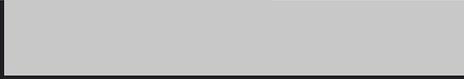
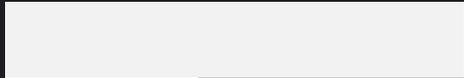




**MAXIMIZING THE QUALITY OF YOUR
AGC DATA AND EFFECTIVENESS OF
YOUR QC PROCESS**

SAGEEP April.2, 2023

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Presentation Overview

- Why is Quality control so important for AGC work
- IVS Test
- Sensor Function test
- Background location test
- Survey coverage



AGC – Importance of Quality Control

The evolution of AGC is necessary to continually improve on the important work that this method is responsible for – munition clean-ups.

Quality Control (QC) Test to Check:

- (i) Sensor
- (ii) Geo-positioning
- (iii) Operator





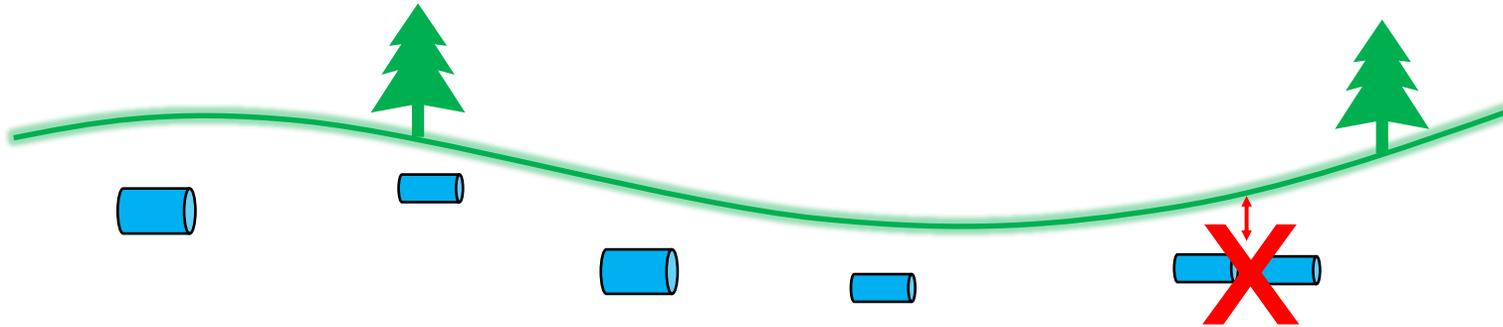
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IVS TEST

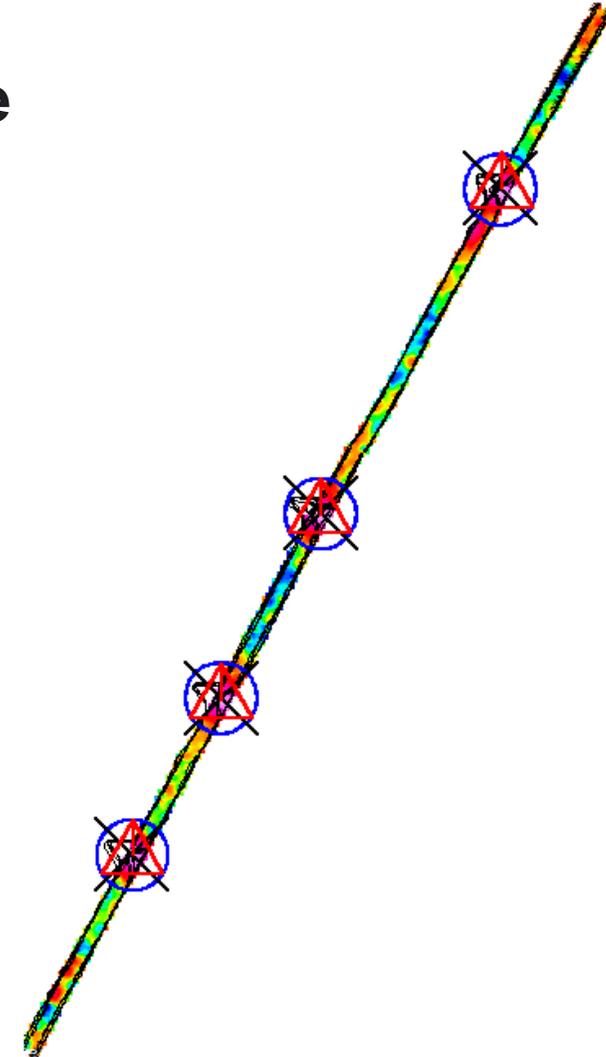
Instrument Verification Strip: Intended Objective

Test Repeatability of the System

How: Bury several objects at some separation, that you can survey at the beginning and end of each day and get the same response.

