Appendix F
Quality Assurance Report:
Digital Geophysical Operations

FORMER FORT ORD, CALIFORNIA
MRS RANGES 43 - 48
QUALITY ASSURANCE REPORT:
DIGITAL GEOPHYSICAL OPPERATIONS

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1.0 INTRODUCTION

Ranges 43 – 48 occupies 498-acres consisting of a 473-acre habitat reserve and a 25-acre future development area located in the south-central portion of former Fort Ord (Figure 1). Nearby Ranges 43 – 48 are the residential communities of Seaside and Fitch Park, Marshall and Stillwell Housing areas, several schools (Fitch Middle School, Marshall Elementary School, and Cypress Grove Charter High School), and recreational facilities managed by the Bureau of Land Management. The site is mostly covered by maritime chaparral with patches of annual grassland habitats along the site's western and southern boundaries. The majority of the site's terrain is rolling hills with elevations ranging from 375–550 ft.

In 2002, the Interim Action Record of Decision (IA ROD 2002) identified surface and subsurface removal as the military munitions (MM: formerly OE) remedial action to be performed on Ranges 43–48. Based on removal actions at Del Rey Oaks (OE-15DRO.1–2) and Seaside (OE-15SEA.1–4), it was determined that the most appropriate technology (MAT) for completing the subsurface MM removal was (1) detecting and removing subsurface MM to depth of detection with Schonstedt GA-52/Cx magnetometers (analog); (2) digital geophysical mapping (DGM) of the post-removal areas with an EM61-MK2 metal detector or a G-858 magnetometer, as well as investigating and resolving any remaining items detected during the mapping process; (3) conducting a QC inspection on the removal work with the Schonstedt magnetometers; and (4) conducting QA inspections. Areas where this approach could not be implemented were delineated as special-case areas for future consideration.

As a result, clean-up operations pertinent to DGM activities were initiated with a prescribed burn in October 2003. The burn was followed by surface and analog removal activities. DGM investigations were conducted between July 2004 and December 2005. The purpose of the investigation was for:

1) mapping geophysical anomalies
2) picking and reacquiring those anomalies that were large enough to represent the smallest munitions and explosive of concern (MEC) or larger

This report covers the Quality Assurance (QA) processes conducted by the U.S. Army Corps of Engineers (USACE) with respect to the collection, processing and evaluation of digital geophysical data collected by Parsons Infrastructure and Technology Group, Inc. (hereafter referred to as Parsons). The activities were designed around the Parsons Quality Control (QC) program to verify that QC operations were in place and operating as designed to provide assurance and documentation of the QC process associated with DGM activities.

2.0 QA ACTIVITES

Data collection at Ranges 43 – 48 was closely associated with the transect surveys at the Watkins Gate Burn Area (WGBA) and investigations of special case areas in MRS MOCO.2 at the northern edge of Ranges 43 – 48. As a result, QA field and data activities were performed jointly. The QA activities for the transect surveys at WGBA have previously been reported by the USACE (2005). QA activities documented in this report cover Parsons' DGM operations on both Ranges 43 – 48 and the special case areas of MRS MOCO.2.

2.1 Field oversight

Field oversight was conducted on a random basis according to the procedures described in Appendix A.

Geophysical data was collected using Geonics EM-61MKII electromagnetic sensors either as single sensors (man portable) or multiple-sensors (towed array)(Figure 2). Such sensors generate a magnetic field that reacts with the ground and materials on or within it. Secondary fields induced in the ground are then measured by receiving coils on the sensor and can be used to locate ferrous and non-ferrous metals in the soil. Data was collected either as individual grids or in grid blocks of variable size consisting of multiple grids. Each grid consisted of an area 100 x 100 ft. Based on the Parsons Field Operations Status Report from 9 March 2006, a total of 500.1 acres were initially slated for ordnance removal actions associated with Ranges 43 - 48. Of this, 274.1 acres (1,261 grids) were cleared by analog surveys and 272.4 acres (1,249 grids) were covered by DGM teams (Figure 3). The analog operations were tracked by the USACE UXO Safety Specialist and are outside the scope of this report except where seeds were missed.

For the MRS 43 – 48 operations, and those remaining in MRS MOCO.2, digital surveys were designed to for 100% coverage of each grid. The thick maritime chaparral cover characteristic of the area had been removed via a prescribed burn so that only scattered small oak trees remained. Vegetation coverage locally impacted DGM access, such as around trees and in areas with protected Sand Gilia (Figure 4). Local topography also eliminated some areas from DGM coverage. Although the area of allowable gaps was not tracked it is estimated to constitute less than 1% of the area and those areas were 100% covered by analog surveys. DGM survey production rates averaged 0.6 acres a day and resulted in 126 anomalies picks per team day and a total of 59,952 anomalies identified by the end of mapping operations. Figure 5 demonstrates one of the grid blocks (B2J7E3) that exhibited a large number of anomaly picks (1362), which was common in parts of Ranges 43 – 48. During the main phase of the DGM digital data acquisition only minor issues were observed. These included limited occurrences where calibration checks (such as cable shaking) were not performed or when questions arose (such as repeat observation of spikes in one sensor during calibration tests over number of days) that indicated that a sensor might be going bad. These issues were typically reported to the Project Geophysicist on the day of observation and then documented in QA-QC geophysical team meetings (Appendix B). Prompt response was characteristic of Parsons

and no corrective actions were generated as a result of field observations. Overall, field data collection was in accordance with the Programmatic and Site Specific Work Plans (Parsons 2001 and 2003).

2.2 Digital data review

A review of digital data by the USACE was performed to monitor the effectiveness of data processing and consistency of data delivery. Issues that were looked at in these data included:

1) Missing survey lines within a grid (interline gaps).
2) Data “gaps” along survey lines.
3) Bowing out of survey lines beyond 50% of survey line spacing.
4) Unreasonable data “spikes.”
5) Data incongruity across survey grids (data levels in one grid are not reasonably compatible with data levels in neighboring grids).
6) Inadequate data density along survey traverse.
7) Lack of accurate, precise locations; survey line orientation.
8) Inadequate/incomplete site survey coverage.
9) Missing, incomplete, or noncompliant instrument standardization checks.

To accomplish this all raw and processed data files were checked by the USACE to ensure that Parsons followed an appropriate and informative naming convention reflecting the grids surveyed as outlined in the DID MR-005-05. The USACE checked that Parsons managed the field and processed data in a professional manner, including organization, daily maintenance, and complete documentation. The transfer and delivery of data was achieved via an ftp site where raw (pre-processed) data was delivered in 3 business days after collection and processed data (including pick files) were delivered in 5 business days. The USACE performed 100% verification of the accompanying documentation for completeness and accuracy. This focused on a review of header files on the pre-processed data (data that has merged into a single file and synchronized with the GPS data) and processed data to verify that dates were consistent, systems and system sampling parameters were identified, project name and contractor was listed, and all column headers were included and defined. Parsons also delivered supporting summary sheets that further documented field parameters and processing. 100% of the summery sheets were reviewed for completeness, verification of calibration data and consistency to the electronic data file headers.

Over the project, electronic data for 237 grid blocks were delivered for QA review. Following the review described above, some of the files were imported into Geosoft Montaj and mapped by QA. This review was tiered in that initially 100% of the files were re-mapped. After about two-months of data delivery the review rate was dropped to 50% and then ultimately 25%. In total, data from 143 grid blocks were re-mapped by QA for independent review and verification. This represents a total of about 60% of the data files. The process of review remained generally consistent throughout the project except following a visit to the MM-Center of Expertise in Huntsville, Alabama in September

2004 where it was suggested to map a sum channel consisting of the sum of the values from channels 1 through 3, instead of just channel 3. The reasoning was 1) to do something different than the contractor (who was only picking based on channel 3 data) and 2) that the lower channels are responsive to shallow items, especially aluminum and hand grenades that could be missed just using channel 3. Overall, the general QA digital data remapping and review consisted at a minimum of:

1) creating a process data database
2) importing processed XYZ data
3) calculation of sum channel
4) generating a grid (0.25 cell size and blanking distance of 2-ft) of sum channel
5) plotting the sum channel (range -3 to 7 for channel 3; -15 to 30 for sum channel)
6) plotting a symbol cover for the track lines (view coverage)
7) importing shapefiles of grids and backhoe polygons (and sometimes tree cover)
8) creating a pick file database
9) importing the pick file XYZ data
10) plotting pick symbols on data map
11) scan data for picks and unpicked anomalies
12) generate QA picks for any unpicked anomalies that warranted further evaluation
13) update QA pick list

General issues found while reviewing the digital data included inconsistent dates among the raw, processed, and pick files as well as their accompanying summary sheets. Examples of issues including line gaps, clerical mislabeling of grid blocks leading to discrepancies in deliverables, leveling, location of picks, missing picks, and noise observed from turns are demonstrated in Figures 6 to 11 (each of these issues were addressed in QA-QC meetings or through corrective action requests). There were a few occurrences where file names did not match the file content or the zip file that contained the delivered data unzipped to different files caused by packing the wrong files during the zipping process. Initially these were handled through discussion at QA-QC geophysics meetings and documented in the form of meeting minutes but as the occurrences continued corrective action requests were generated to initiate a more formal response. On two occasions, plotting of the summary channel data revealed that channel 1 data had not been leveled and were addressed in the corrective action requests CESPK-ED-GG-FY05-0005 and CESPK-ED-GG-FY06-0001 (Appendix C). Several discussions reflected in the QA-QC geophysical team meeting agenda and notes related the size of acceptable data gaps in the DGM data; however, during these discussions it became apparent that most of these issues appeared after QA upgraded their software and it was realized that the gaps were generated because the default blanking distance of 1-ft was being used to generate the maps, not 2-ft which is proportional to the project DQOs.

