Unique Remedial Design Case Study with Potential for Drastically Variable Outcomes

Brian S. Brunette, GSI Services Group, Ellington, CT
Courtney deVries, GSI Services Group, Denver, CO

SAGEEP 2025/3rd MRM Denver, Colorado USA

http://www.eegs.org

Presentation Topics

- Industry Related Advice (Humorous Truths)
- Preliminary Statement & Personnel Involved
- Brief Background
- Common Sampling Strategies
- CASE STUDY: What was done? What did happen?
  - Transect Design/Densities Generated
  - Transect Dig Locations (Distributions)
  - Transect Dig Results (MEC/MD/RRD)
  - Grids based on Density and Dig info
- CASE STUDY: What could have happened?
  - Transect Design/Densities Generated
  - Grids based on Solely on Density Info
- Comparative Results & Projected Outcomes
- Additional Info (pre/post project) – did it help / would it have helped?
- Recommendations
- BONUS: Industry-Related Topics

Industry Related Advice (humorous truths)

Feeling need to sample enough (i.e., < 1 UXO/acre) to mimimize future actions
"UXO Estimator" era

⇩

Leveraging statistics (e.g., < 95% of UXO) to minimize future actions
"VSP Designs" era

⇩

Utilizing site history, LUCs, statistics, CSMs, with conservative ApAs & receptor interaction theme
"WofE & PDT" era

Currently trending more complicated methods w/ more people involved to make subjective decisions
"Human AI" or "More RA" era?

- Year 2000 "…Don't let anyone ever talk you into being a PM for one of these EE/CA type of sampling projects, as:
  - they can be extremely unpredictable;
  - you will have to deal with every random thing and UXO find that occurs on site;
  - It seems like you can't close out the project"
- Year 2010 "…Usually when a presented recommendation to PDTs is for:
  - future remediation from a sampling project, generally these meetings go smooth because there is future work to (encounter/remedy uncertainties);
  - no further action (NFA), the meetings are scrutinized full bore with a fine-tooth regulatory comb, often requiring more sampling (unless open/shut case)."
- Year 2020 "…It is basically impossible to:
  - sample your way to NFA once MEC is encountered; and
  - believe there is no residual MEC (only significantly reduced MEC)."
- Take home message: conveying difficulties of EE/CA/RI/RDs, processes can be complicated by drastic differences between sites which are predictable and other sites which are conversely unpredictable (or less predictable). *And in the future, the more data we take into account from less predictable sites upfront, the easier it will likely be to make group decisions.*

Preliminary Statement & Personnel Involved

- **Preliminary Statement** "The decisions made leveraged SME input from the prime contractor, government, and regulatory stakeholders, and in cases of disagreement the more conservative answer was commonly agreed to."

- **Contract Era** ~ 5 years ago, prior to currently trending changes in critical density definitions and USACE EM Guidance revisions. (*Presentation more qualitative – what did happen, what could have happened – not numerical.*)

- **Personnel Involved** The list of key personnel included the following:
  - Prime Contractor (GSI): Project/Program Manager, Senior Scientist / Geophysicist, CQM, SUXOS, UXOQCS, GIS, etc.
  - Government Oversight (USACE/AF): Project/Program Managers, Lead OESS, OESSs, QA Project Geophysicist, etc.
  - Stakeholders: State Department of Health Regulator, Public Representatives

Brief Background

- Purpose: collect Remedial Design sampling to supplement vintage projects
- Site Info: ~ 139 acres of multi-use and repurposed land ranging from target range, military barracks/buildings, Nike facility, and urban warfare training. Anecdotal rumors for the potential of demolition activities, but no evidence--maybe a one-off or maybe nothing at all?
- Prior Investigations:
  - vintage[1] (ca 2000-2010) OE Removal Actions, CSE Phases I/II, and limited RI
  - modern (ca 2010-2021) desktop[2] Feasibility Study, Proposed Plan, and Record of Decision

[1]due to the vintage products, reports lacked MD category fidelity (e.g., frag, fuze, piece).
[2]due to the desktop construct, no additional field data were collected to supplement

- Receptor Details:
  - public residents/trespassers commonly walk through site to get to/from beach
  - some trespassers/guests camp and live within wooded (shade) portions of site
- Munitions Suspected: 37mms, grenades, 25-lb bombs, training devices, etc.
- Anticipated Anomaly/MEC Distributions:
  - Uncertain/unpredictable, as sampling from prior investigations was very limited
  - Unlikely to be compact "bullseyes", as inferred from multi-use, repurposing, and OE actions

Common Sampling Strategies & Anticipated Outcomes (1 of 2)

Commonly-Used Playbook

- Design/conduct transect DGM[1] without any plans for anomaly investigations
- Presumes defined impact area, default VSP, usually broader (250-600') transect spacing
- Generate anomaly densities within VSP
- Define Areas of Interest based on transitions from lower/higher density (LDs/HDs)
- Prioritize grids: density changes
- Collect grid DGM data
- Investigate the bulk of anomalies from w/in DGM grids (more grids or digs/grid)
- Generate memo, gain approvals, HUA/LUA

Outcome: likely different (TBD, site specific) from well-defined compact target area site compared to site with more uncertainties.

[1]May leverage lower position accuracy without requirements for anomaly resolution and likely allot standard default transect designs

One of Many Revised Strategies

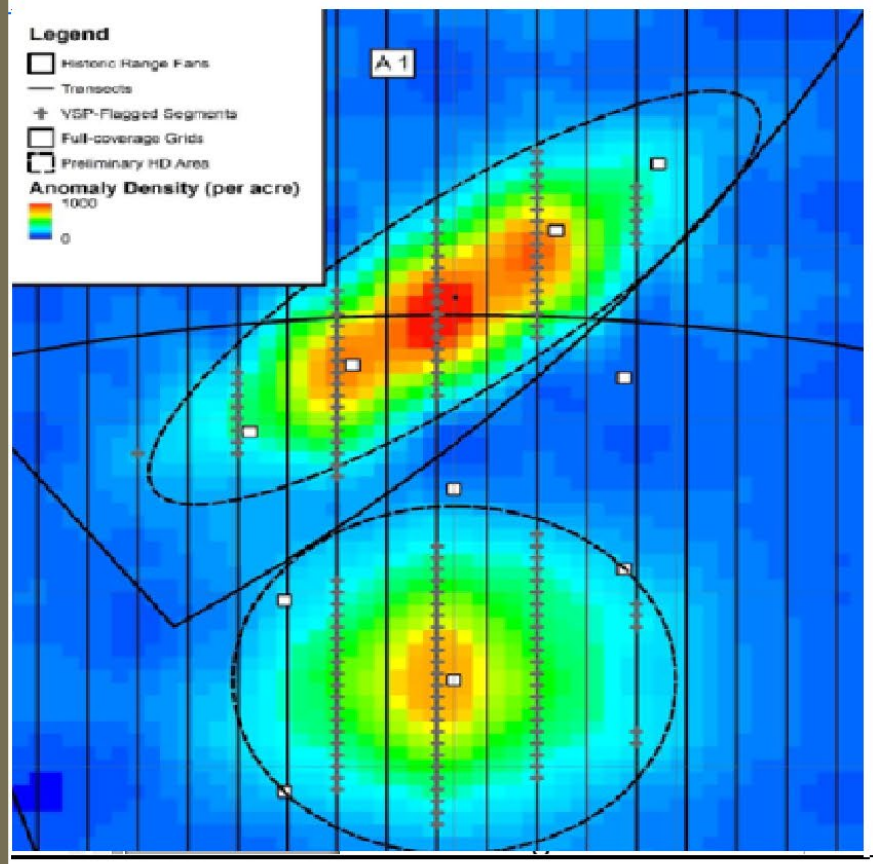
- Design/conduct transect DGM[2] with plans to investigate subset of anomalies
- Presumes uncertain impact areas, % of site, usually narrower (50-150') transect spacing
- Generate anomaly densities within VSP
- Define Areas of Interest based on transitions from lower/higher density (LDs/HDs)
- Prioritize grids: dig results & density changes
- Collect grid DGM data
- Avoid or reduce investigating anomalies from w/in DGM grids (less grids or digs/grid)
- Generate memo, gain approvals, HUA/LUA

Outcome: likely similar (TBD, site-specific) from well-defined compact target area site compared to site with more uncertainties.

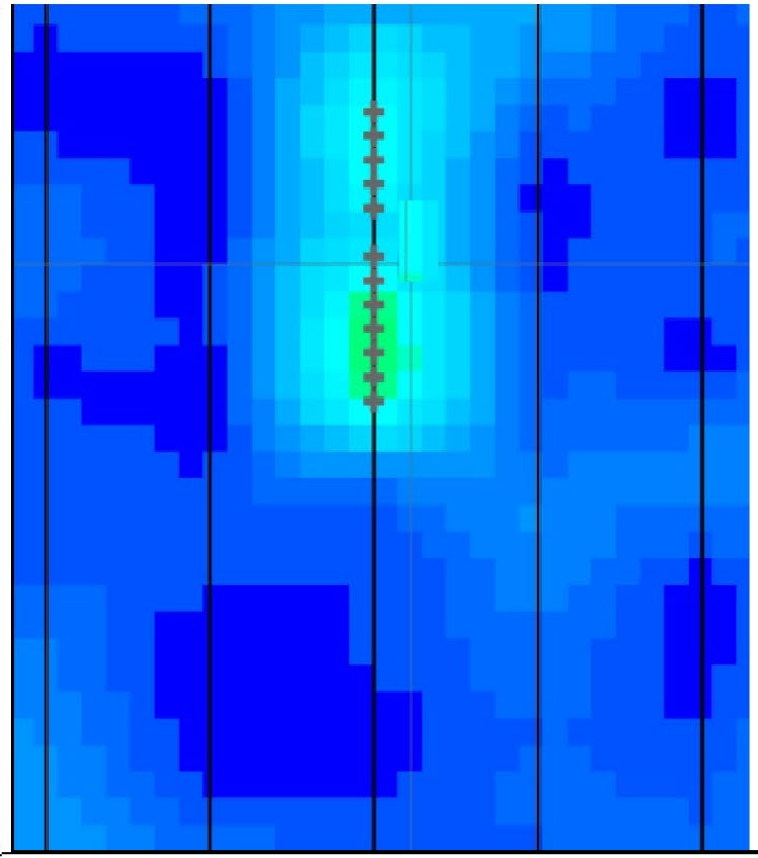
[2]Requires higher position accuracy to meet anomaly resolution standards while lending itself to more conservative transect designs

Common Strategies & Anticipated Outcomes (2 of 2) – transects digs change results? (grid vs spacing size?)

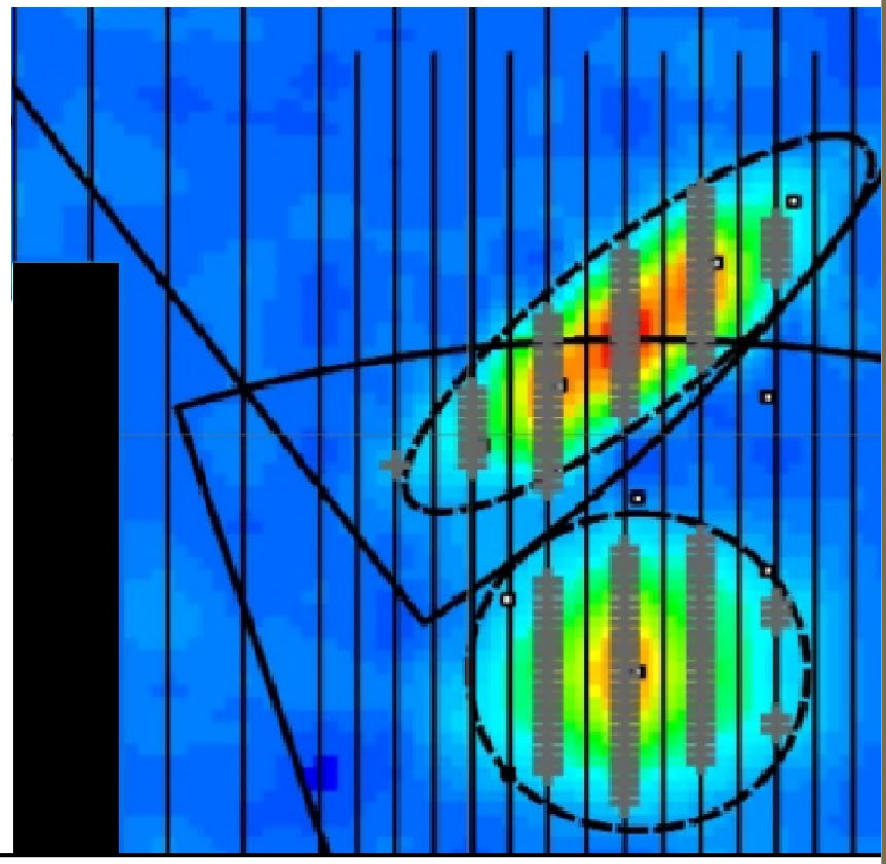
Commonly Used Playbook (MR-QAPP Toolkit 1)



