anomalies (> 900 anomalies/acre)

Total Acreage ≈ 378.3 acres



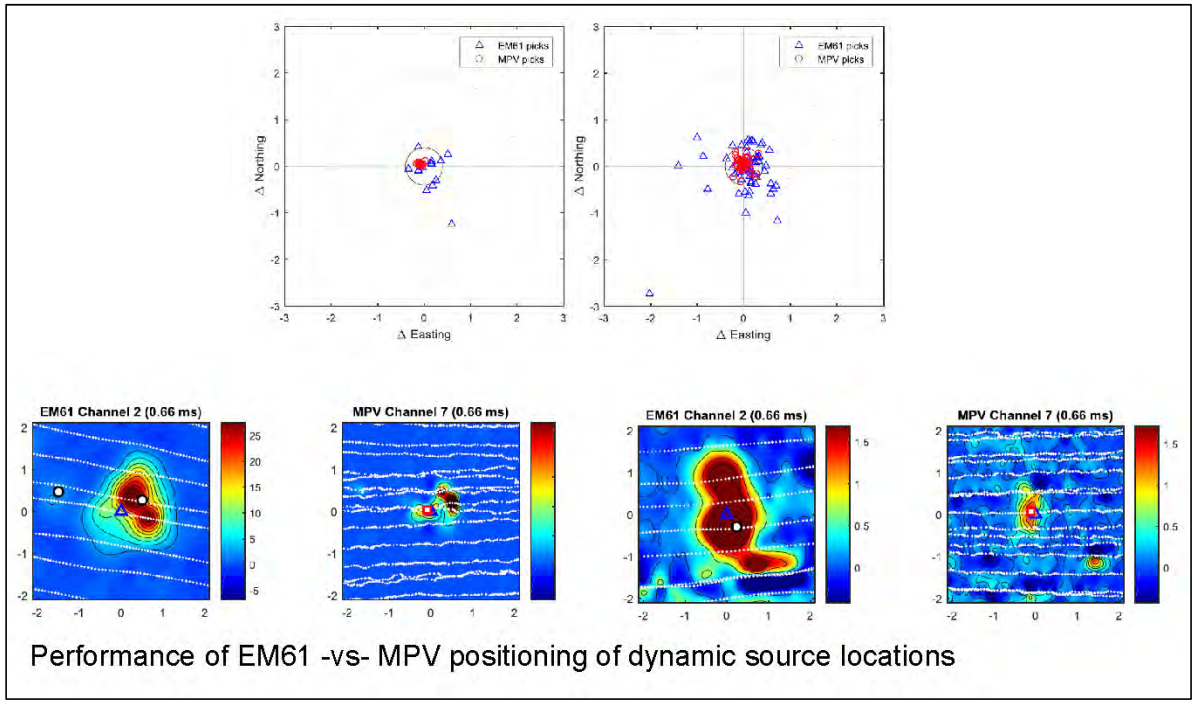
****NOTE that these areas are preliminary and final areas are still being refined****

Primary Objective: Evaluate areas where anomaly densities are conducive to AGC and areas where we need to do "something else first" (e.g. 6-inch analog removal, sifting, etc.)

DGM vs. AGC Anomaly Densities

Differences in resolution between the EM61 and advanced sensors result in apparent density differences (~1.5x EM61 anomalies = AGC anomalies)

- Different Rx coil sizes result in higher resolution with AGC instruments
  - 1m x 0.5m for EM61
  - 15cm x 15 cm for MM2x2
- Different footprint sizes may result in “missing” anomaly source:
  - 1m x 0.5m for EM61
  - 0.8m x 0.8m for MM2x2
- AGC can still be useful in planning and conducting MEC remediation in areas above 2,900 anomalies/acre (depending on objectives)
- Differences in resolution between the EM61 and advanced EMI sensors result in apparent density differences (~1.5x EM61 anomalies = AGC anomalies)