The data quality of grid block B2J8I3 represents the closest QA came to failing a grid due to data quality (Figure 12). QA's attempt to fail the grid led to a QA-QC geophysical team meeting on 8 December 2004. The issue at hand was extensive noise that produced a systematic pattern in these data. The noise was clearly not generated by the geophysical properties of the soil or buried objects. QC acknowledged that they had identified the

problem and decided internally to address it by making additional picks in the grid as a more cost-effective compromise to resurveying. Further discussion led to the conclusion that project DQOs related to DGM focused on passing calibration tests, line spacing and along line data density, but did not address “reasonableness” of the data. As a result of this discussion, QC implemented procedures to include QA on subsequent data issues, internally rejected the only recurrence of similar data and QA documented the issue in the lessons learned (Section 4.0) and has included data “reasonableness” in subsequent work plan DQOs.

These issues described in this section were typically addressed promptly by the Project Geophysicist and when data resubmittal was required the QC Geophysicist typically redivered data within 1-buisness day. The only recurring issues were those associated with file headers, dates and file naming that were more of a clerical nature with overall data quality remaining high. To enforce the importance of header quality, QA ultimately shifted from addressing the issues in a meeting format to the issuances of corrective action requests (CARs) that resulted in additional steps being implemented by QC (Appendix C). Overall, digital data collection, processing and delivery was in accordance with the Programmatic and Site Specific Work Plans (Parsons 2001 and 2003).

2.3 QA Seeding

Twenty seven seeds were emplaced by QA in the Ranges 43 – 48 area as described in the QA seeding plan (Figure 13; Appendix D). Seeding was initiated after the analog sweeps had begun so several of the initial seeds (~5) were planted after the analog survey and before digital mapping. The remaining seeds were planted prior to analog surveys. The intent was to test the overall removal process, not just DGM. Seeding locations and depths were selected to test:

1) grid coverage
2) excavation procedures
3) anomaly picking procedures

The 27 seeds included projectiles (30mm(1), 37mm (16)), hand grenades (4), rockets (2.36-in (2)) and mortars (81mm (4); Table 1). To meet the testing objectives seeds were placed near corner stakes and along grid boundaries, near vegetation or smaller topographic features that are obstructions to straight line paths, and randomly within grids. There were four sets of double seeds that consisted of a larger seed being buried typically 0.5 feet above a smaller seed. The smaller seed was generally below the maximum depth of detection from the surface, but easily detectable from the base of the hole once the upper seed was removed. These double seeds were used to verify that UXO technicians swept the hole with a magnetometer after removing an item to verify that the hole was clean. Seeds were buried at depths ranging from 7 to 20-inches and the depths were determined from more than 200 QC seed depths provided by Parsons. QA’s goal was to select depths near the maximum of those used by Parsons to provide more of a test on picking procedures yet to match QC and thus provide a verification of the QC process.

Of the 27 seeds that were buried in Ranges 43 – 48, four were located in grids that were not surveyed. Nineteen of the remaining 23 seeds were recovered

ORD-QA09: 37mm projectile buried 14-inches below the ground surface in a horizontal position (Figure 14). Failure to detect this seed resulted in the issuance of the corrective action request CESPK-ED-GG-FY05-0003 (Appendix C) of 6 June 2005. Route-cause analysis by Parsons found that the seed was located within an anomaly polygon identified during the anomaly picking process and thus should have been retrieved by the UXO excavation team. For a corrective action Parsons re-excavated the polygon area and found the seed. To prevent recurrence all the UXO teams were briefed on excavation procedures that included surveying the site after the excavation was complete to verify that no anomalies above 3 mV in channel 3 remained.

ORD-QA13: 37mm projectile buried 14-inches below the ground surface in a horizontal position. Failure to detect this seed resulted in the issuance of a corrective action request CESPK-ED-GG-FY05-0006 on 21 November 2005 (Appendix C). QA review of the DGM data indicated that the seed was located between two anomalies (B2J7G8-229 & B2J7G8-230), with B2J7G8-229 being only 10-inches away (Figure 15. When the QA Safety Specialist went into the field to investigate the miss he was not able to detect the seed with the Schonstedt so called over a UXO team with an EM61-MKII and was able to identify the seed (no reading was recorded). Regardless, the fact that B2J7G8-229 was excavated and located within 1-foot of the seed should have resulted in its recovery if proper excavation techniques were used and the hole properly swept with the Schonstedt. Since delivery of the grid to QA was made at the end of the contract no actions were made to prevent future occurrences. However, QC imposed a 10% reinvestigation of dig sites in the affected grid.

ORD-QA22: a Mark II hand grenade buried at 12-inches in a horizontal position (Figure 16). The missed seed was discussed in the 31 March 2005 Geophysical meeting between QA and QC. At that meeting the Project Geophysicist noted that the anomaly from the seed is visible in the data but produced a response of only 1.5 mV (Channel 3) which is within the noise and well below the 3.0 mV picking threshold. Static (free air) tests conducted with the EM61 MK1 during the Ordnance Discrimination and Detection Study (ODDS) noted that the worst case for detection was in the horizontal position and a response of 2.25 mV was observed at 12-inches from the stand (Parsons, 2003). Based on the ODDS data picking of ORD-QA22 would have been questionable in an air-media, thus it is unlikely to have been detectable buried in the ground. This missed seed did not constitute a failure of the grid but instead demonstrates depth limitations of the EM61-MKII.

ORD-QA24: a M30 hand grenade buried at 9-inches in a horizontal position near a tree that impeded the EM61 survey. Failure to detect this seed resulted in the issuance of a corrective action request CESPK-ED-GG-FY05-0004 on 6 October 2005 (Appendix D). Route-cause analysis by Parsons found that the seed location was within 3 ft of anomaly B2J8C4-0131 that was eliminated during the advanced processing because the anomaly width of 1.6 ft was below the 1.7 ft cutoff. Field investigation observed a 2.5 mV

anomaly over the seed and a 3 mV anomaly 3-ft away over B2J8C4-0131 (Figure 17). Although the anomaly over the seed was below the digital processing threshold, it was determined that it was detectable using a Schonstedt and should have been found during the analog process. Parsons determined that the cause of the miss was that not enough surface scrap had been removed prior to the survey. The contractor's corrective action was to resurvey around all the trees in grid B2J8C4 and provided refresher training to the UXO technicians on surveying around trees. QC then went and performed QC checks around eight trees and increased the number of tree checks on subsequent grids.

Thus, based on these results it is determined that 3 of the 4 missed seeds were detectable and should have been found. All of these missed seeds were located in grids that went through the full removal process (analog and digital). It should be noted that QA's seeding strategy was designed not only to test detection but also survey coverage. Two of the missed seeds were attributed to excavation teams not adequately checking excavations prior to abandoning them. These misses were within the dig radii of anomalies selected in the DGM process. The other miss was located near a tree and was likely below the detection limit of the digital tool but determined to be detectable with a Schonstedt. The performance of Parsons, including their route-cause analyses of missed seeds, is deemed to be in accordance of the work plan and sufficient to meet the intent of the DQOs.

2.4 QA Digital Re-Surveys

The USACE conducted independent digital QA surveys scattered about the impact area. In total, 13 grid blocks consisting of 36 grids were surveyed (Figure 18). The individual grid block maps are presented in Appendix E. The overall goal of 1.5 to 2% stated in the QA work plan was exceeded. Several anomalies were identified and placed in the QA anomaly dig list. No items exceeding the project DQOs were found by these digs. The large anomalies in grid block B2A8J3 that were identified by QA in the QA DGM data, but these were not reacquired because the OA Safety Specialist determined that they were caused by blow-in-place (BIP) operations in adjacent grids during the Range 45 sift operation. Otherwise, all QA digital resurvey grids passed QA inspection.