One of Many Possible Revised Strategies



Example Hybrid Strategy (interwoven transects)

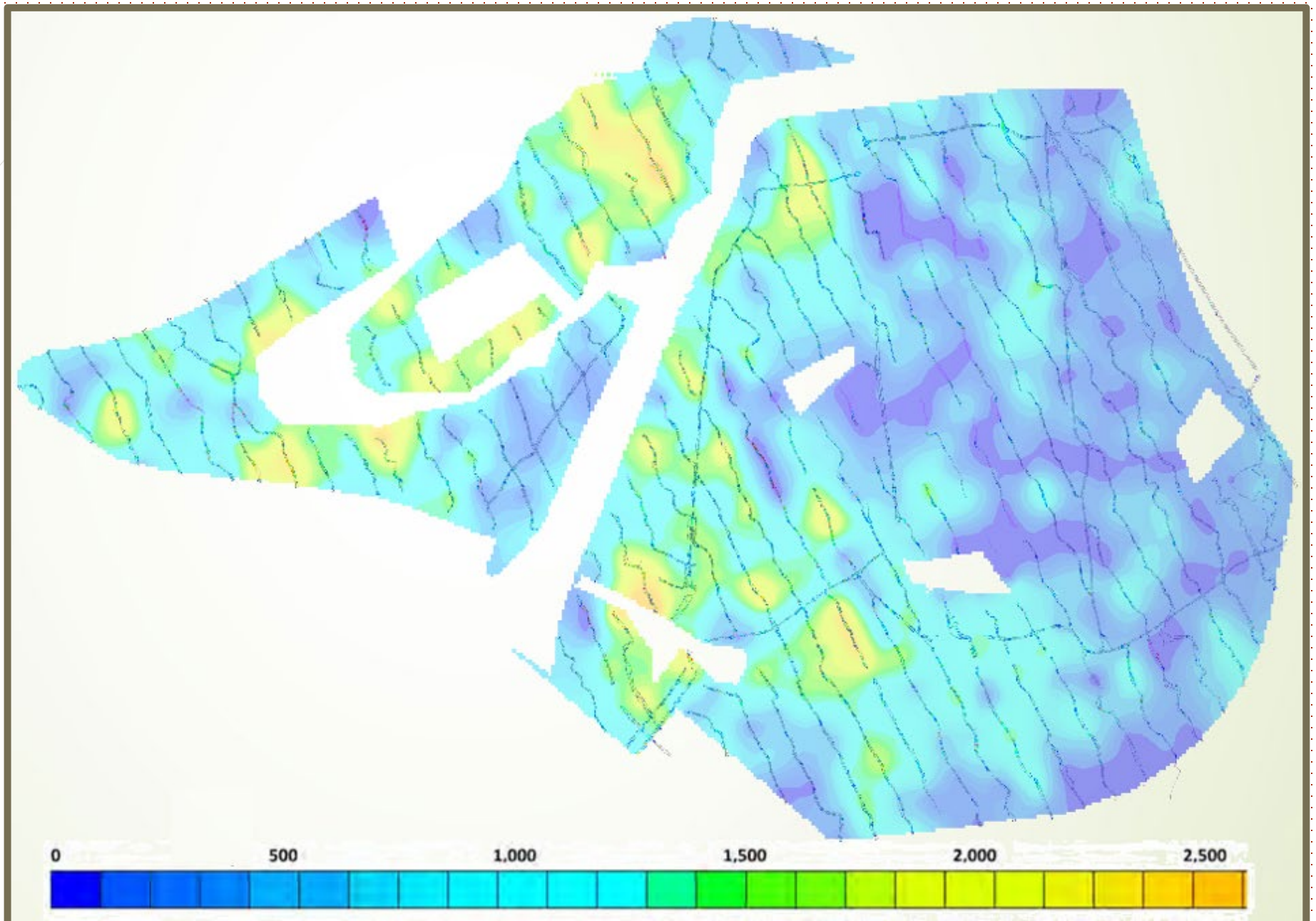


All would require PDT and MR-QAPP Approval. Revised strategies 'may require' KO approval

CASE STUDY: What was done?

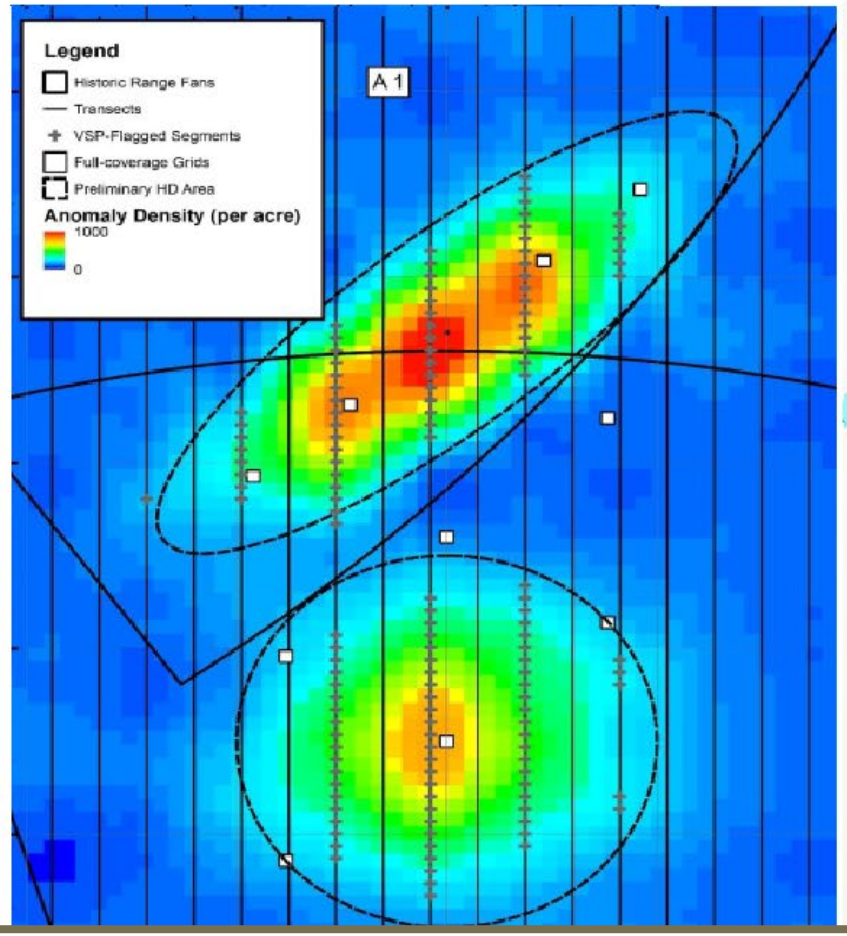
Revisions applied to current site with outcome.

Transect Design / Densities Generated (1 of 3)

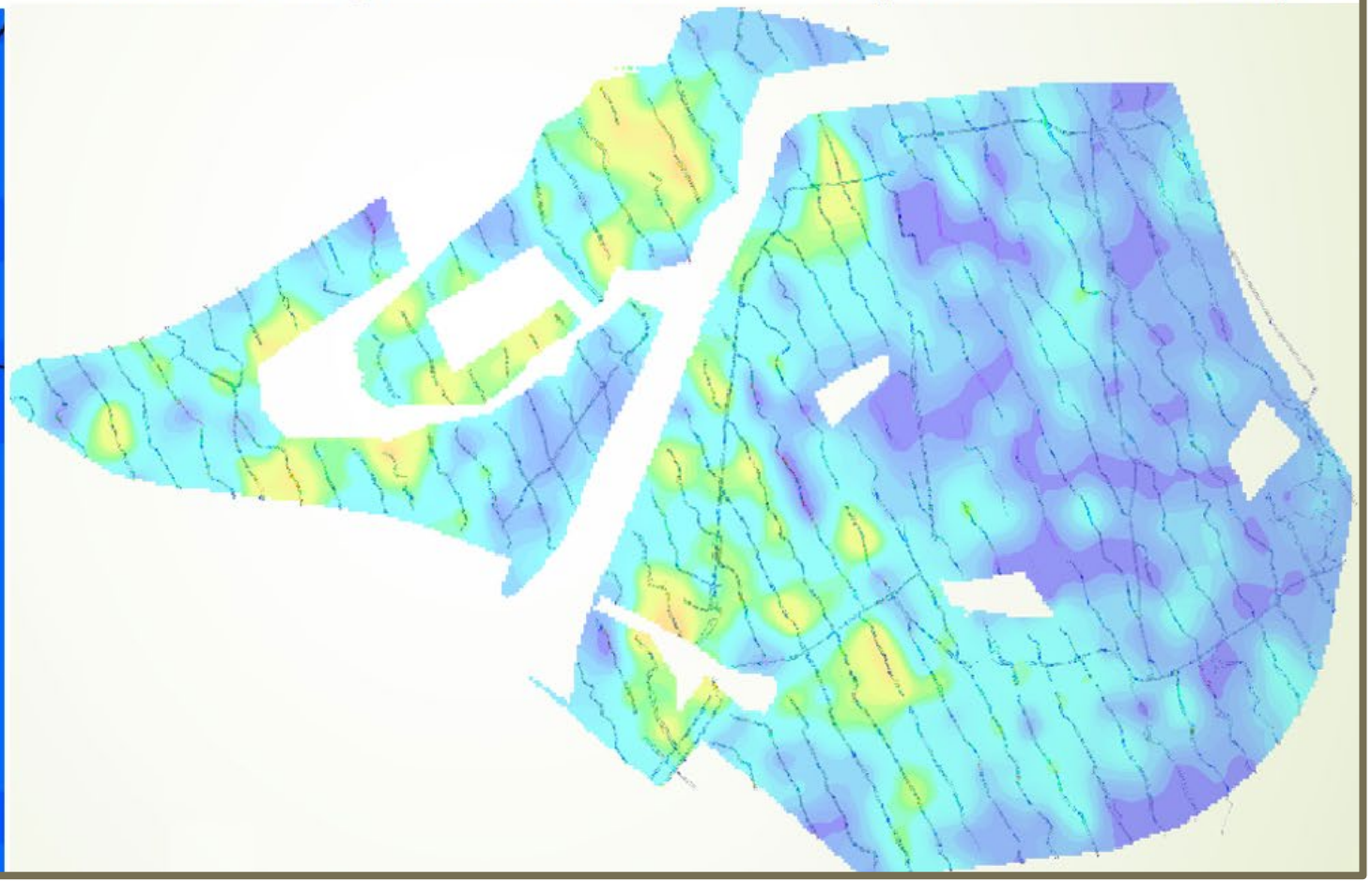


Transect Design/Densities Generated (2 of 3) – Results digging grids only vs transects & grids?