Performance of EM61 -vs- MPV positioning of dynamic source locations

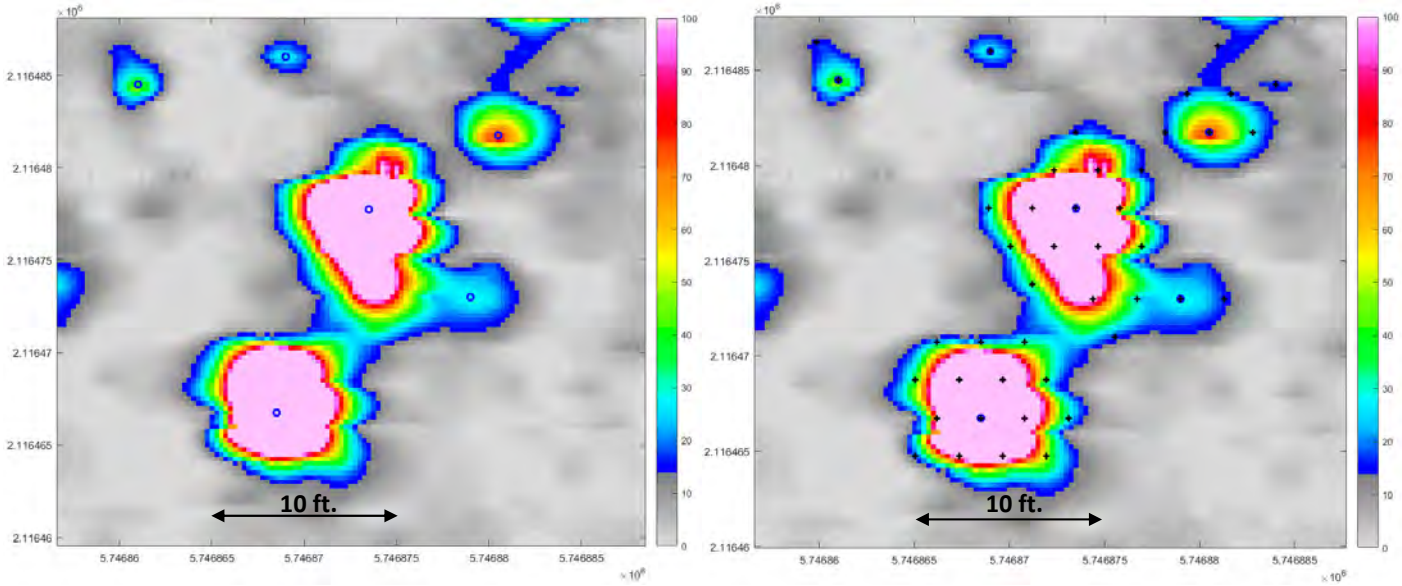
EM61 Anomaly "Tiling"

Differences in resolution between the EM61 and advanced sensors result in apparent density differences (~1.5x EM61 anomalies = AGC anomalies)

- Different footprint sizes may result in "missing" anomaly source:
  - 1m x 0.5m for EM61
  - 0.8m x 0.8m for MM2x2
- Blind seed offset MQOs:
  - EM61 = 56cm (90%) – 66cm (100%)
  - AGC = 40cm (100%)

Tiling Approach (developed by Black Tusk Geophysics):

1. Pick peaks using standard Blakely algorithm
2. Merge targets with 40cm of each other
3. Add six additional targets on a circle centered on targets from Step 2 (separated by 60° with radius = 70cm) unless
   a) Target falls outside of anomaly footprint (14 mV contour)
   b) Target is within 70 cm of an existing target
4. Repeat Step 3 until anomaly footprints are covered



Standard Anomaly Picking

Anomalies After Tiling

EM61 Anomaly “Tiling”

Differences in resolution between the EM61 and advanced sensors result in apparent density differences (~1.5x EM61 anomalies = AGC anomalies)