2.5 QA Anomaly Excavations

During the execution of the digital data file review and QA digital grid resurveys 115 anomalies were excavated by the Corps UXO Safety Specialist (Figure 19). These consisted of 61 ordnance fragments, 26 items identified as munitions debris (MD), 6 nails or wire scrap, 1 piece of aluminum foil, 1 piece of charred wood, 7 empty holes (plus an additional 5 that no surface anomaly was found using a Schonstedt believed to indicate aluminum MD at the south end of Range 45), and 8 expended items (MD-E) that were smaller than the smallest MEC (37 mm) for this project. As a result, no grid failures were issued due to items being found by QA that exceeded the DQO (ferrous metal item greater than 2-inches).

2.6 Corrective Action Request

During the clean-up operations several issues were identified. Originally these were handled through discussions in QA/QC geophysics meetings that were documented in meeting minutes (Appendix C). Starting in 25 April 2005 these issues were documented in Corrective Action Requests (CARs). The following CARs are included in Appendix D will be summarized below.

FY05-0001: This CAR was issued on 25 April 2005 to address recurring issues in data file headers and summary sheets. These included mismatched headers, errors in grid block naming, missing spike data and missing summary sheets. In response to the CAR, Parsons promptly re-delivered corrected data files and summary sheets.

FY05-0002: Discussed in WGBA AAR (USACE 2005)

FY05-0003: This CAR was generated on 6 June 2005 because of a missed QA seed (ORD-QA09). This seed was a 37mm grenade buried at 14" below ground surface. Route cause analysis by Parsons indicated that the seed was located in an anomaly polygon that was excavated. Although the seed was located near the maximum depth of detection, excavation protocols should have recovered the item. As a corrective action Parsons re-investigated the polygon area.

FY05-0004: This CAR was generated on 6 October 2005 because of a missed QA seed (ORD-QA24). This seed was a M30 grenade buried at 9" below ground surface. Route cause analysis by Parsons indicated that a nearby anomaly that would have caught the seed was eliminated by the advanced processing routine. The seed was also located near a tree making it difficult to cover with the EM61, yet it was determined to have been detectable by a Schonstedt magnetometer, thus it should have been recovered during the analog survey. The corrective action by Parsons was to perform additional analog surveys around trees in the grid (B2J8C4) where the seed had been located.

FY05-0005: This CAR was generated on 24 October 2005. The two issues focused on a >10 mV anomaly that was not picked in the data and a leveling problem in the data from grid block C2B7H5. Route-cause analysis indicated that the anomaly was outside of the survey area and was thus not picked; however, it was indicated that the anomaly was associated with a culvert that was to be excavated. The leveling issue was resolved through reprocessing and delivery of the corrected file.

FY05-0006: This CAR was generated on 21 November 2005 because of a missed QA seed (ORD-QA13). This seed was a 37mm buried at 12" below ground surface. Root cause analysis by Parsons indicated that a there was an anomaly identified within 10" of the seed, which should have resulted in its recovery. They suggested that the high density of metal in the area saturated the response but that improper excavation practice resulted in the missing of the seed. As a corrective action 10% of the digs in that grid were re-surveyed by QC to evaluate performance.

FY06-0001: This CAR was generated on 14 February 2006 and was caused by improperly leveled data that was revealed when QA plotted its sum channel (sum of channel 1-3 in the EM61 data). Route-cause analysis identified that the proper file had been delivered but a re-delivery of these data included data that had not been leveled. These data were subsequently re-delivered.

3.0 CONCLUSIONS

QA activities by the Government verified that Parsons had an adequate QC program in place and that data collected at Ranges 43 – 48 and the former SCAs of MOCO2 are sufficient and in accordance with the project DQOs.

4.0 LESSONS LEARNED

As a result of QA activities during the removal process on Ranges 43 – 48 a number of lessons learned were identified. These are listed below and fall into two categories: QC acceptance criteria and Programmatic. QC acceptance criteria are those lessons learned directly during the oversight process either from visual observations in the field or by direct review and manipulation of the DGM data. The items listed under Programmatic are broader in context and cover issues experienced in the development and execution of the QA activities and are captured here for consideration and implementation in subsequent MMRP removal actions.

QC acceptance criteria:

a. DIDs need to be further developed to better define acceptance and failure criteria on standardization tests and field data quality
b. Spike used in traditional standardization check should be selected to mimic most probable MEC. For an EM61-MKII the object should produce a spike amplitude of 20 to 50 mV. Variability between beginning and end background static levels should not exceed 5 mV. Each coil or coil-arrays should have a unique (numbered) spike object assigned to it so that temporal variability can be monitored.
c. Static calibration checks in the future for EM61-MKIIs should use the new Geonics calibration coils that have known values allowing the coils to be calibrated routinely to set standards.
d. QC criteria must include evaluation of reasonableness of data acquired, not just whether or not system passes before and after standardization checks. This is for cases where field conditions (e.g., saturated ground following a rain event or moisture in couplings) cause intermittent or cyclic noise that was not detected during standardization.
e. At the initiation of all future projects the Corps geophysicist needs to meet with the contractor’s project geophysicist and QC geophysicist. It should be clearly defined that there will be a grace of 1 occurrence of any QA issue in the delivered data (this addresses issues with data deliverables, not field issues that would require re-survey of grids). Following detection by QA the issue will be discussed

with the contractor, deliverables will be modified to rectify and the archived data updated. Any subsequent repeat will result in the Corps submission of a Corrective Action Report requiring the contractor to review their own data at their expense to find the problem and resubmit until the issue is resolved.

Programmatic:

a. QA was not involved during development of SSWP and was brought in only at initiation of data collection (given this was caused partially by change in personnel). As a result, the QA plan was developed around an existing field and QC program and the QA program had to be adopted as not to impact an already existing and approved SSWP. This impacted QA seeding, which was initiated after analog teams had already cleared numerous grids, thus in those grids seeding could not evaluate the combined analog-digital process. This primarily impacted the initial seeding in June 2004 when many of the seeds were planted after analog surveys were complete. All seeds planted in July were ahead of the analog surveys, thus evaluated both phases of surveys.
b. At initiation of project and during the development of the QA plan, the QA geophysicist and QA safety officer need to clearly define protocols on how digital review results are to be communicated and at what frequency. This includes defining what documentation needs to be generated, what is archived and what needs to be shown to the QA safety officer. How are digital file issues to be handled and at what point does the QA safety officer need to be informed or become involved in corrective actions?
c. QA seeding should not only evaluate contractor performance but can be used to monitor detector performance throughout the surveyed area. A proposed “triple-seed” configuration, where 3 seeds are placed at ranging from Pds of 100% to ~25%, could be used selectively around the range to measure site-specific performance and variability in detection depth. These data would then be useful during the risk analysis phase. However, it must be noted that such a procedure would mean that a percentage of seeds would be missed and these would not be considered a failure on the part of the contractor. Those seeds planted with Pds at or near 100% from the GPO would still be considered failures if missed. Although this approach would slightly increase seeding costs and tracking of these seeds, the benefits would be realized during risk analyses where these data would provide more site specific data on system performance and maximum depths of detection, thus increasing confidence in the clean-up and a better understanding of ordnance detection capabilities.
d. When planting a QA seed a decimeter accurate GPS unit must be used to record the seed’s location (as was used for this effort). Once buried, the geophysical system to be used in the survey (an EM61-MKII or G-858, and Schonstedt) should be run over the target to verify detectability at the time of seeding. Digital responses should be recorded in the spreadsheet used to track seed status as well as a notation as to whether or not the item was detected by a Schonstedt. Seeding during this effort used a Schonstedt to verify detection at the time of seeding. Use of an EM61-MKII would have been beneficial to address Parsons questions at the

onset of their route-cause analyses regarding geophysical response at the time of seeding.

e. Procedures for evaluating missed QA seeds need to be standardized. Procedures should include notifying the contractor of a missed seed, going to the field accompanied by a contractor representative, finding the location with a GPS unit and verifying with the appropriate geophysical tools EM61MKII/G-858 and Schondstedt that the item was detectable and recording the digital response. The contract representative is on site to verify the procedures and that the seed item was recovered.
f. Throughout the projects there have been logistical issues in that QA required the release of either an EM61 or towed array, and a high-precision GPS unit to perform field activities. Additionally, QA had to rely on the contractor providing 1 geophysicist any time an EM61 was to be used by QA. The primary issue needs to be resolved by reserving an EM61 and GPS unit specifically for QA. The best option is for the Corps, notably the Range Support Center, to own at least one unit of each geophysical instrument (EM61-MKII and G-858/GSMP-30) and high-precision (decimeter accuracy) GPS unit. The equipment should be housed in Sacramento where it will be available to multiple projects.
g. The Range Support Center needs to establish QA standards for all MMRP projects and assure that during the development of Scopes of Work that funding is allocated at the end of projects to allow QA to review the DIDs and incorporate any lessons learned for subsequent projects.