Toolkit 1 "bullseye" examples



Current Project Site "more complicated" example

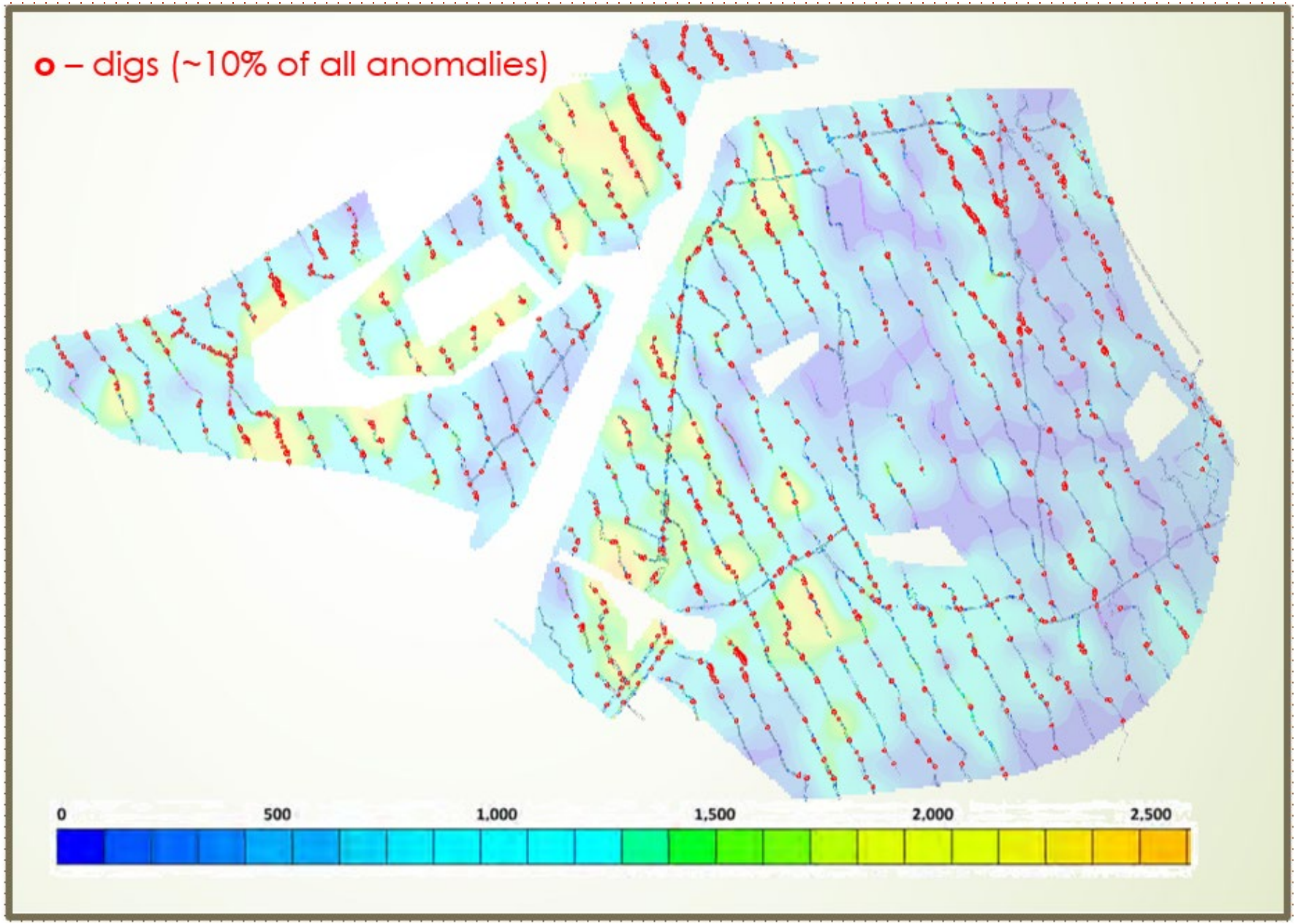


Transect Design / Densities Generated (3 of 3)

Anomaly Density is consistently weighted as the highest WoE factor by PDTs based primarily on the MR QAPP Toolkit 1 training and project exp. from the PDT.

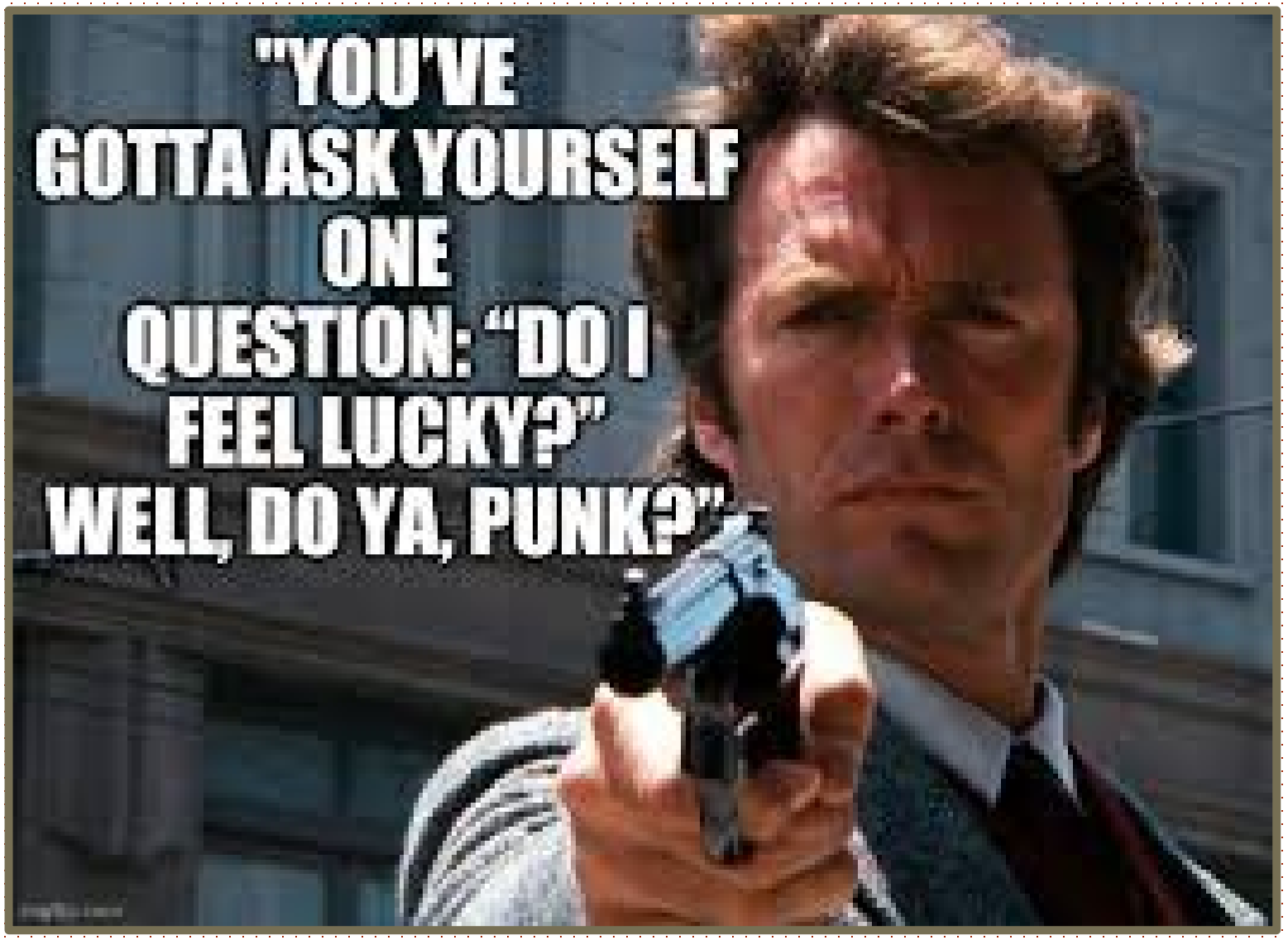
Getting the PDT to divert from this is very difficult.

Transect Dig Locations (Distributions) 1 of 2

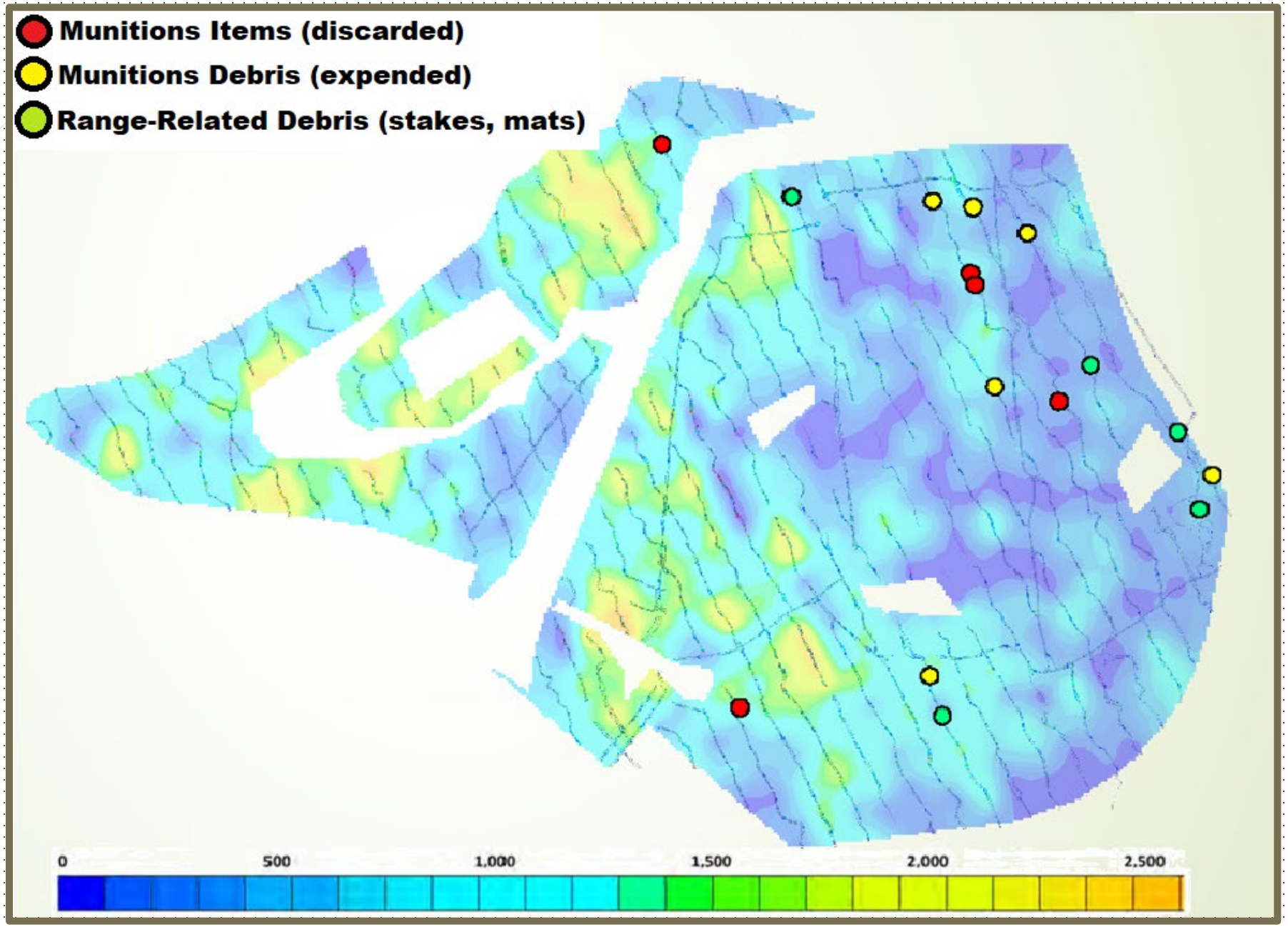


Transect Dig Locations (Distributions) 2 of 2

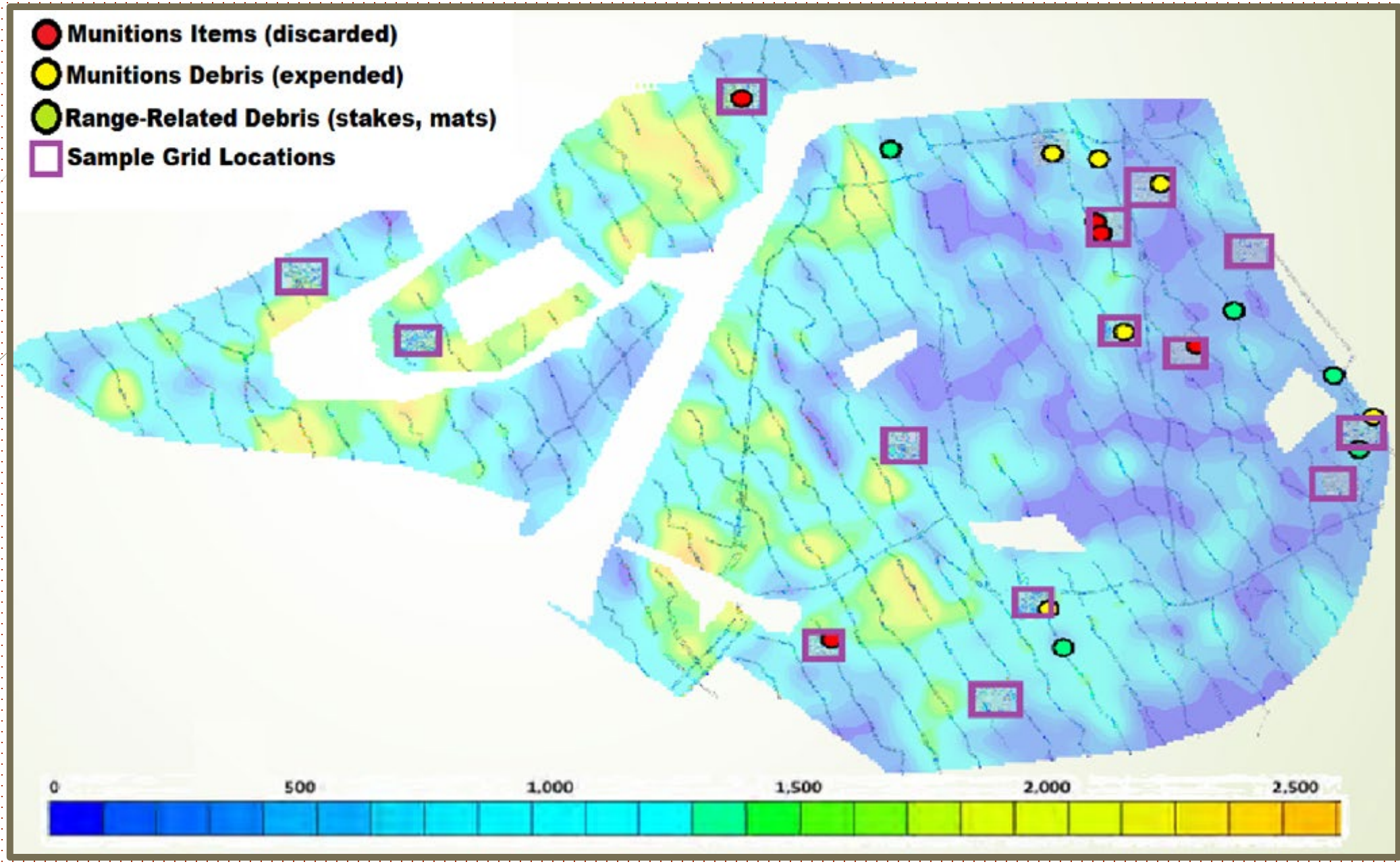
Do we know where the MEC Hazards are?