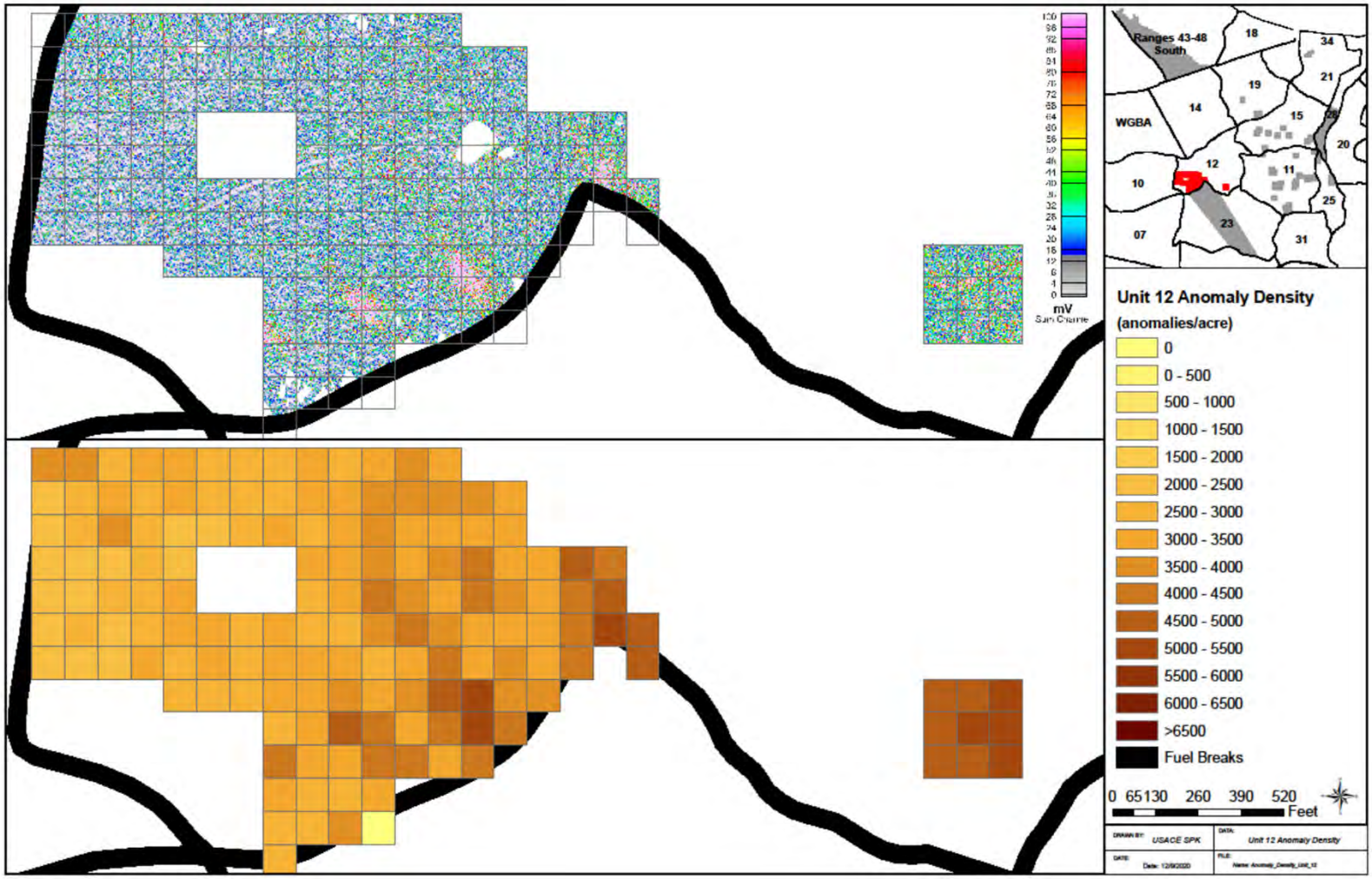
Unit 23 MSFFS Anomaly Density Comparisons					
Area	**EM61 (anomalies/acre)**	**MM 2x2 (anomalies/acre)**	**Tiling Approach (anomalies/acre)**	**MM 2x2 Multiplication Factor**	**Tiling Approach Multiplication Factor**
A	500	725	819	1.45	1.64
B	750	1116	1300	1.49	1.73
C	1000	2082	1825	2.08	1.83
D*	1400	2065	3033	1.48	2.17

*Note that anomaly density in Area D is not significantly different from Area C, but background is far more variable which resulted in only ~50% MM2x2 clutter rejection. Likely the cause for higher tiling anomaly density estimates.

Tiling approach results in slightly higher anomaly density estimates but is a good estimator of “true” anomaly density estimates (~1.75x multiplication factor).