5.0 REFERENCES

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IA ROD, 2002. Final, Record of Decision, Interim Action for Ordnance Explosive Sites Ranges

43–48, Range 30A, and Site OE-16, Former Fort Ord, California, September 2002.

Parsons, 2003. Final, Ranges 43-48 Site Specific Work Plan. Monterey, California, Parsons Environmental.

6.0 TABLES

Table 1. QA seeds and recovery tracking log.

ID	TYPE	DEPTH (in)	ORIENTATION	NORTHING (ft)	EASTING (ft)	CARD_ID	DATE SEEDED	DATE RETURNED	PHASE RECOVERED *	STATUS**
1	37 mm	12	Horizontal	2122050.82	5740178.13	ORD-QA01	06242004	7142004	Digital	Found
2	37 mm	14	Horizontal	2122073.57	5740290.20	ORD-QA02	06242004	7142004	Digital	Found
3	37 mm	12	Horizontal	2120904.31	5744649.58	ORD-QA03	06242004	7142004	Digital	Found
4	37 mm	12	45 degrees	2123099.96	5741899.95	ORD-QA04	06242004	7142004	Digital	Found
5	81 mm	6	Horizontal	2122050.82	5740178.13	ORD-QA05	06242004	7142004	Digital	Found
6	2.36" Rocket	12	Horizontal	2122216.92	5744051.35	ORD-QA06	07132004	1192005	Digital	Found
7	2.36" Rocket	12	Horizontal	2121748.19	5741933.43	ORD-QA07	07142004	3172005	Digital	Found
8	30 mm	16	Horizontal	2121598.44	5741088.40	ORD-QA08	07142004	5092005	Digital	Found
9	37 mm	14	Horizontal	2121243.26	5742440.98	ORD-QA09	07132004	6072005	MISSED	Missed
10	37 mm	14	Vertical	2122600.03	5740844.24	ORD-QA10	07142004	11242004	Digital	Found
11	37 mm	13	Vertical	2120632.80	5742866.58	ORD-QA11	07142004	9232004	ANALOG	Found
12	37 mm	10	Horizontal	2122151.52	5744258.94	ORD-QA12	07132004	6212005	Digital	Found
13	37 mm	12	Horizontal	2121663.83	5742216.43	ORD-QA13	07142004	111505	MISSED	Missed
14	37 mm	14	Vertical	2122151.52	5744258.94	ORD-QA14	07132004	6212005	Digital	Found
15	37 mm	7	Horizontal	2121418.79	5743451.48	ORD-QA15	07142004	6072005	Not Surveyed	Area not surveyed
16	37 mm	14	Horizontal	2121699.42	5743600.72	ORD-QA16	07132004	10272004	ANALOG	Found
17	37 mm	11	Horizontal	2122704.14	5740470.96	ORD-QA17	07142004	12012004	Digital	Found
18	37 mm	8	Vertical	2121829.40	5743031.94	ORD-QA18	07132004	6072005	Not Surveyed	Area not surveyed
19	37 mm	12	Vertical	2121625.16	5741428.82	ORD-QA19	07142004	6072005	Not Surveyed	Area not surveyed
20	37 mm	11	Vertical	2121265.58	5741248.77	ORD-QA20	07142004	11092004	ANALOG	Found
21	MK II Hand grenade	10	Horizontal	2121598.44	5741088.40	ORD-QA21	07142004	5092005	Digital	Found
22	MK II Hand grenade	12	Horizontal	2121644.45	5743705.55	ORD-QA22	07132004	33105	MISSED	Missed
23	MK II Hand grenade	20	Vertical	2121748.19	5741933.43	ORD-QA23	07142004	3172005	Digital	Found
24	M 30 Hand grenade	9	Horizontal	2121291.76	5742860.09	ORD-QA24	07132004	100605	MISSED	Missed
25	81 mm mortar	9	Horizontal	2123023.60	5744001.68	ORD-QA25	07132004	9232004	ANALOG	Found
26	81 mm mortar	20	Vertical	2120357.70	5743140.56	ORD-QA26	07142004	6072005	Not Surveyed	Area not surveyed
27	81 mm mortar	16	Vertical	2121098.32	5743199.01	ORD-QA27	07132004	2222005	Digital	Found

* = Seed found during Digital or Analog activities; Missed by all field activities; or the area was not geophysically surveyed. All seed planted in July 2004 were placed ahead of anolog surveys.
** = indicates status of seed as either having been Found or Missed by both analog and digital surveys. Four seeds were placed in grids not surveyed due to programmatic changes after seeding operations.