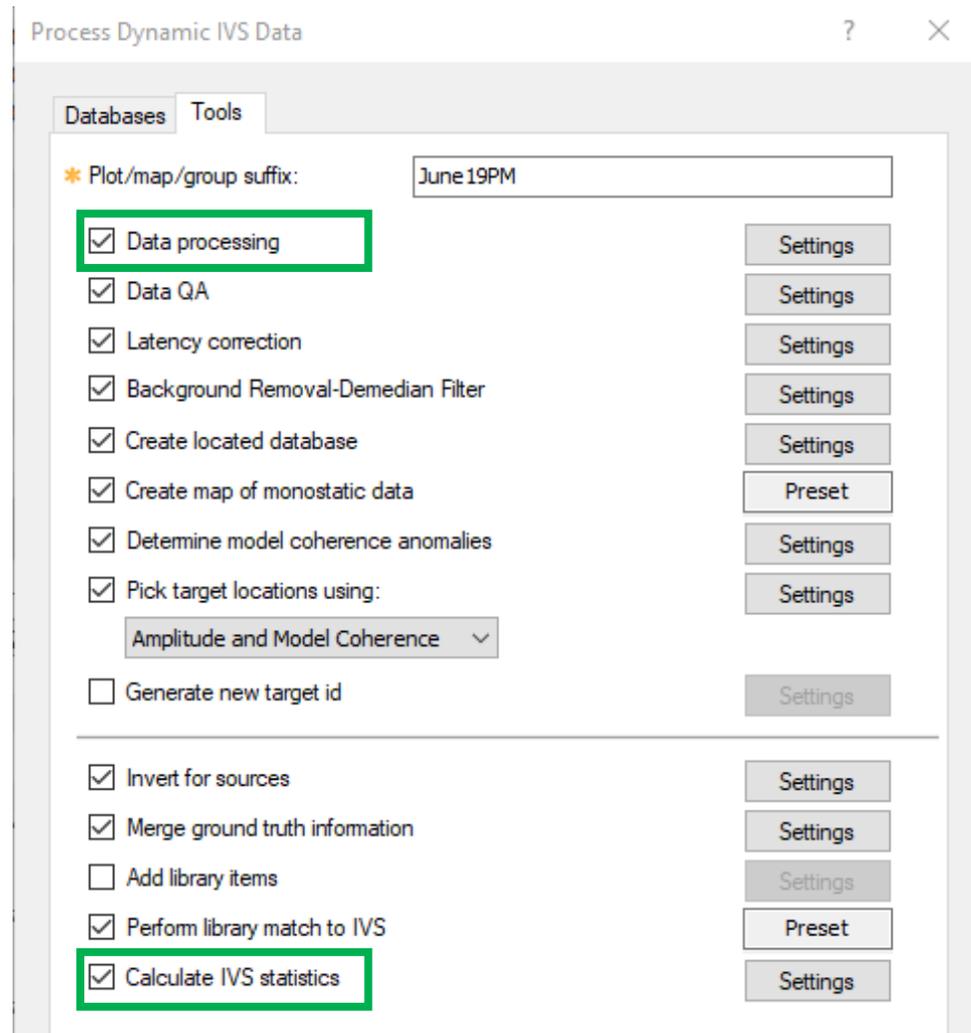


- Objects are not intended to be at detection limit of sensor
- Should not be multiple objects at a location





IVS – Data Processing bundle!



- Several steps
- Efficient
- Repeatable
- Reduce human error through automated workflow
- Data processing verifies data quality included MQO's
- IVS statistics, from inversion results, help with trend analysis of identify source locations, and checking MQO's



IVS: Data Processing - Matching to MQO's

Measurement Quality Objective	Acceptance Criteria
→ Geodetic Accuracy	GPS status flag indicates RTK fix (RTK GPS) RTS passes Geodetic Function Test (RTS)
→ Transmit current levels	Current must be \geq [Insert instrument-specific requirements]
→ Valid orientation data	Orientation data reviewed and appear reasonable within bounds appropriate to site
→ Valid receiver data – No MQO?!	