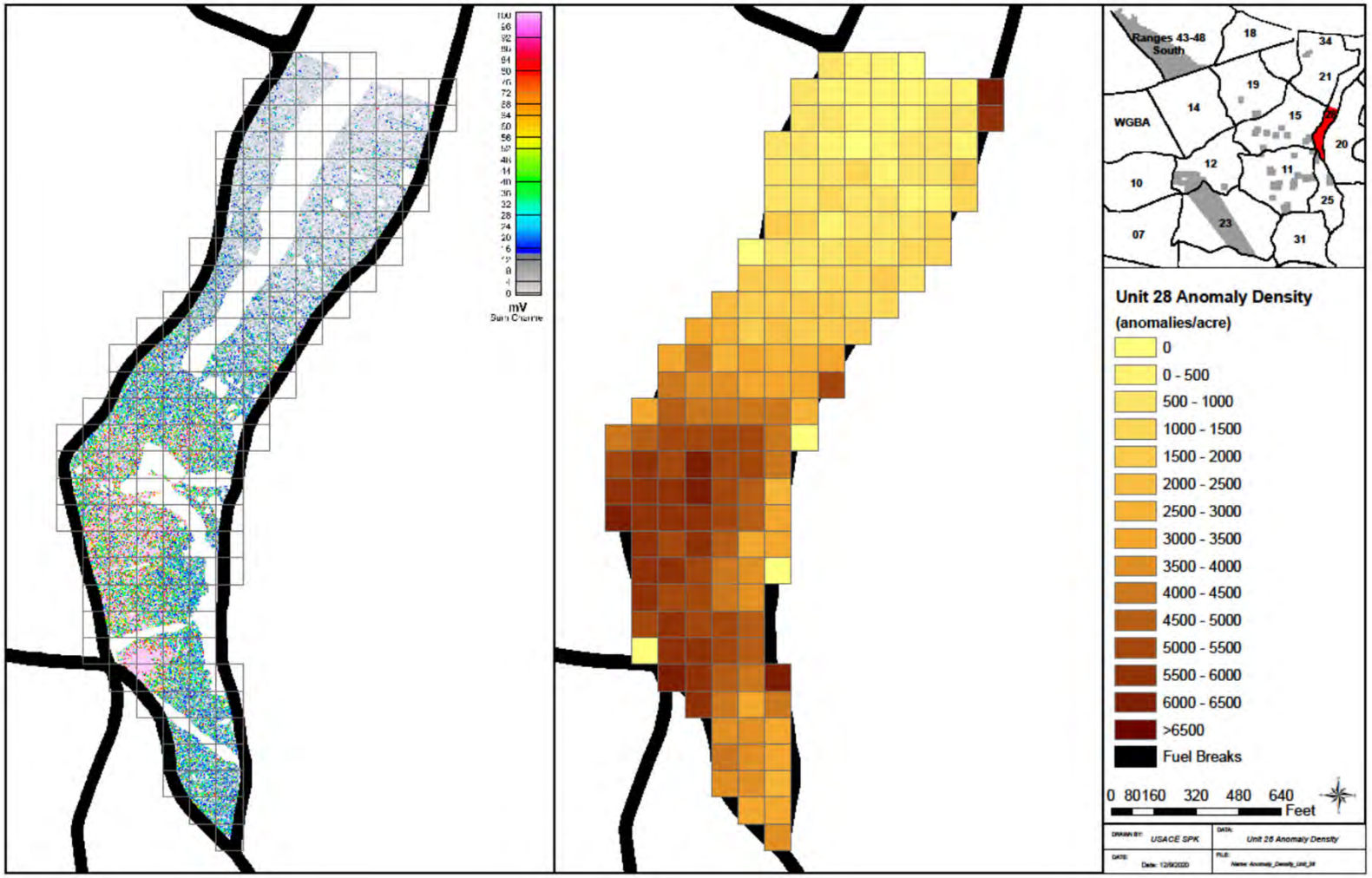
Results: Unit 12

Anomaly Density (anomalies/ acre)	Percentage of Grids
> 3,400	42%
2,500 > 3,400	48%
< 2,500	10%



Results: Unit 28

Anomaly Density (anomalies/ acre)	Percentage of Grids
> 3,400	44%
2,500 > 3,400	12%
< 2,500	44%



Preliminary Conclusions - Discussions

What makes the most sense given the <u>RISK TO RECEPTORS</u>?

- Public access is restricted

- Intrusive activities require construction support

- Non-intrusive activities: Goal is to support the long-term reuse by BLM, additional mitigation (e.g., additional removal action or institutional controls) would be evaluated to address the risk to BLM workers from potentially encountering sensitive fuze-type UXO that could have become exposed from erosion or changes in site conditions.

We have options to appropriately address risk without the impacts of sifting:

1. Anomaly densities have been derived using a 14 mV threshold (37mm at 16 inches). Will a risk-reduction type clearance be protective of receptors?

2. Analog removal prior to DGM/AGC re-mapping

3. Go straight to AGC cuing operations or subsurface investigation using existing DGM data.