Anomaly ID	Easting	Northing	CH_3 (mV)	Grid_value (mV)	Phase	Item	Depth	Status	Weight	comments
B2H8J6-QA-0001	5743063.3	2119907.1	2.99	19.59	DIGITAL	NA	NA	NA	NA	Did not dig based on concurrent dig results
B2B7B4-QA-0001	5741893.5	2123112.0	5.58	17.16	QA	14.5 mm subcal	1"	MD-E	.1 lbs	3.4 mV Ch 3
B2H8J7-QA-0001	5743116.6	2119972.4	3.02	20.60	DIGITAL	NA	NA	NA	NA	Did not dig based on concurrent dig results
B2H8J8-QA-0001	5743239.9	2119952.7	2.93	20.09	DIGITAL	NA	NA	NA	NA	Did not dig based on concurrent dig results
B2H8J8-QA-0002	5743232.2	2119963.8	3.19	24.03	DIGITAL	NA	NA	NA	NA	Did not dig based on concurrent dig results
B2I0J3-QA-0001	5744771.7	2120922.5	5.72	33.12	QA	Frag	1.00	RRD	0.1	Used analog and Whites systems
B2I0J3-QA-0002	5744745.5	2120951.5	4.48	28.17	QA	Frag	1.00	RRD	0.1	Used analog and Whites systems
B2I0J3-QA-0003	5744734.3	2120997.3	7.05	15.91	QA	Frag	1.00	RRD	0.2	Used analog and Whites systems
B2I0J4-QA-0001	5744882.3	2120939.0	6.88	26.94	QA	Brass casing .30	0.00	RRD	0.1	Used analog and Whites systems
B2I0J4-QA-0001	5744882.3	2120939.0			DIGITAL	Brass casing .30	0.00	RRD	0.1	Used analog and Whites systems
B2I7D0-QA-0001	5742441.1	2120359.9	3.81	44.03	DIGITAL	Frag	5.00	RRD		
B2I7D1-QA-0001	5742579.7	2120334.6	4.76	39.99	DIGITAL	magnetic metal	4.00	RRD		
B2I7D2-QA-0001	5742687.0	2120375.2	4.91	33.69	DIGITAL	Frag	4.00	RRD	<.01	
B2I7E8-QA-0001	5742228.3	2120401.3	4.17	33.92	DIGITAL	Bullet		RRD	0.1	
B2I7E8-QA-0002	5742206.6	2120471.4	4.21	42.12	DIGITAL	Frag	1-3	RRD	<0.01	several small pieces
B2I7H5-QA-0001	5741978.8	2120798.3	4.35	33.70	DIGITAL	Frag	1-3	RRD	<0.01	several small pieces
B2I9G0-QA-0001	5743479.7	2120674.9	4.49	35.61	DIGITAL	Aluminum (?)				Not detected with Schonstedt, ground in surounding area littered with shards of aluminum casing from 40mm
B2I9J1-QA-0001	5743583.2	2120932.7	4.54	34.98	DIGITAL	Frag	6.00	RRD		
B2J6F4-QA-0001	5740857.5	2121530.1	3.96	28.86	DIGITAL	Frag	1.00	RRD	<0.01	
B2J6F5-QA-0001	5740926.4	2121547.7	3.89	26.06	DIGITAL	Frag	1.00	RRD	<0.01	
B2J6F5-QA-0002	5740957.9	2121557.2	5.93	31.24	DIGITAL	Frag	1.00	RRD	<0.01	
B2J6G7-QA-0001	5741116.3	2121655.8	4.36	30.27	DIGITAL	Frag	2.00	RRD		1.5-in long piece
C2A0A4-QA-0001	5744844.0	2122005.3	1.70	66.98	DIGITAL	Frag	2.00	RRD		1.5-in long piece
C2A5D6-QA-0001	5740006.6	2122370.6	2.83	15.69	DIGITAL	NA	NA	NA	NA	Did not dig based on concurrent dig results
C2A5E3-QA-0001	5739705.0	2122428.0	2.00	8.00	DIGITAL	Rust	1.00	RRD	0.1	Used analog and Whites systems
C2A5E5-QA-0001	5739933.0	2122493.0	3.00	18.00	DIGITAL	Pop-out pins	1.00	RRD	0.1	Used analog and Whites systems
C2A5F4-QA-0001	5739877.0	2122528.0	3.00	15.00	DIGITAL	Empty	0.00	Emty	0	Used analog and Whites systems
C2A5F6-QA-0001	5740073.0	2122536.0	3.00	16.00	DIGITAL	14.5	5.00	MD-E	.1 lbs	14.5" found on surface .5" from item
C2A5G0-QA-0001	5740481.0	2122612.0	2.50	19.00	DIGITAL	ow asphalt and board with n	1.00	RRD		Used analog and Whites systems
C2A5G8-QA-0001	5740208.0	2122641.2	4.25	32.4	DIGITAL	NA	NA	NA	NA	Did not dig based on concurrent dig results
C2A5G8-QA-0002	5740234.5	2122648.9	3.32	18.18	DIGITAL	NA	NA	NA	NA	Did not dig based on concurrent dig results
C2A5H0-QA-0001	5740428.5	2122719.0			DIGITAL	Empty	0.00	Empty	0	Used analog and Whites systems
C2A6B1-QA-0001	5740712.9	2122148.1	4.11	50.62	DIGITAL	Frag	3.00	RRD		
C2A6D0-QA-0001	5741465.7	2122380.7	3.15	20.87	DIGITAL	Frag	6.00	RRD		1.5-in piece of aluminum
C2A6D0-QA-0002	5741466.9	2122346.3	2.91	21.71	DIGITAL	Aluminum fag	0.00	RRD	0.1	Used analog and Whites systems
C2A6E0-QA-0001	5741476.1	2122402.5	2.97	15.34	DIGITAL	Aluminum fag	1.00	RRD	0.1	Used analog and Whites systems
C2A6E3-QA-0001	5740792.0	2122425.0	2.00	19.00	DIGITAL	Aluminum fag	1.00	RRD	0.1	Used analog and Whites systems
C2A6E4-QA-0001	5740883.0	2122437.0	2.00	17.00	DIGITAL	Nail	1.00	Nail	0.1	Used analog and Whites systems
C2A6E5-QA-0001	5740965.0	2122497.0	1.00	21.00	DIGITAL	.45 cal-bullet	0.00	RRD	0.1	Used analog and Whites systems
C2A6E6-QA-0001	5741045.2	2122653.5	2.82		DIGITAL	Empty	0.00	Empty	0	Used analog and Whites systems
C2A6F0-QA-0001	5741491.5	2122598.3	2.89	18.06	DIGITAL	Frag	1.00	RRD	0.1	Used analog and Whites systems
C2A6F2-QA-0001	5740650.5	2122538.8	2.87	23.75	DIGITAL	Nails	1.00	Nails	0.1	Used analog and Whites systems
C2A6F3-QA-0001	5740730.0	2122519.8	3.23	19.11	DIGITAL	Bolt	2.00	Bolt	0.1	Used analog and Whites systems
C2A6F5-QA-0001	5740917.0	2122580.0	2.00	23.00	DIGITAL	45 cal bullet and metal flake	1.00	RRD	0.1	Used analog and Whites systems
C2A6F7-QA-0001	5741149.5	2122567.5	2.86	20.19	DIGITAL	NA	NA	NA	NA	Did not dig based on concurrent dig results
C2A6F7-QA-0002	5741136.0	2122524.8	2.97	21.69	DIGITAL	NA	NA	NA	NA	Did not dig based on concurrent dig results
C2A6F8-QA-0001	5741201.2	2122565.8	2.87		DIGITAL	Aluminum	0.00	RRD	0	Used analog and Whites systems
C2A6F8-QA-0002	5741238.3	2122595.8	2.85 to 2.99		DIGITAL	Empty	0.00	Empty	0	Used analog and Whites systems
C2A6G6-QA-0001	5741041.2	2122490.6	2.73		DIGITAL	; cal bullet and aluminum scr	0.00	RRD	0.1	Used analog and Whites systems
C2A6H1-QA-0001	5740570.5	2122759.8	3.13	15.10	DIGITAL	Bullet	4.00	RRD	0.1	Used analog and Whites systems
C2A6H1-QA-0002	5740533.0	2122725.5	4.52	17.16	DIGITAL	Aluminum Foil	1.00	Aluminum Foil	0.1	Used analog and Whites systems
C2A6H5-QA-0001	5740912.0	2122777.0	3.19	21.84	DIGITAL	.45 cal bullets (3)	3.00	RRD	0.1	Used analog and Whites systems
C2A6I1-QA-0001	5740592.5	2122841.8	4.07	42.57	DIGITAL	QA Digital	1.00	RRD	0.1	Used analog and Whites systems
C2A6I5-QA-0001	5740940.0	2122891.8	3.07	33.25	DIGITAL	.45 cal bullets	1.00	RRD	0.1	
C2A6J8-QA-0001	5741200.6	2122919.0	2.56 to 2.62		DIGITAL	Bullet	1.00	RRD	0.1	Used analog and Whites systems
C2A6J8-QA-0002	5741213.4	2122902.6	3.82		DIGITAL	Bullet	1.00	RRD	0.1	Used analog and Whites systems
C2A7A6-QA-0001	5742029.7	2122050.6	3.15	24.61	DIGITAL	NA	NA	NA	NA	Did not dig based on concurrent dig results
c2a7b4-QA-0001	5741896.1	2122127.3	3.04	21.58	DIGITAL	NA	NA	NA	NA	Did not dig based on concurrent dig results
c2a7b4-QA-0002	5741892.3	2122169.4	2.67	21.84	DIGITAL	NA	NA	NA	NA	Did not dig based on concurrent dig results
c2a7b4-QA-0003	5741834.7	2122189.0	3.09	17.07	DIGITAL	NA	NA	NA	NA	Did not dig based on concurrent dig results

Anomaly ID	Easting	Northing	CH_3 (mV)	Grid_value (mV)	Phase	Item	Depth	Status	Weight	comments
QA-B2H8J5-QA-0001	5742986.1	2119971.3	19.60	117.03	QA	Frag	6.00	RRD	0.1	
QA-B2H8J5-QA-0002	5742969.1	2119945.9	10.00	60.09	QA	Frag	6.00	RRD	0.1	
QA-B2H8J5-QA-0003	5742915.8	2119939.0	8.42	57.13	QA	blank (aluminum)				
QA-B2H8J6-QA-0001	5742877.1	2119977.4	14.07	91.97	QA	Frag	3.00	RRD	0.1	
QA-B2H8J6-QA-0002	5742853.9	2119924.4	11.01	71.36	QA	Frag	5.00	RRD	0.1	
QA-B2H8J6-QA-0003	5742807.6	2119993.3	14.55	88.41	QA	blank (aluminum)	NA	NA	NA	
QA-B2J6H5-QA-0001	5741151.5	2121704.6	6.91	32.33	QA	.50 cal bullet	1.00	RRD	0.1	
QA-B2J6H5-QA-0002	5741175.4	2121798.8	8.37	52.45	QA	Bullet	4.00	RRD	0.1	
QA-B2J8J0-QA-0001	5743447.3	2121918.2	6.79	42.19	QA	frag	4.00	RRD	0.1	
QA-B2J8J0-QA-0002	5743465.2	2121979.1	9.29	55.59	QA	frag	3.00	RRD	0.1	
QA-B2J8J0-QA-0003	5743535.5	2121944.7	9.02	49.99	QA	Frag	5.00	RRD	0.1	
QA-B2J8J3-QA-0001	5742711.6	2121951.4	57.06	472.08	QA	NA	NA	NA	NA	Frag introduced to site from Range 45 BIPs
QA-B2J8J3-QA-0002	5742719.8	2121933.2	5.15	43.21	QA	NA	NA	NA	NA	Frag introduced to site from Range 45 BIPs
QA-B2J8J3-QA-0003	5742732.1	2121919.6	5.62	37.65	QA	NA	NA	NA	NA	Frag introduced to site from Range 45 BIPs
QA-B2J8J3-QA-0004	5742759.1	2121932.9	19.28	101.79	QA	NA	NA	NA	NA	Frag introduced to site from Range 45 BIPs
QA-B2J8J3-QA-0005	5742777.7	2121980.0	12.14	80.8	QA	NA	NA	NA	NA	Frag introduced to site from Range 45 BIPs
QA-B2J8J9-QA-0001	5743358.1	2121939.1	9.41	49.92	QA	frag	1.00	RRD	0.1	
QA-B2J8J9-QA-0002	5743386.6	2121947.0	8.59	77.58	QA	blank (aluminum)	NA	NA	NA	
QA-B2J8J9-QA-0003	5743430.8	2121934.4	6.94	57.27	QA	frag	1.00	RRD	0.1	
QA-C2A7C5-QA-0001	5741984.0	2122210.4	4.39	43.56	QA	frag		RRD	0.1	
QA-C2A7C7-QA-0001	5742173.8	2122262.5	10.09	52.44	QA	blank (aluminum)	NA	NA	NA	
QA-C2A7C7-QA-0002	5742183.8	2122265.0	11.75	68.22	QA	blank (aluminum)	NA	NA	NA	
QA-C2A7C7-QA-0003	5742170.4	2122251.6	8.01	49.13	QA	40mm casing	6.00	RRD	0.1	
QA-C2A8A3-QA-0001	5742715.0	2122023.3	4.38	73.05	QA	NA	NA	NA	NA	Did not dig based on concurrent dig results
QA-C2A8A3-QA-0002	5742768.0	2122033.9	5.9	43.34	QA	NA	NA	NA	NA	Did not dig based on concurrent dig results
QA-QAB2J6A0-0001	5741494.6	2121077.0	5.73	35.36	QA	Frag	5.00	RRD	<0.01	
QA-QAB2J6A0-0002	5741498.2	2121034.4	5.50	37.17	QA	Frag	1.00	RRD	<0.01	
QA-QAB2J6A9-0001	5741397.1	2121096.5	9.44	55.29	QA	Frag	1.00	RRD	<0.01	
QA-QAB2J6A9-0002	5741385.7	2121094.9	4.35	35.45	QA	Frag	1.00	RRD	<0.01	
QA-QAB2J6A9-0003	5741363.5	2121053.6	7.40	46.84	QA	Frag	1.00	RRD	<0.01	
QA-QAB2J6A9-0004	5741357.6	2121053.2	6.11	43.51	QA	Frag	1.00	RRD	<0.01	
QA-QAB2J6A9-0005	5741350.2	2121045.7	6.29	37.83	QA	Frag	0.50	RRD	<0.01	
QA-QAB2J6A9-0006	5741335.0	2121026.2	4.30	31.41	QA	Frag	1.00	RRD	<0.01	
QA-QAB2J6A9-0007	5741375.2	2121000.1	3.88	24.28	QA	charred wood	0.00	RRD	<0.01	
QA-QAB2J7A1-0001	5741577.0	2121083.6	5.05	36.22	QA	Frag	1.00	RRD	<0.01	
QA-QAB2J7A1-0002	5741543.8	2121043.8	3.92	31.30	QA	Frag	10.00	RRD	<0.2	
QA-QAB2J7A1-0003	5741503.6	2121017.6	5.47	42.76	QA	Frag	1.00	RRD	<0.01	