Transect Dig Results – initial suggestion of no grids



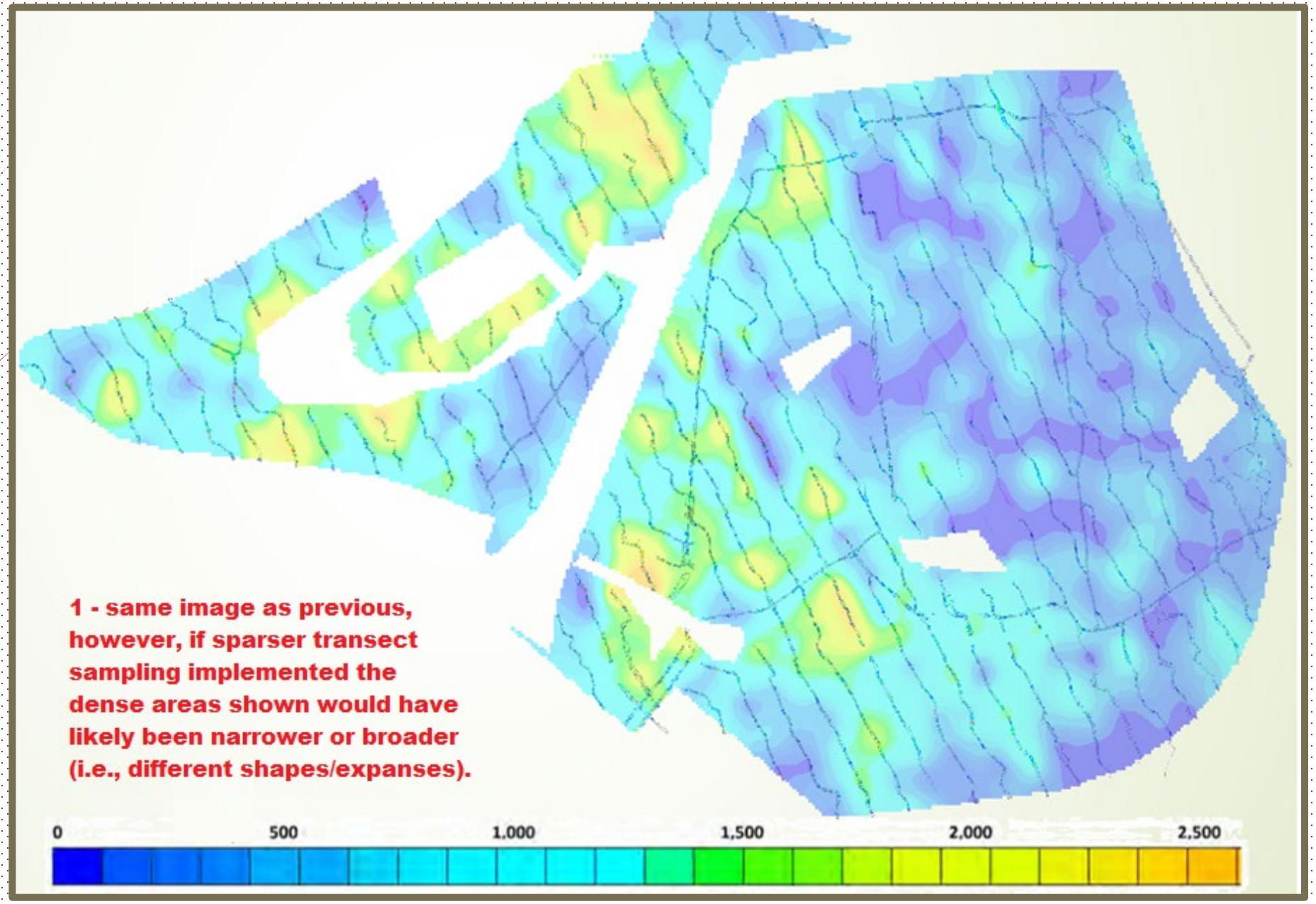
Grids from Density/Dig Info – contractually obligated



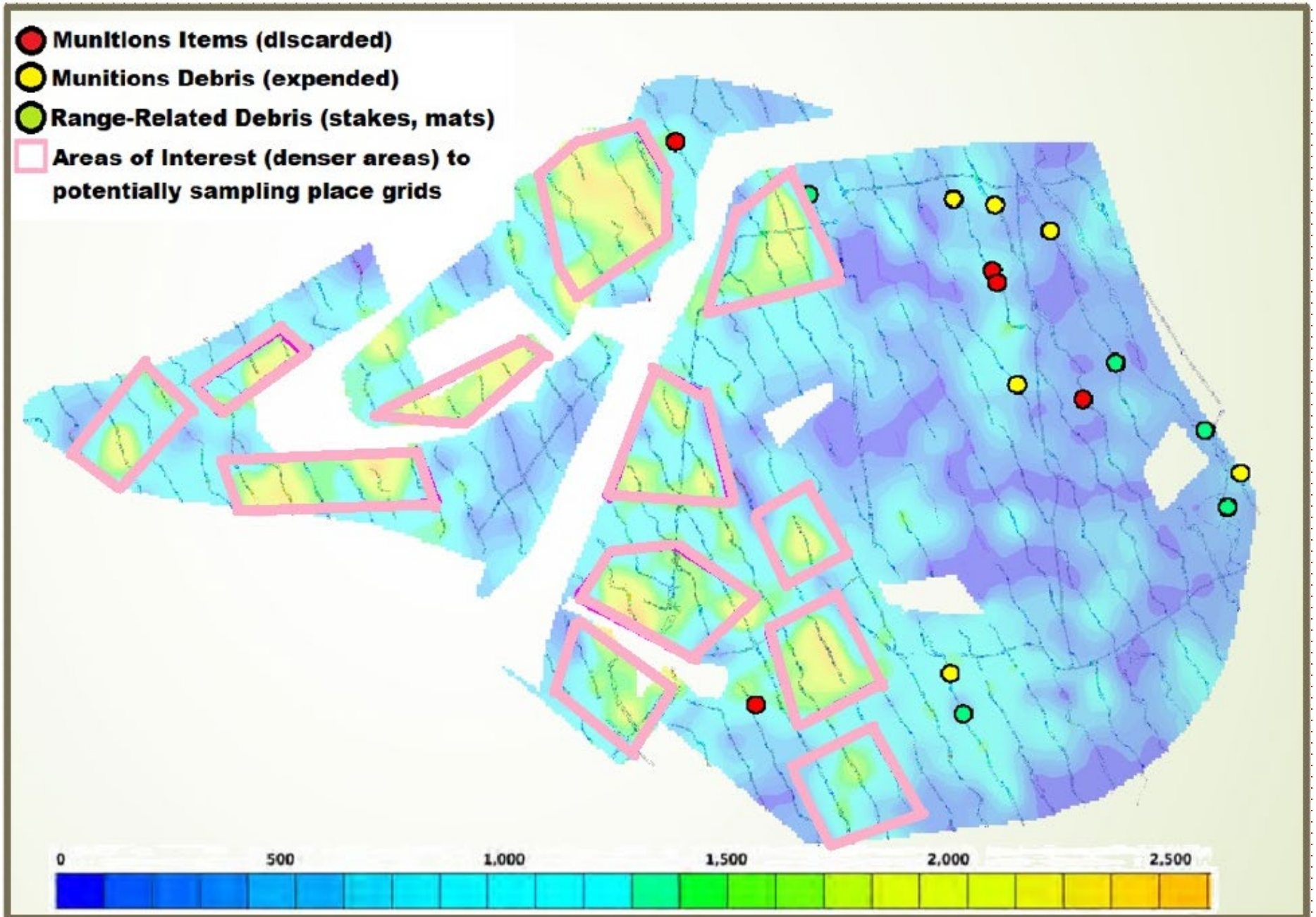
CASE STUDY:
What could have happened?

Standard methods applied to current site with likely outcome.

Transect Design / Densities Generated[1]



Grids Based Solely on Density Info (1 of 2)



Grids Based Solely on Density Info (2 of 2)

Comparative Results & Projected Outcomes

Commonly-Used Playbook

- Transect DGM[1] generates density image with less definitions and broader AOIs
- No transect digs, no MEC/MD/RRD finds
- Grids placed on density only would have encountered no MEC/MD/RRD
- No findings to define MEC/MD type

Outcome: unknown for sure, but the site likely would have been recommended for NFA/5YR and not for any further environmental actions (TCRA/RA), without priorities, focused away from low density portions (eastern) of the site.

[1]May leverage default transect spacing using a lower position accuracy system without the requirements for anomaly resolution and likely allot less data collection during RD processes

One of Many Revised Strategies

- Transect DGM[2] generates density image with higher definitions and narrower AOIs
- Transect digs, ~ 20+ MEC/MD/RRD finds
- Grids placed on density & digs may encounter more MEC/MD if they resided
- MEC/MD mostly DMM and no fragments

Outcome: known for sure, and the site was recommended for future environmental actions (TCRA/RA), with priorities, particularly the lower anomaly density but higher MEC/MD/RRD portions (east) of the site.

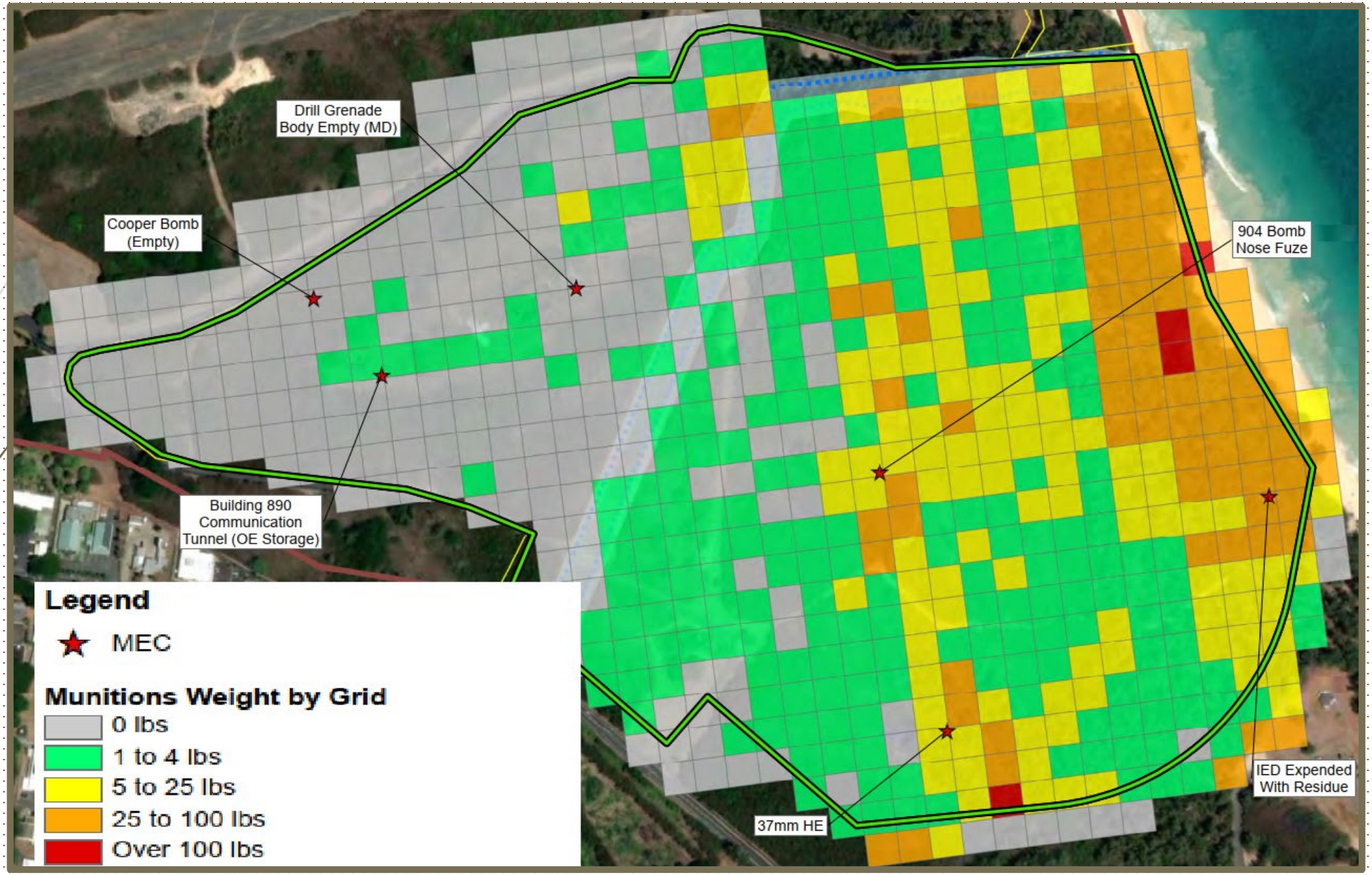
[2]Leverage tighter transect spacing requiring higher position accuracy to meet anomaly resolution standards while lending itself to more data collection during RD processes