- Data to process:
- Time and Position (GPS fix quality & separation)
 - Elevation
 - Platform attitude (pitch & roll & heading)
 - Transmitter currents
 - Saturated receiver data
 - Flat lined receiver data



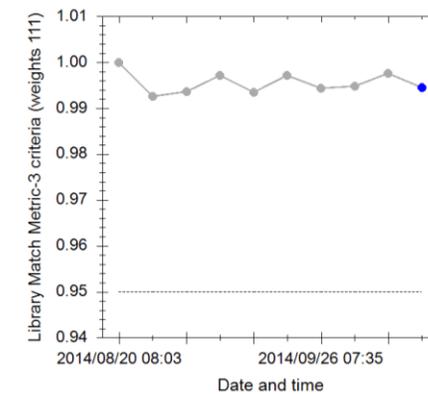
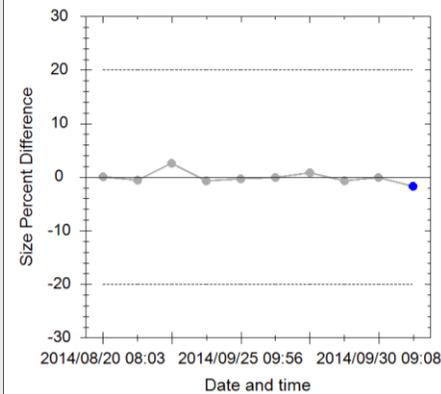
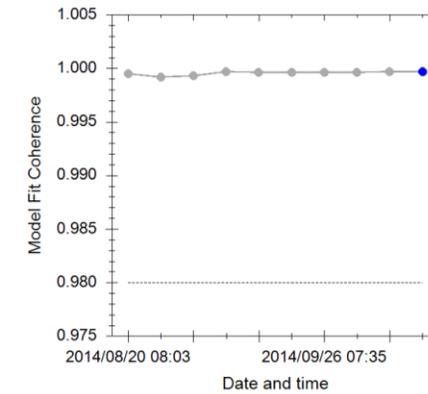
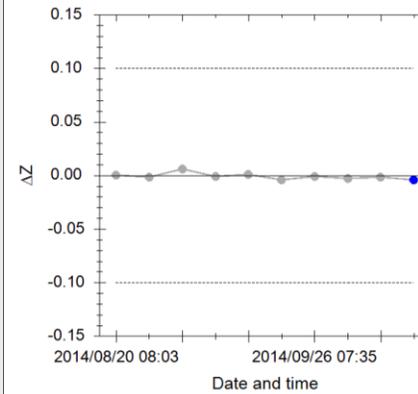
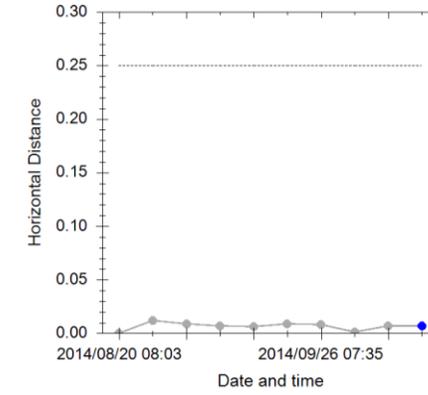
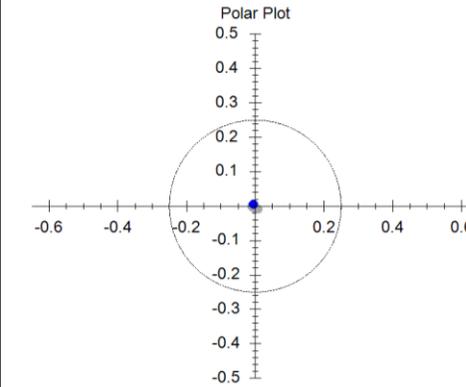
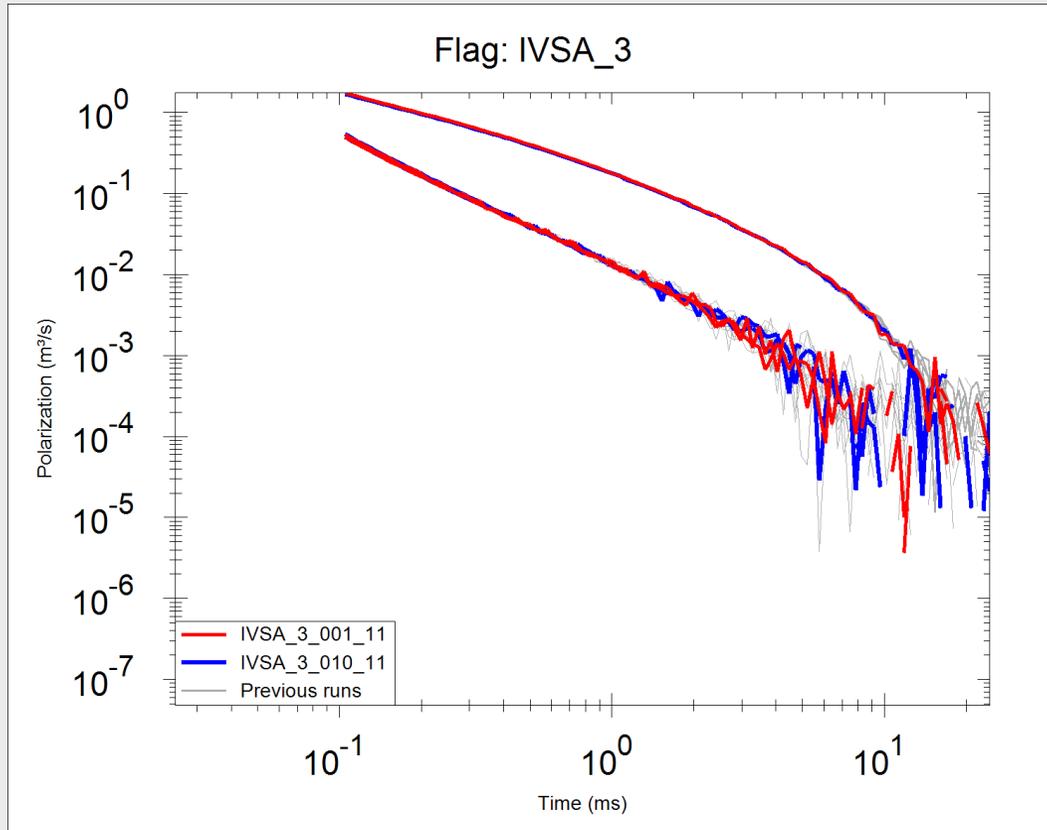
IVS: Inversion Statistics- Matching to MQO's