7.0 FIGURES

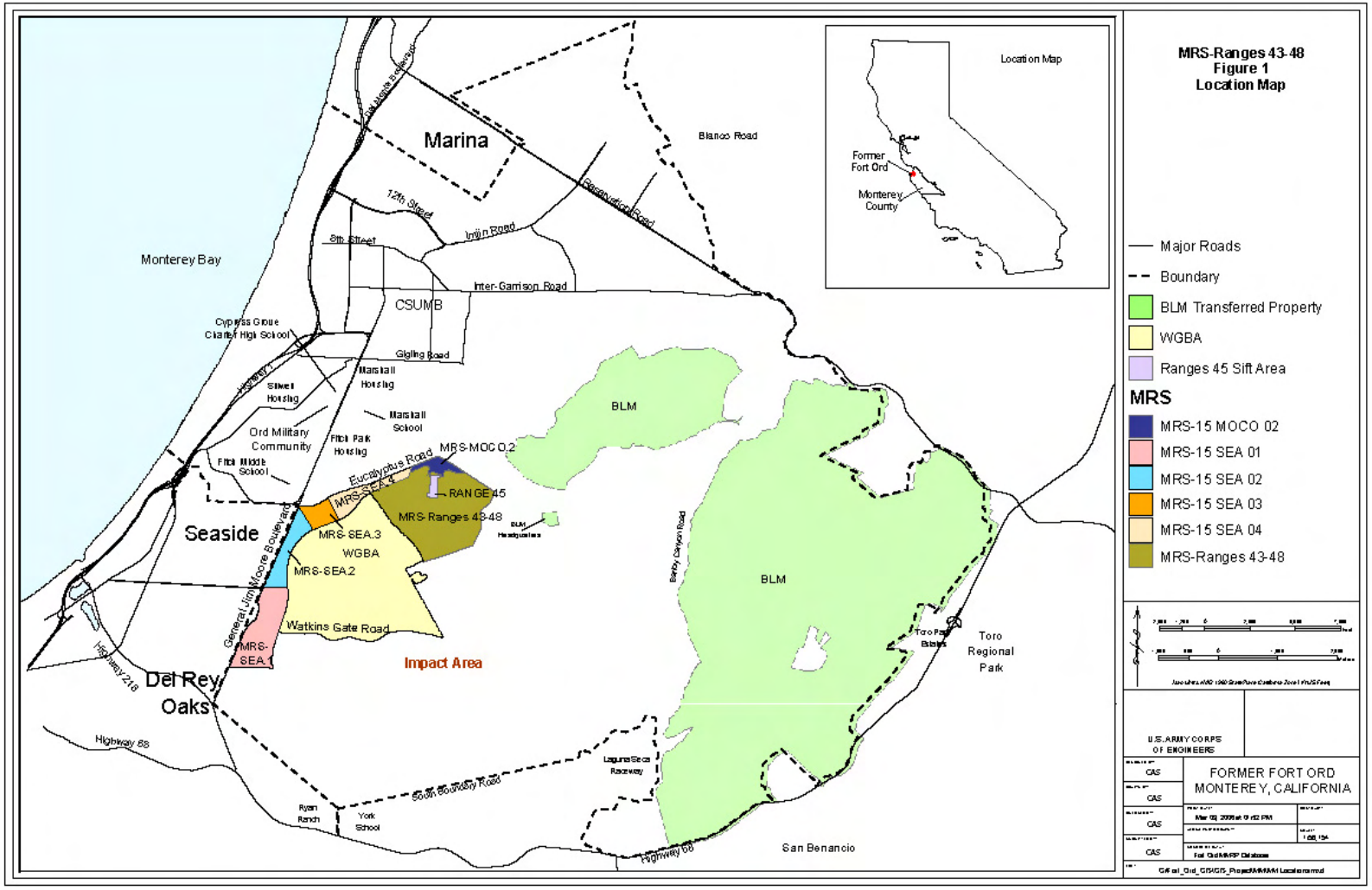


Figure 1. Map showing locations of impact areas and features discussed in text.

a. Towed-array with three EM-61 MKII sensors.

b. Single man-portable sensor.

Figure 2. Geonics EM-61 MKII configurations.