Additional Information

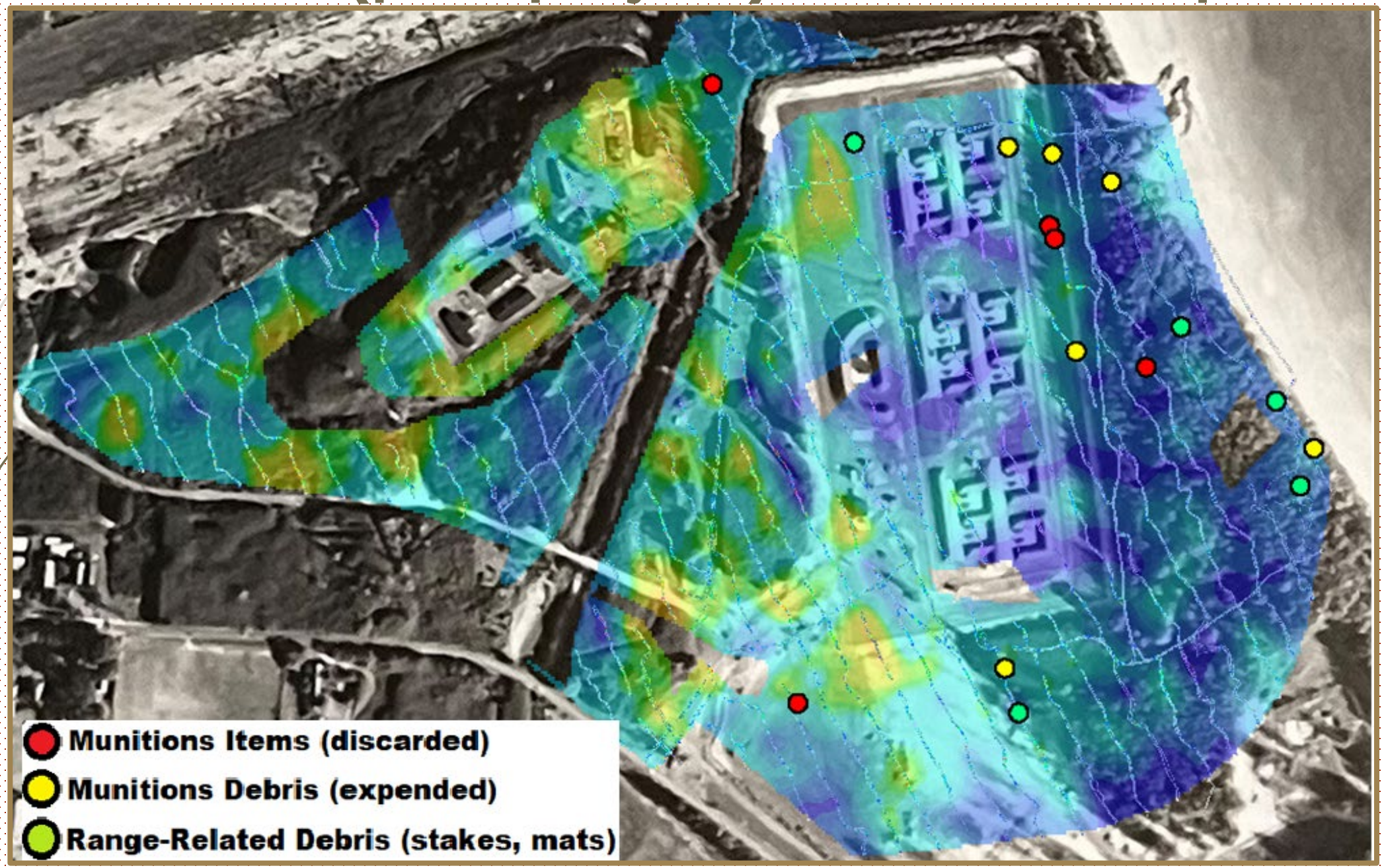
Did It Help (Pre-project Information)?

Would it Have Helped (Post-Project Information)?

Additional Info (pre-project) – Did it help? Yes & No



Additional Info (post-project) – Would it help? Yes



Recommendations

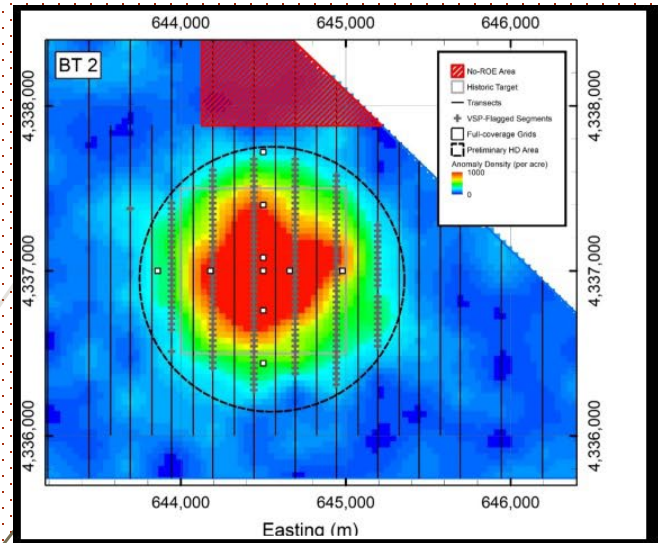
- Strongly consider budgeting/planning to dig transects when
  - Site history includes mixed-use, maneuver area, or repurposed land sites
  - Vintage of prior work quality or sample fidelity lends itself to uncertainties
  - Potential for no frag; and non-fragmenting rounds (i.e., practice) or DMM exists
- Re-evaluate not digging transects (to the point of digging transects) when
  - Transect anomaly densities don't indicate clear targeted/impacted area
  - No fragmentation or minimal fragmentation is noticed on the surface
  - Field documentation includes infrastructure or other non-munitions observations (trash disposal; landfill), which confuse findings from anomaly density as MEC decision driver
- Plan for the above usually infer or require
  - Higher quality positioning during DGM & reacquire to ensure accurate dig results
  - Narrower transect spacing (to resolve uncertainty)
  - More time/money spent upfront (higher quality/ fidelity)
  - Discussions / agreements from PDT to be lengthy to resolve varying opinions, and commonly only resolved with implementing the most conservative answers
  - Better value for discerning/constraining aerial extents and costs for future RA/TCRA.
  - RI/RD $↑ may drive RA/TCRA $↓↓, particularly given the cost/acre of modern tech
  - But (see bonus topics) as if critical density 'LOW' may not be much RA/TCRA $↓↓

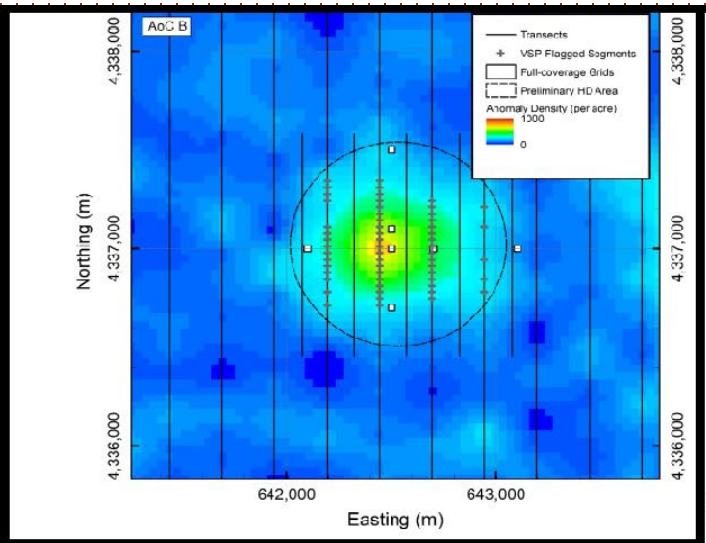
BONUS TOPICS: Current Trends

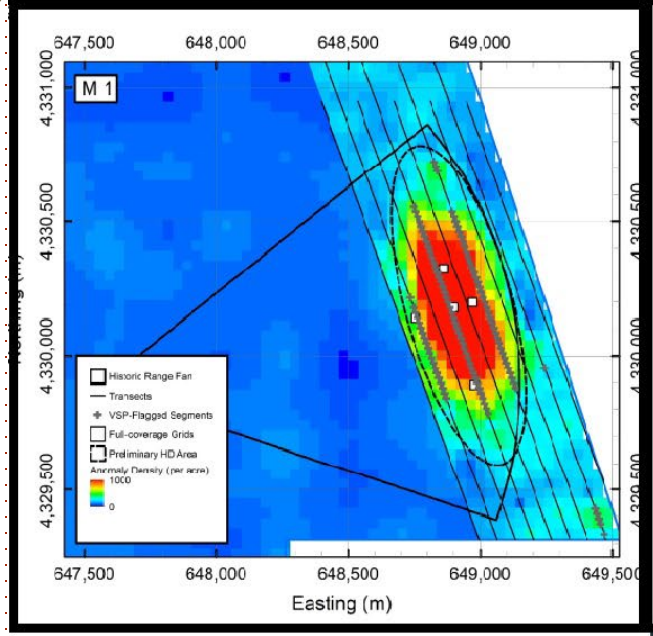
Discussions of Current Trends (*Time Permitting*)

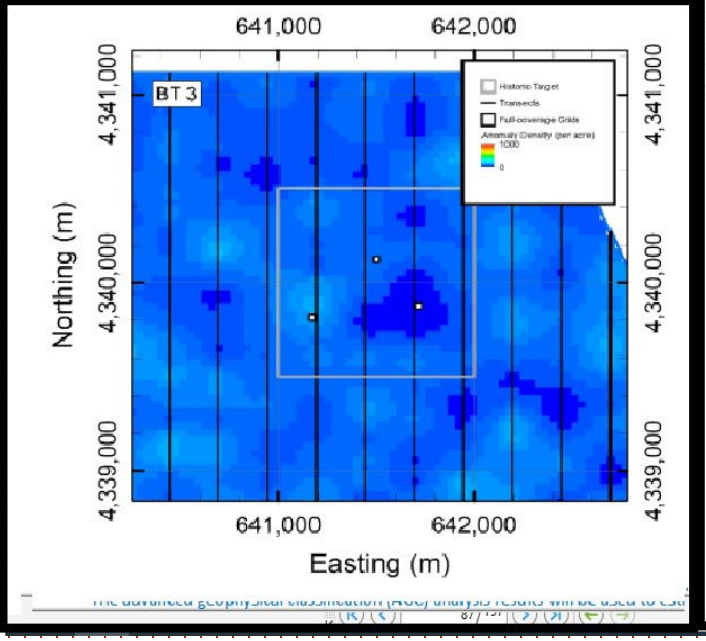
BONUS Topics (1 of 8) – MR QAPP Toolkit #1