Measurement Quality Objective	Acceptance Criteria
Initial/Ongoing detection survey positioning accuracy (IVS)	Derived position of IVS target(s) are within 25cm of ground truth location
Confirm inversion model supports classification	100% of predicted seed (QC and Validation) positions $\leq 0.25\text{m}$ radially from known position (x, y) Z $\leq 0.15\text{m}$.
Confirm Derived features match ground truth	Data analysis shows items have polarizability parameters that are consistent with their actual size , shape/symmetry and wall thickness
Confirm inversion model supports classification	Derived model response must fit the observed data with a fit coherence ≥ 0.8
Initial/Ongoing derived polarizabilities accuracy (IVS)	Library Match metric ≥ 0.9 for each set of inverted polarizabilities

Measure (unit)	Threshold
Horizontal distance (m)	0.25
Delta Z (m)	0.1
Size percent difference	20
Model fit coherence	0.8
Library match metric-3 criteria (weigh...	0.85



IVS Statistics: Trend Analysis





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SENSOR FUNCTION TEST



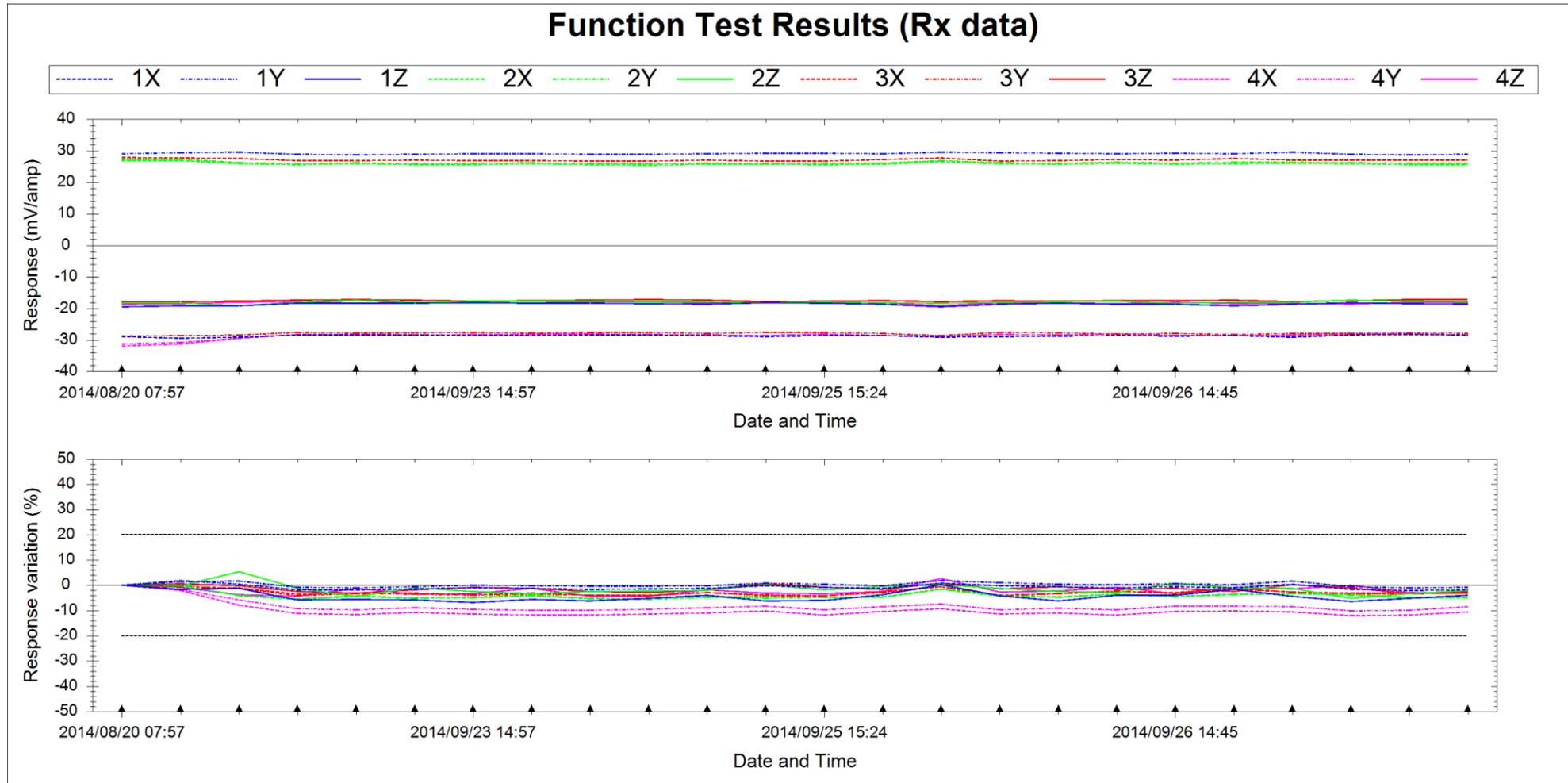
Sensor Function Test summary

- Sensor function test – also important for QC. Sensor function test first, before IVS
- Sensor function test in the field (manufacturer test: green light or red light) and running the test in our software (validation). Consistency between on-sensor processing and in office using the software.
- Now with HDF v1 amplitude threshold will be coming from the manufacturer. This will improve the robustness and reliability of this test.

Measurement Quality Objective	Acceptance Criteria
Ongoing instrument function test (Beginning and end of each day and each time instrument is turned on)	Response (mean static spike minus mean static background within 20% of predicted response)



Sensor Function Test: Trend Analysis





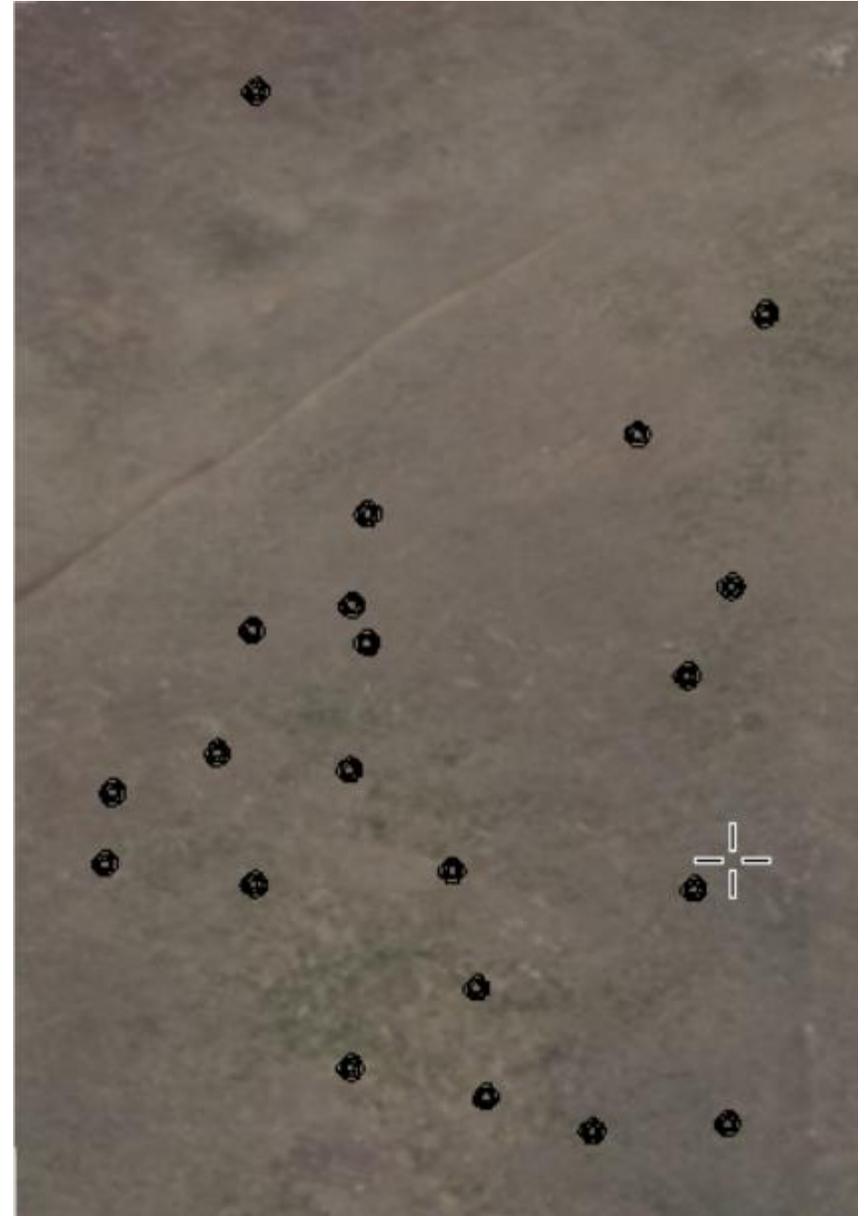
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BACKGROUND LOCATIONS TEST