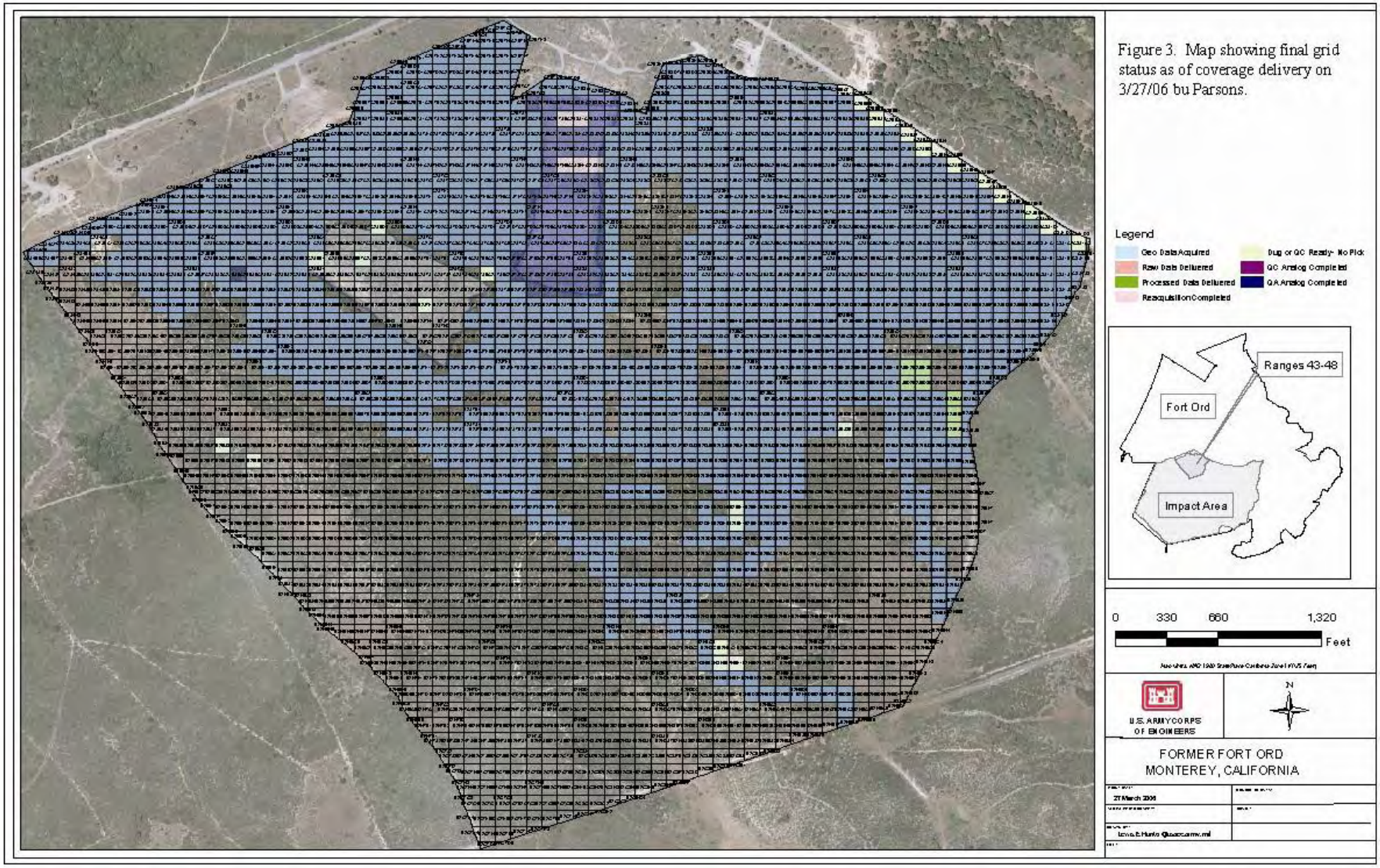


Figure 3. Map showing final grid status according to delivery by contractor on 3/27/06.

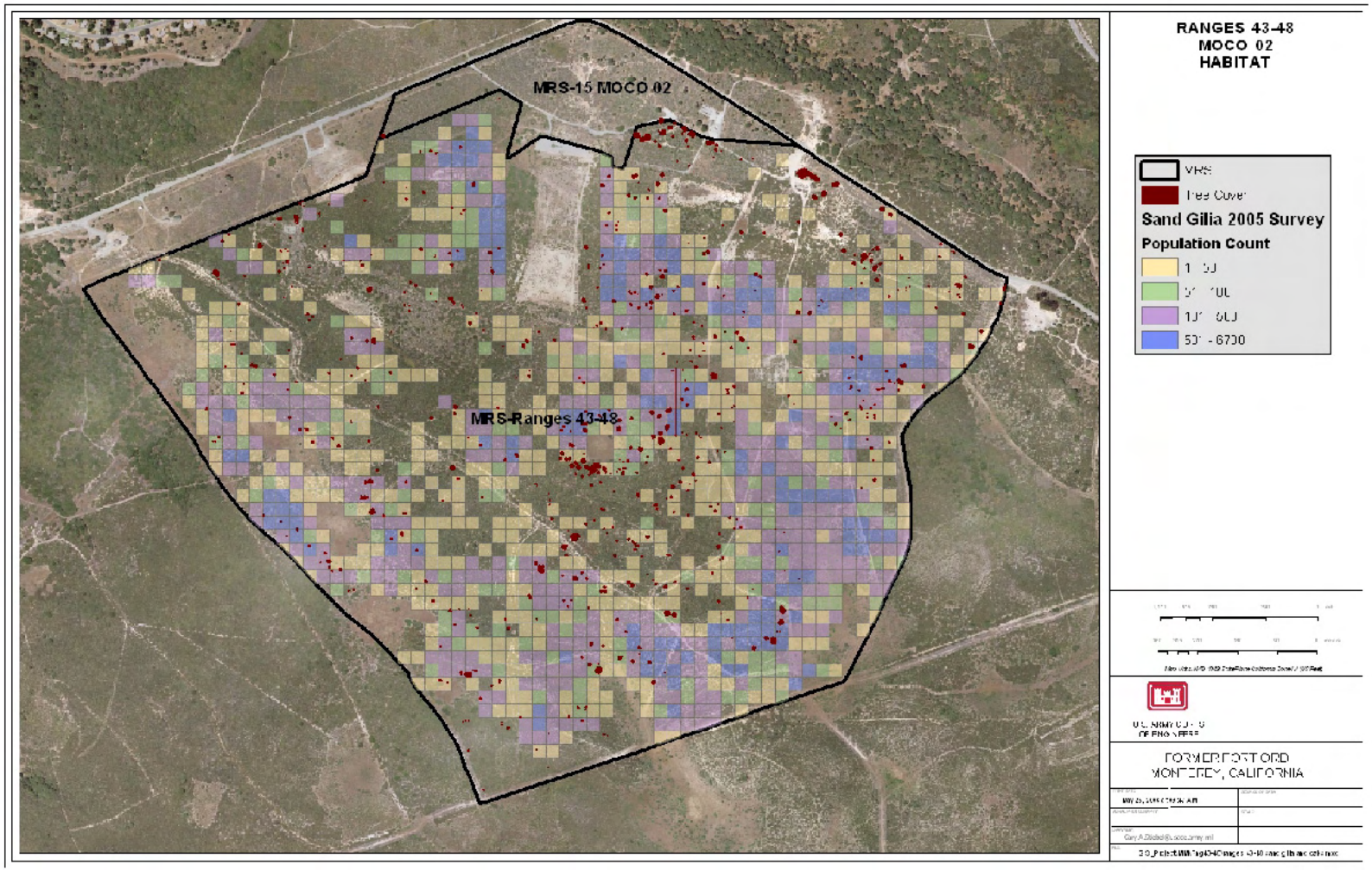


Figure 4. Map showing the location of trees left following the prescribed burn and 2005 Sand Gilia.

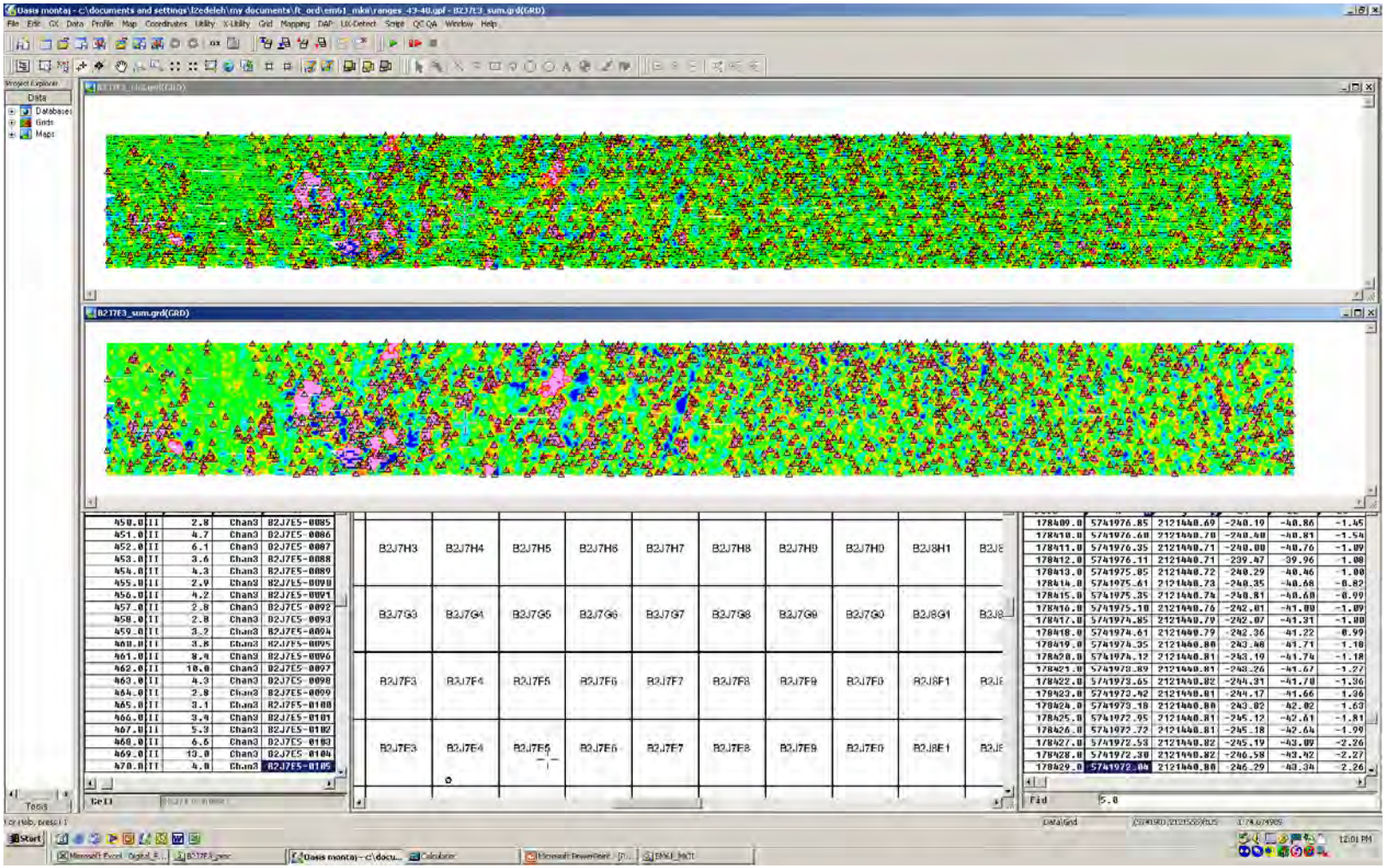


Figure 5. Screen grab of grid block B2J7E3 demonstrating high density anomaly picks. (Top) Channel 3 data, (Middle) Sum channel plot and (Bottom) tabulated pick data and grid map.