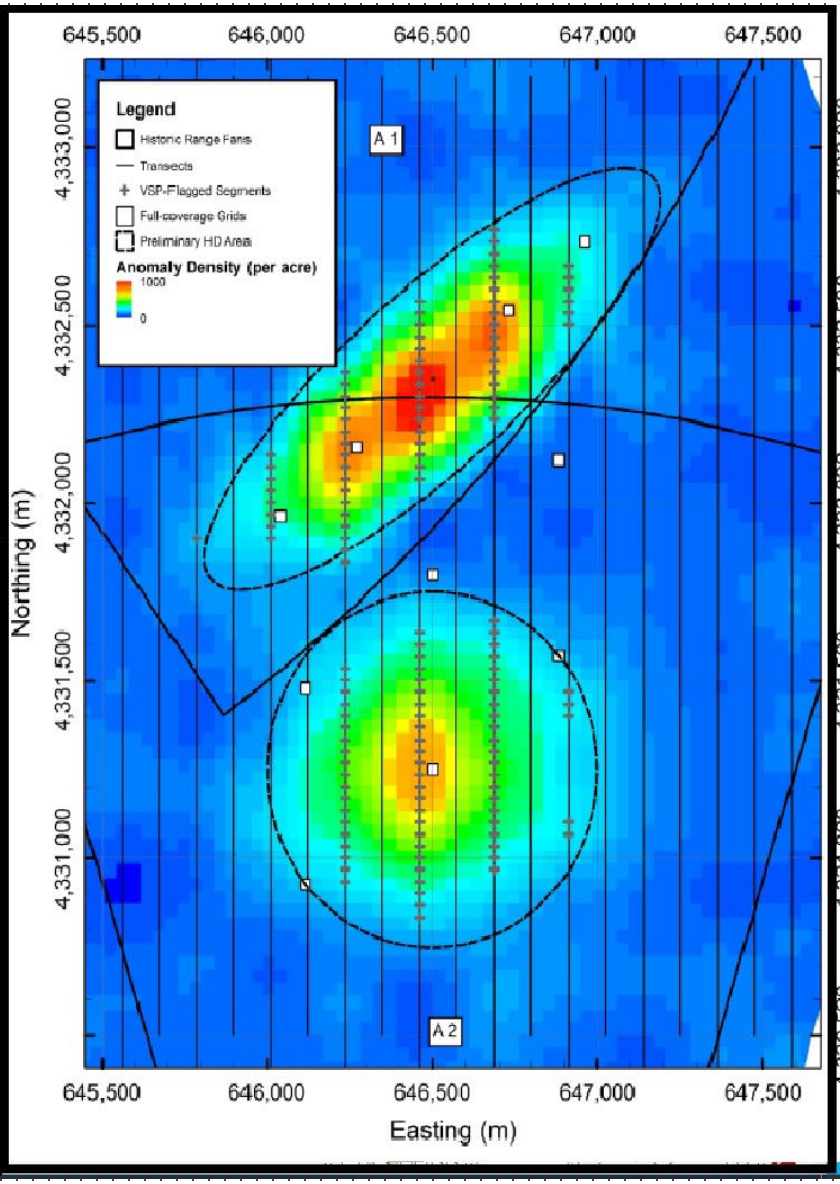
Predictable Examples (bullseyes or blank)



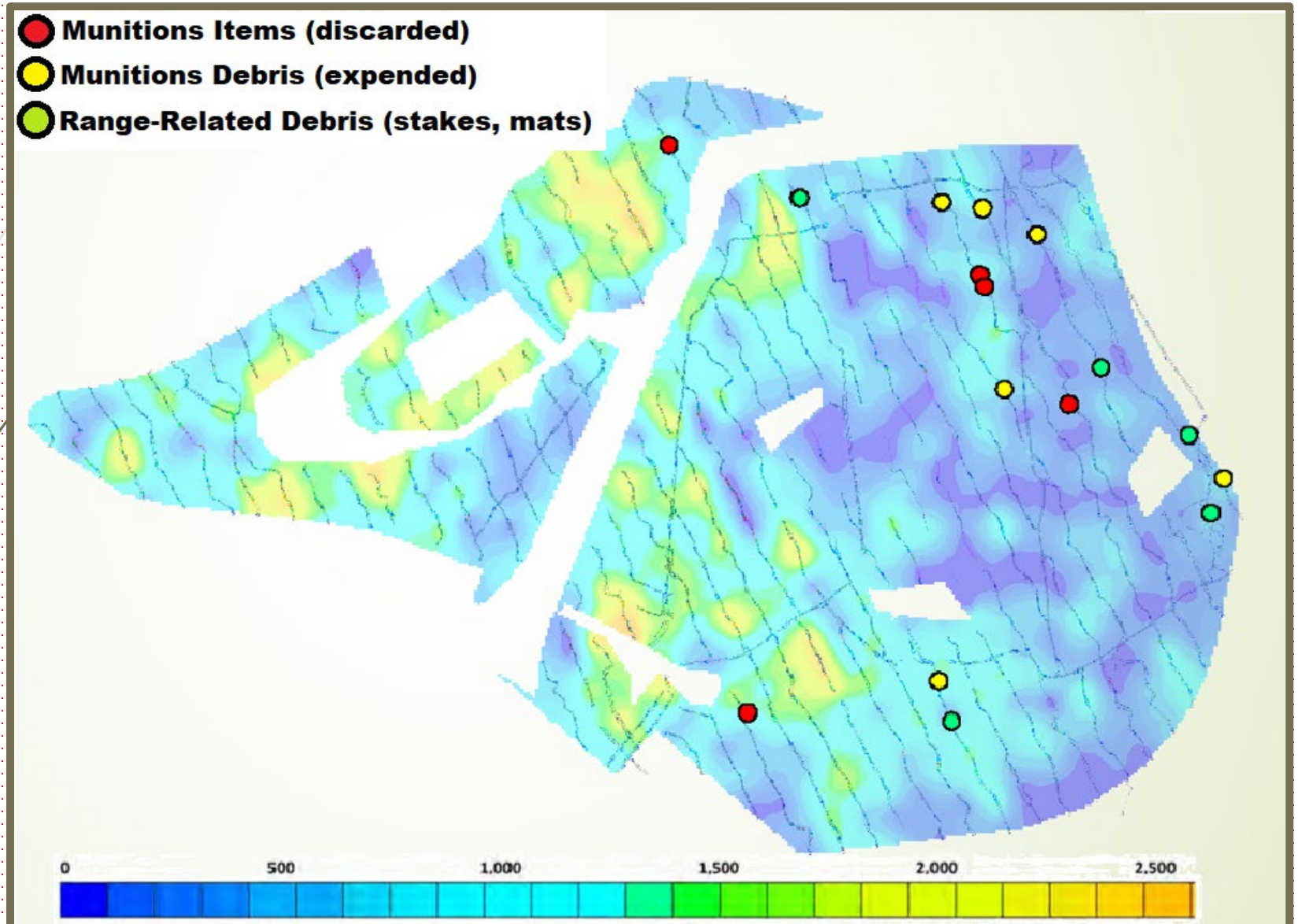






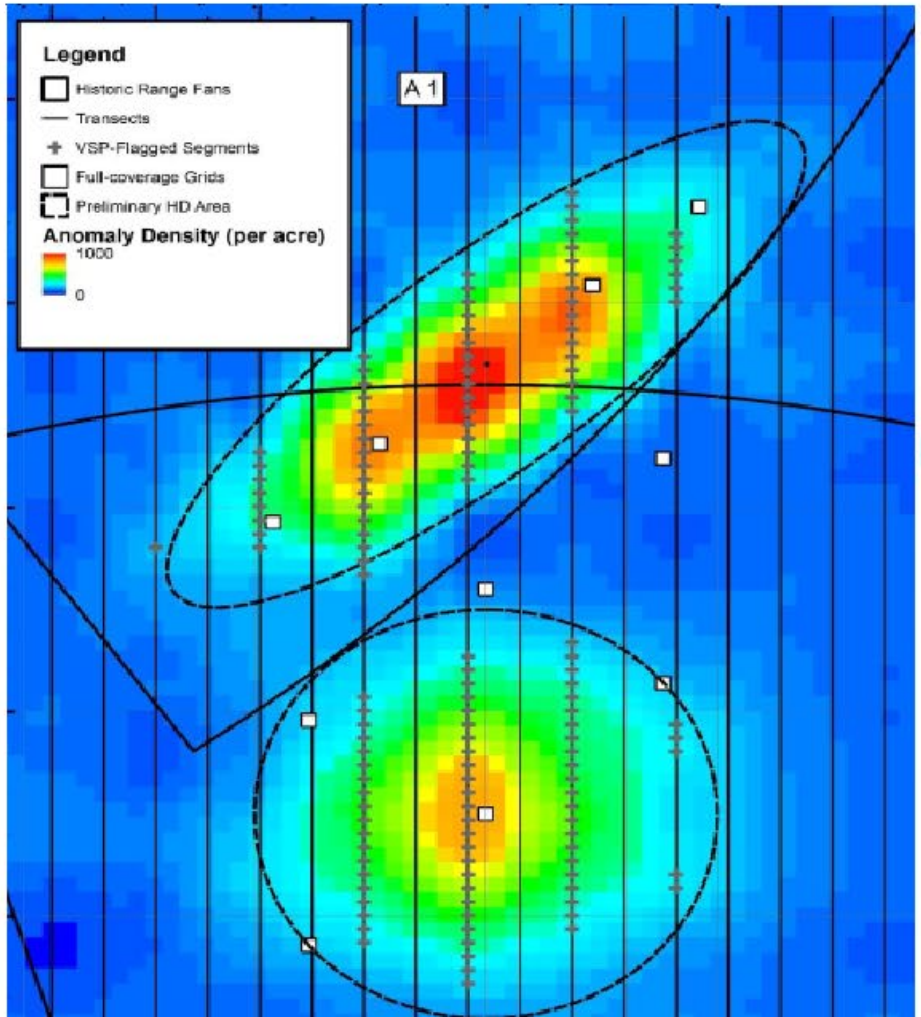


BONUS Topics (2 of 8) – Case Study Example (No bullseyes, narrow hot spots non-MEC related)

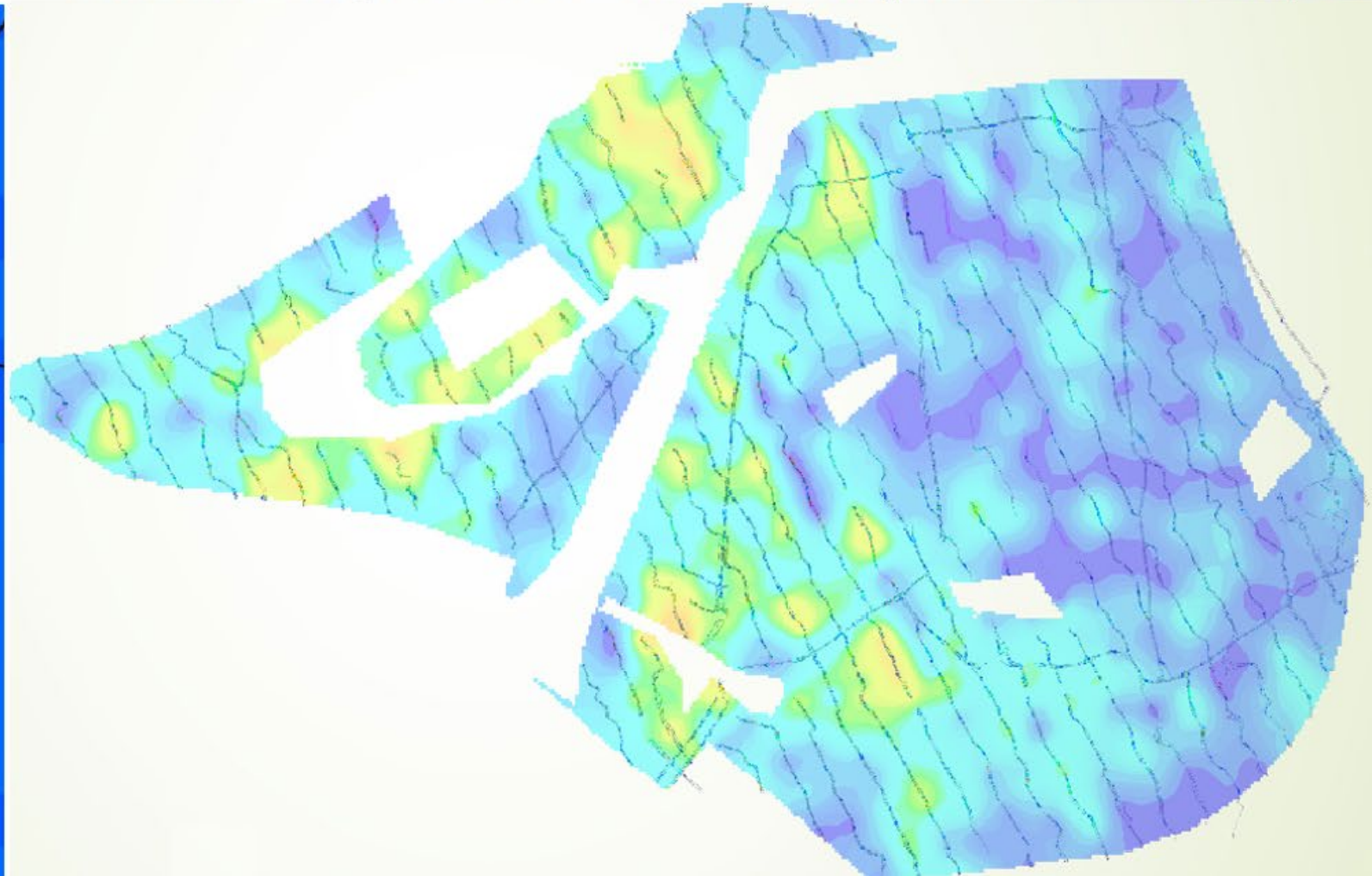


BONUS Topic (3 of 8) – Toolkit vs Case Study Example, Grid Size vs Transect Spacing: ApA compares