Selecting Background Locations

- Dynamic/mapping survey data (EM or Mag)
 - Look at the noise in the data to try and identify any noise regimes
- Ideally a clear spot with no anomalies.
- Field notes (any changes in geology, vegetation, utilities in the area, soil color)

Once locations are chosen and some test data collected – next step is to Validate the Background Location



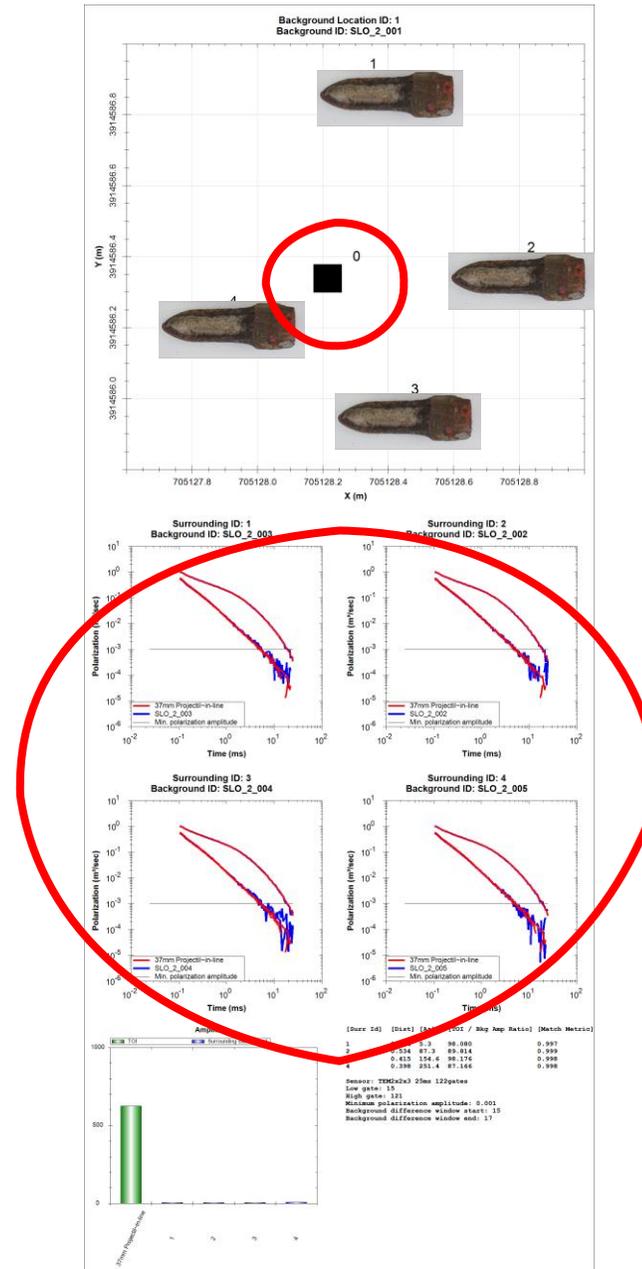


Background Location Validation Test

At each proposed location, take 5 readings – like the side of a dice

The central measurement is treated as the background, and the value subtracted from the four surrounding areas.

These areas are then seeded with the forward modelled TOI data.





Background Location Validation Tool: MQO

Measurement Quality Objective	Acceptance Criteria
Initial measurement of production area background locations and background verification (five background measurements: one centered at the flag and one offset at least 1/2 sensor spacing in each cardinal direction)	All five measurements have a library match within 0.9

Background Location Validation Test

Raw Background Validation Data

- Database prefix: GridA_SBR
- Group name: Targets
- Mask channel: UXA_MASK

TOI Reference Data

- Database prefix: TOI_SMD
- Group name: Targets
- ID channel: UXA_TARGET_ID
- TOI description channel: UXA_Identification
- Selected TOI: 37mm Projectile M74 AT TP_BlossomPoint_TP45 - 0.30 - F
- Response data channel: UXA_DATA_NORM

Less OK Cancel

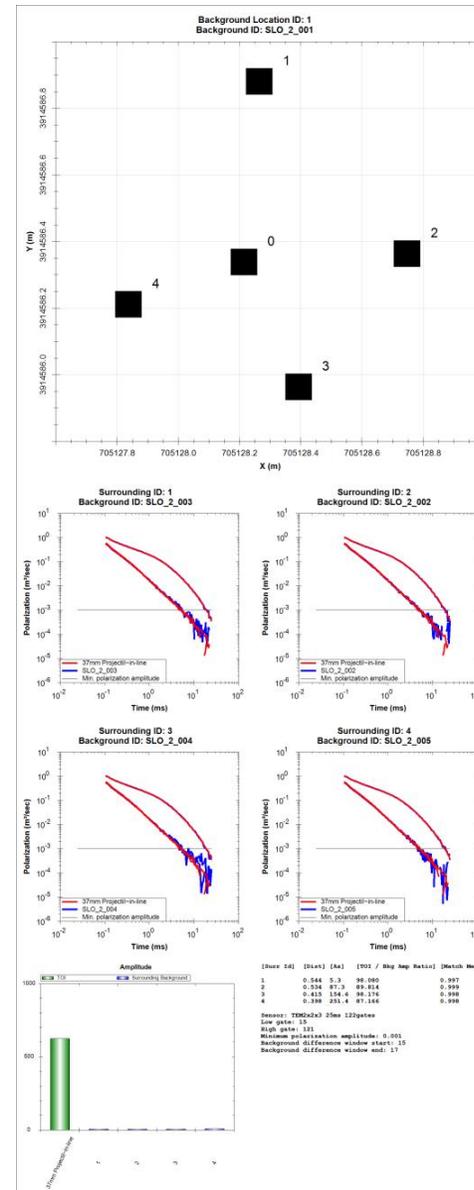
- Background cluster distance (m): 1.2
- Min. reference to surrounding measurement (m): 0.2
- Max. reference to surrounding measurement (m): 0.8
- Sum of TOI to background amplitude threshold (m³/s): 2.5
- Min. polarization amplitude (mV): 0.001
- TOI match metric: 0.85
- Background difference window start gate: 15
- Background difference window end gate: 17
- Background location ID: Auto generate Use flag ID



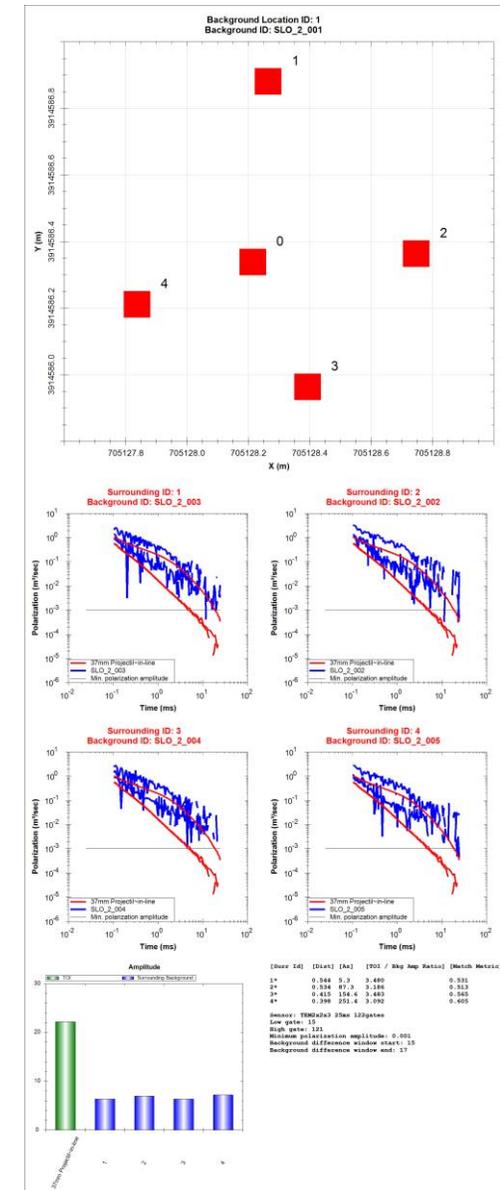
Background Location: Getting More!