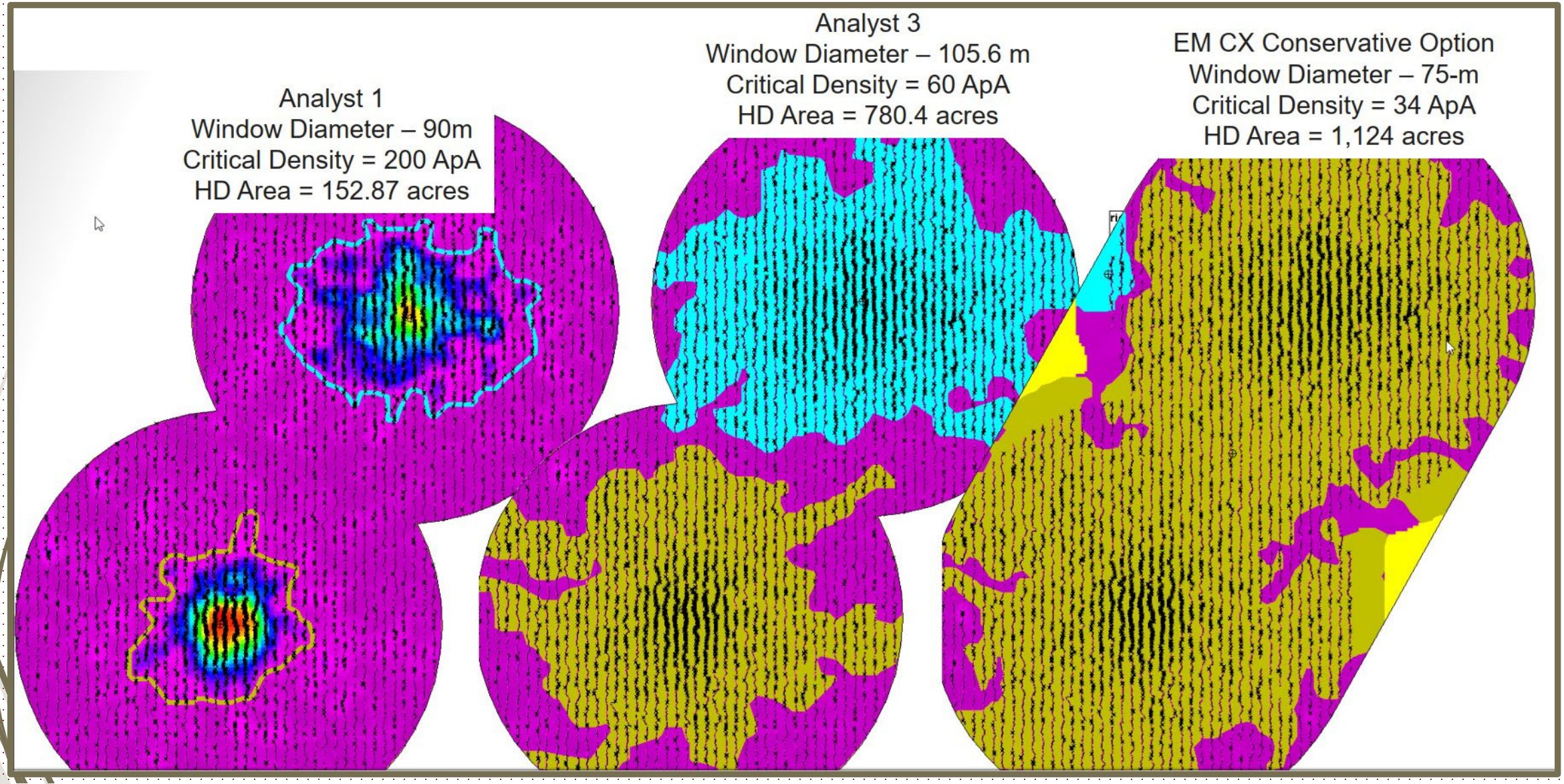
Toolkit 1 "bullseye" examples



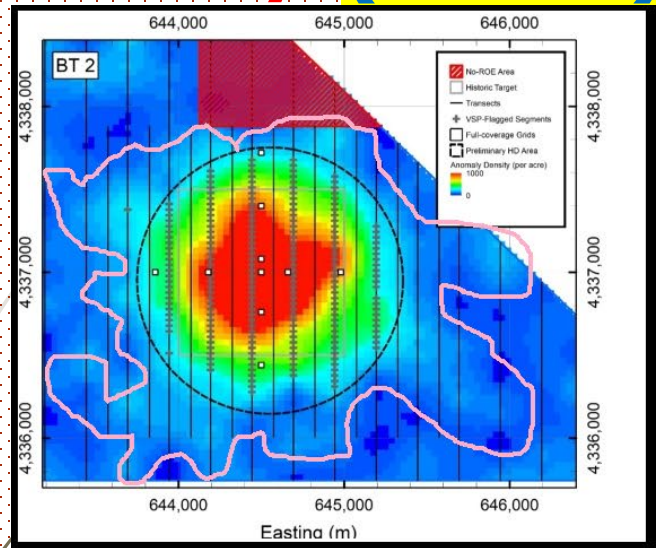
Current Project Site "more complicated" example

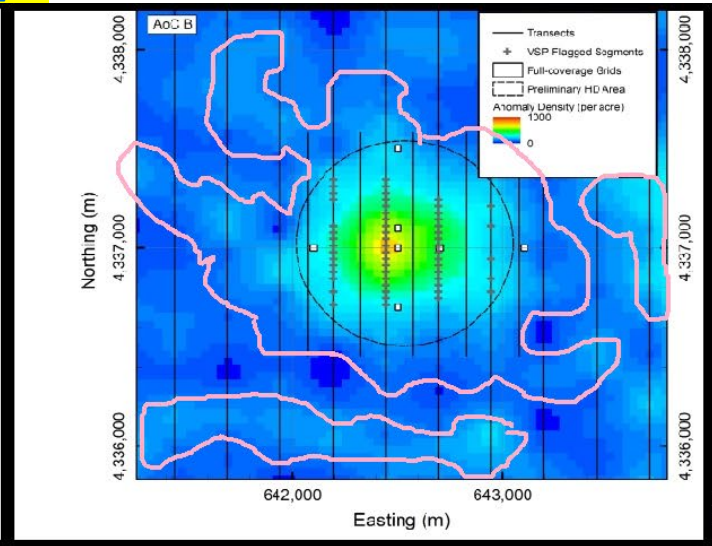


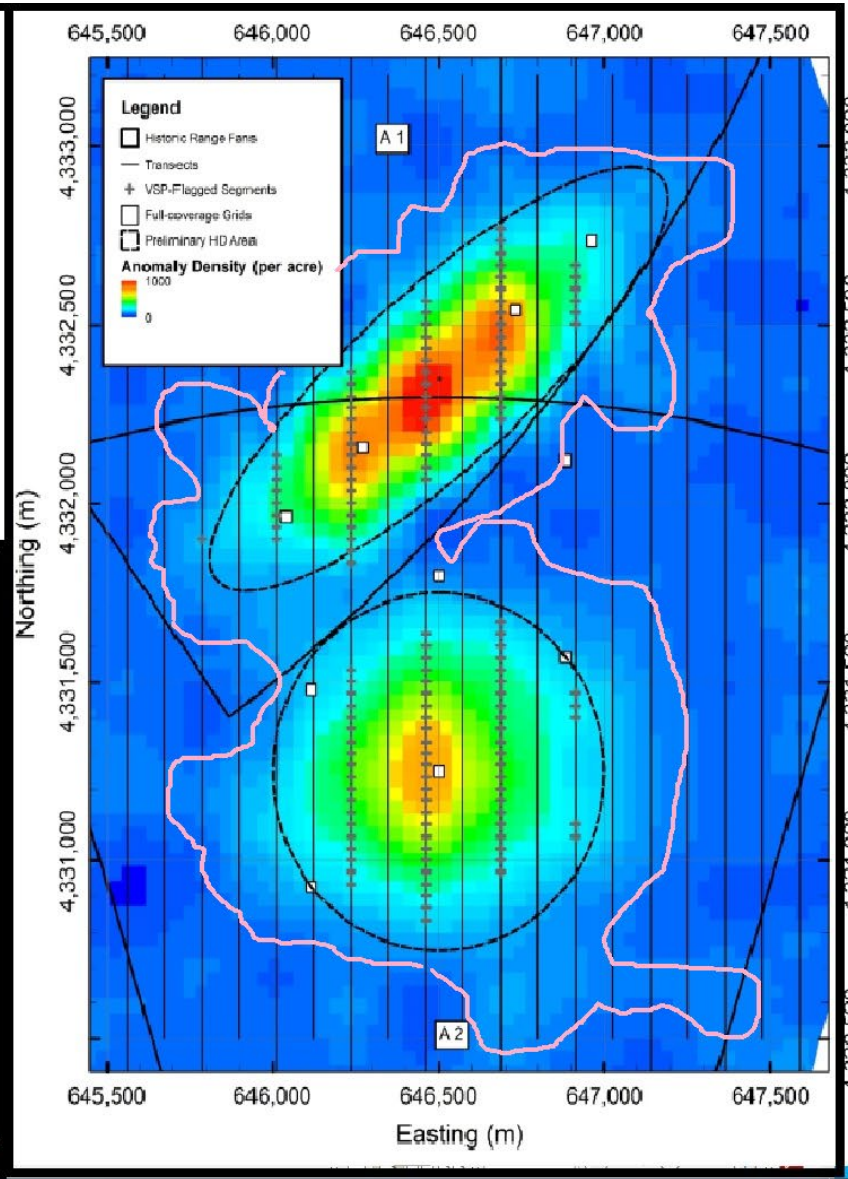
BONUS Topics (4 of 8) – Critical Density Recently Revised/Reiterated as closer to background

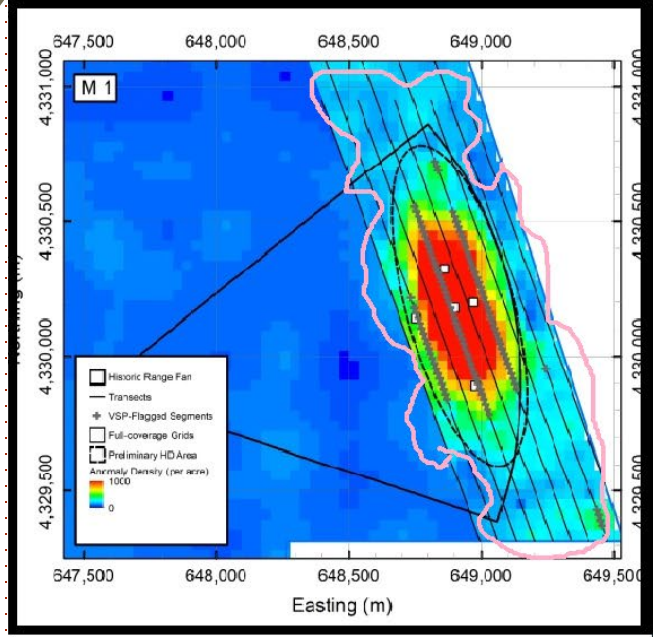


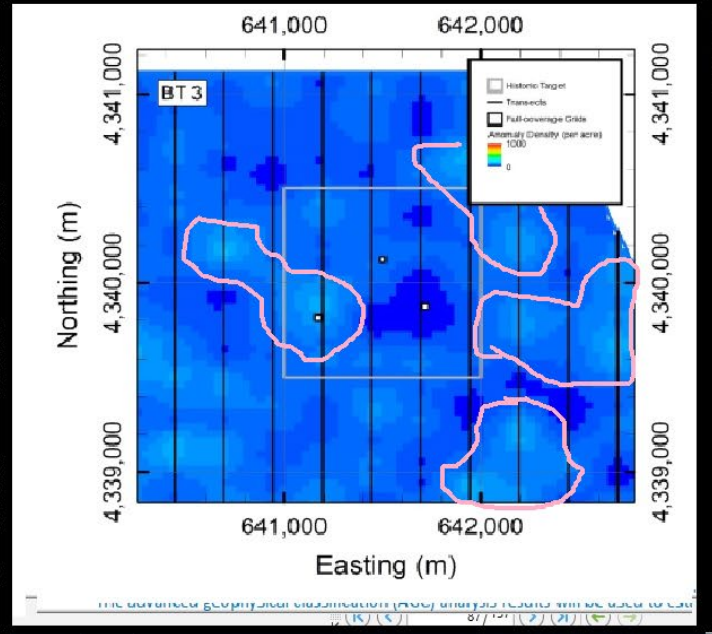
BONUS Topics (5 of 8) – Revised/Reiterated Critical Density (lower) Tied to Toolkit #1 – redo VSP?