- Forward Modelling: Create Depth Response Curve
- Other TOI's:
 - Different TOI's might have difference clearance depths
- Run with the different probable depths
 - This tool can be used to help you plan your project - what can actually be detected on your site?

37mm at 10 cm



37mm at 50 cm



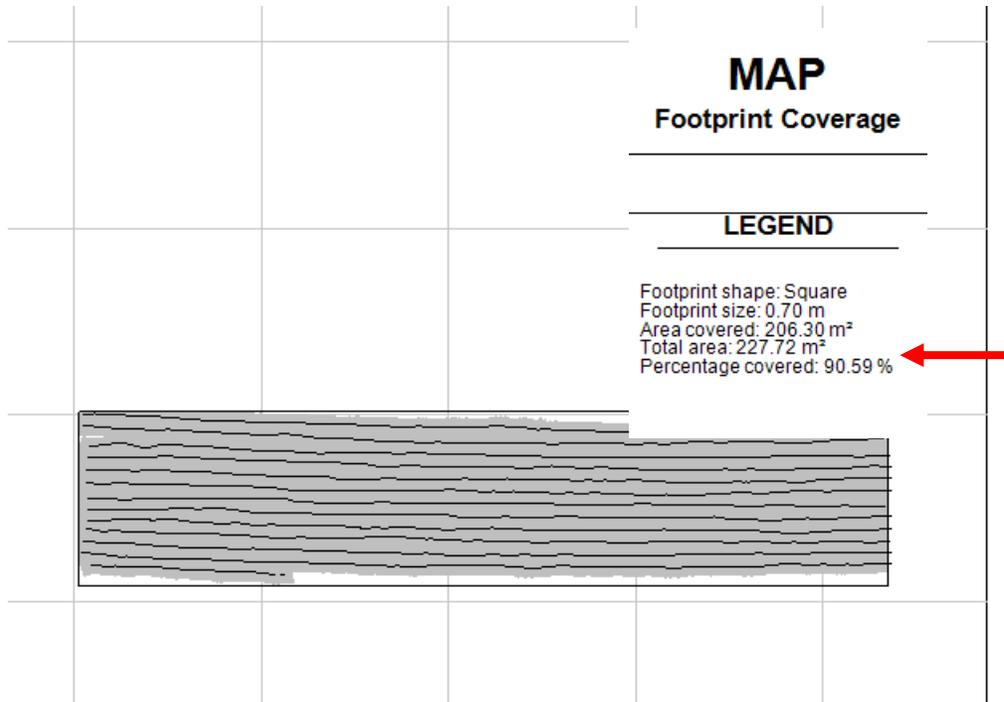


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SURVEY COVERAGE

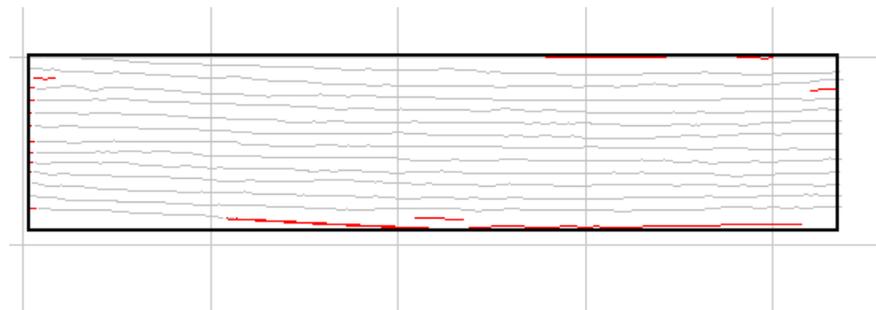


Survey Coverage Tool - MQO



Survey Coverage Map

Measurement Quality Objective	Acceptance Criteria
Coverage (DGM)	100% at project required cross-track (0.7 m) measurement spacing (excluding site specific access limitations, e.g., obstacles, unsafe, terrain)



Infill Lines in red



Summary

Rigorous QC of the large amount of data associated with AGC projects is important

These QC checks are designed to make sure the AGC system (senor, geo-location and operator) are working correctly

It can be simplified with thoughtfully designed software tools, producing easy to digest maps and grids.

Set yourself up for Success!



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THANK-YOU! QUESTIONS?