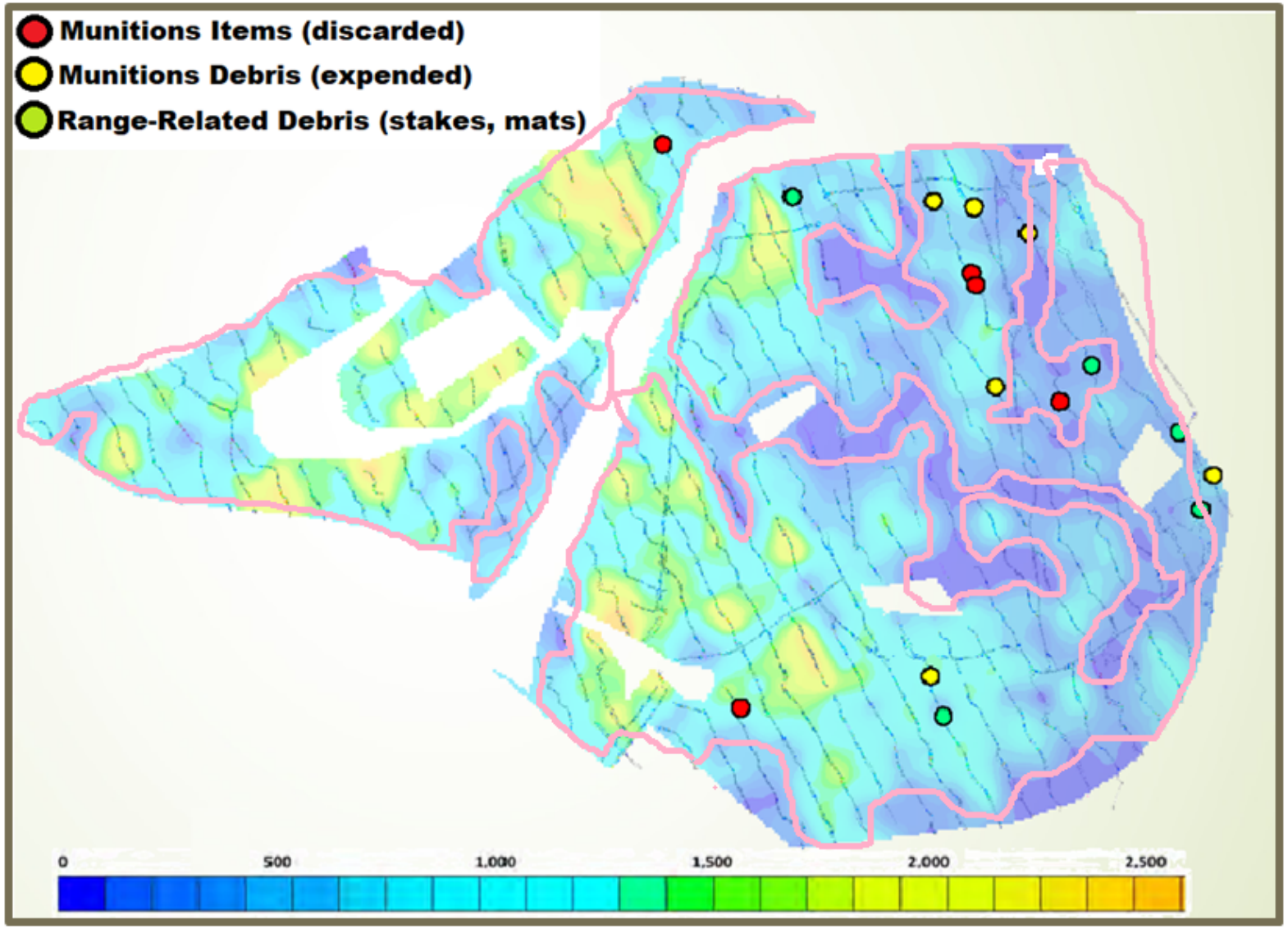








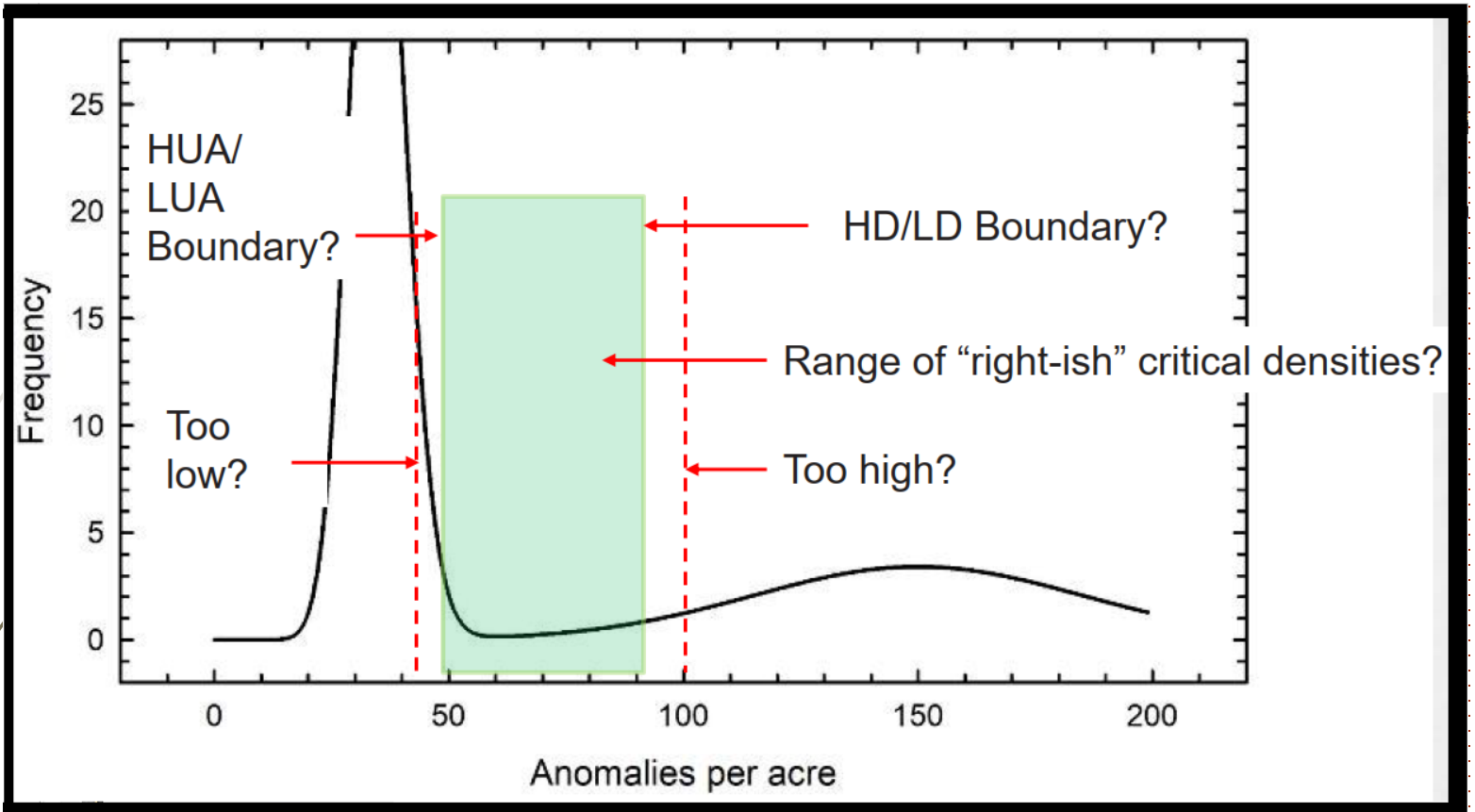
BONUS Topics (6 of 8) – Revised/Reiterated Critical Density (lower) Tied back to Study – whole site



1. Still would have missed MEC if we stuck to the exact critical density linepath even though its likely full site would've been recommended for future RA IF MEC found.

2. Doesn't solve issue of MEC only in dense anomaly areas.

BONUS Topics (7 of 8) – Critical Density Variability



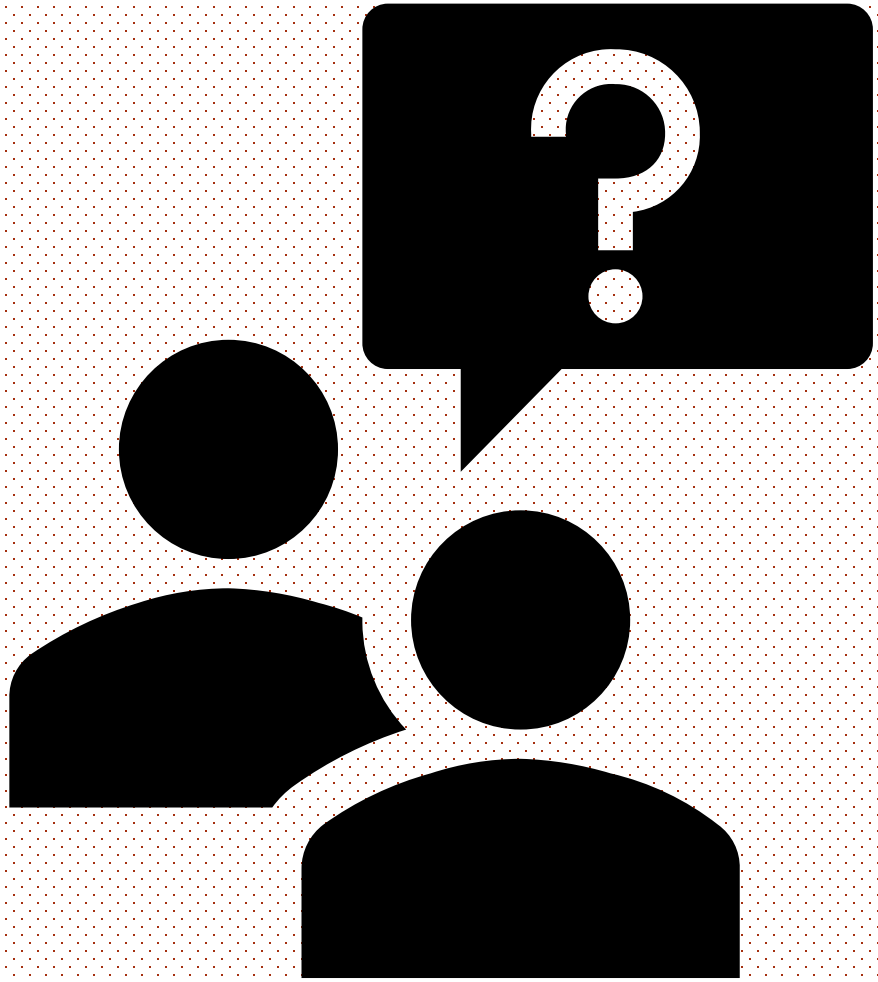
Critical (ApA)	HD Area (ac)	
34	1,124	50 ApA Variability at low end could be 500 acres (1/2 Site)
60	780	
150	343	50 ApA at moderate end could be difference of 200 acres (1/4 site)
200	153	

BONUS Topics (8 of 8) – Project Delivery Teams

- Team Size (Strengths)
  - Increasing participation maximizes approvals through the entire process
  - Varying view of technical and practical opinions
  - Wide-Ranging industry-related training and education
  - Incorporating contractor, government, and regulatory inputs
  - Involving/garnering solutions earlier rather than later in project timeline is better
  - Summarizing desired outcomes to CO/KO important for decisions which modify cost

- Planning Decisions and Outcomes (both positive/negative)
  - Majority doesn't always rule
  - Commonly conservative approaches win over aggressive approaches, if there is uncertainty, disagreements, or dissenting opinions
  - Initially expect "No" regarding less conservative approaches or conclusions, unless a large amount of data sets/details can bolster case regarding low chance of success.
  - "No is always the correct answer.." Lorne Michaels, Saturday Night Live, has same view until writer/performer comes back to sell the skit, idea, etc., after working on it more
  - In other words, don't take it personally, as a lot of people have to sign off on it and the results will be available for the public to see, whether it's the admin record or TV show

End of Presentation (Questions)



General Application Questions
Brian S. Brunette
GSI Services Group
bbrunette@gsisg.com

QC/Site-Specific Questions
Courtney deVries
GSI Services Group
cdevries@gsisg.com