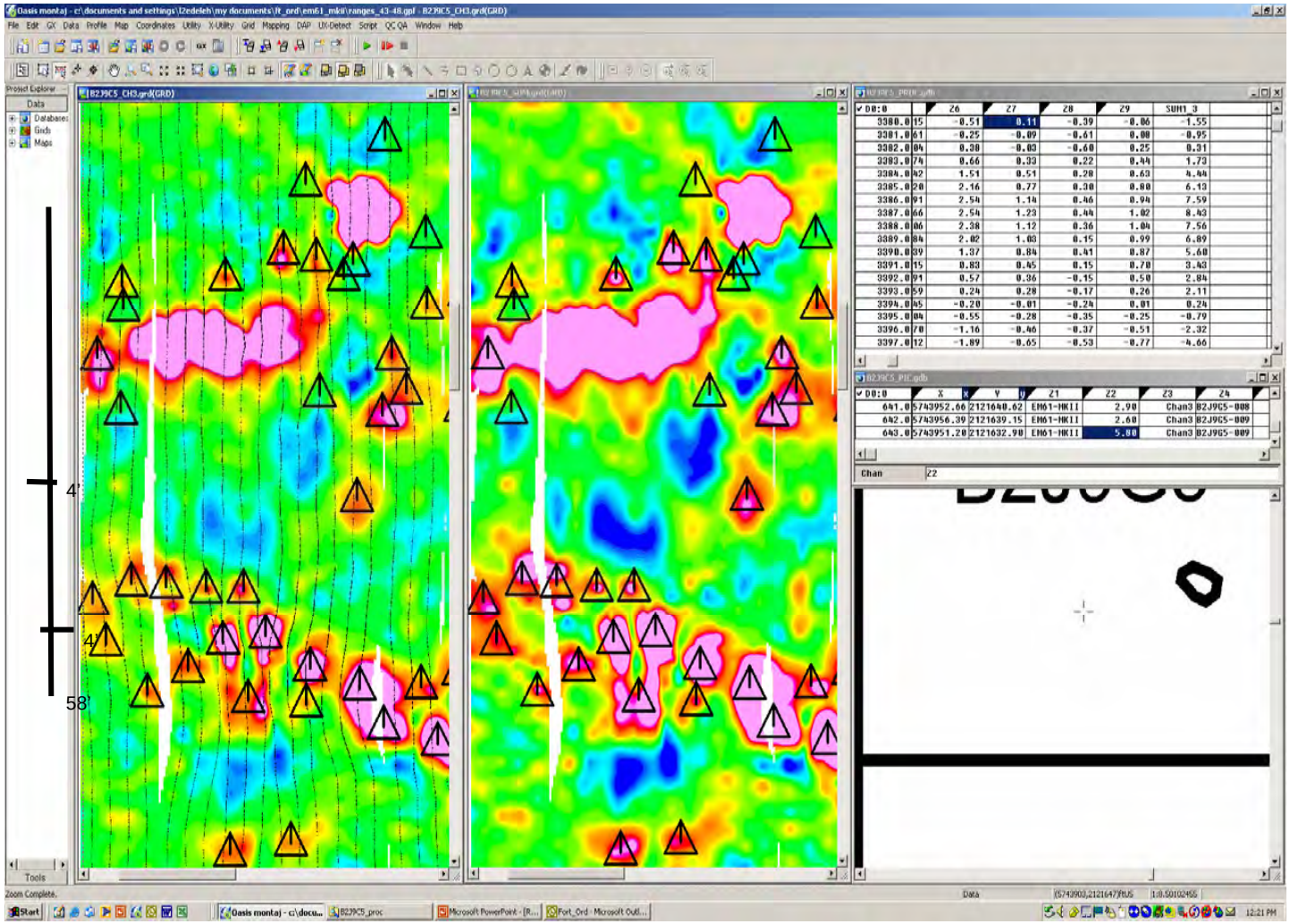


Figure 6. Screen grab showing example of a datafile containing a gap. DQO limits gaps to less than 4 sq. ft.

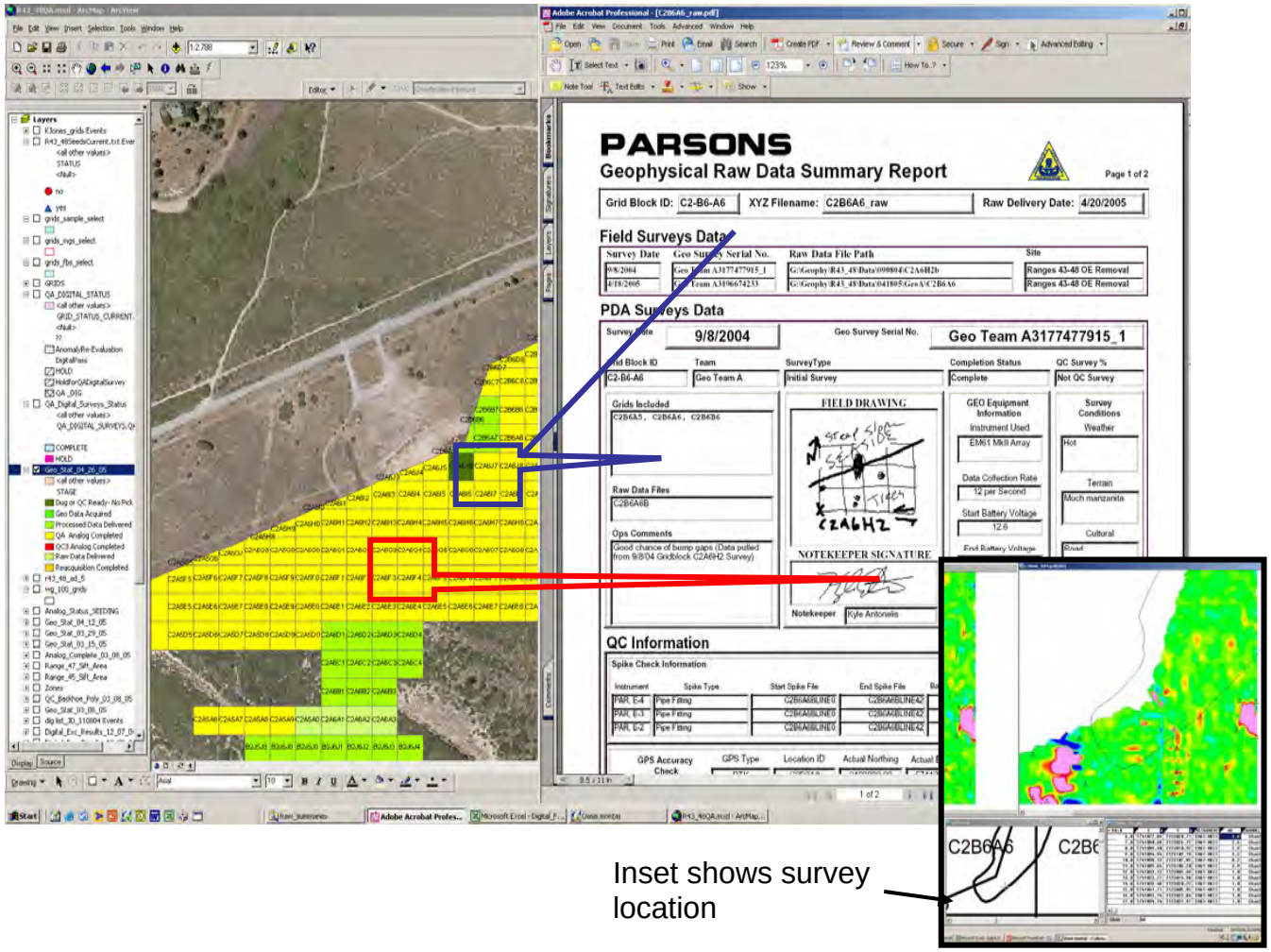


Figure 7. Screen grab showing example where raw data summary sheet disagreed with processed data. Field sketch contained the wrong grid block name.

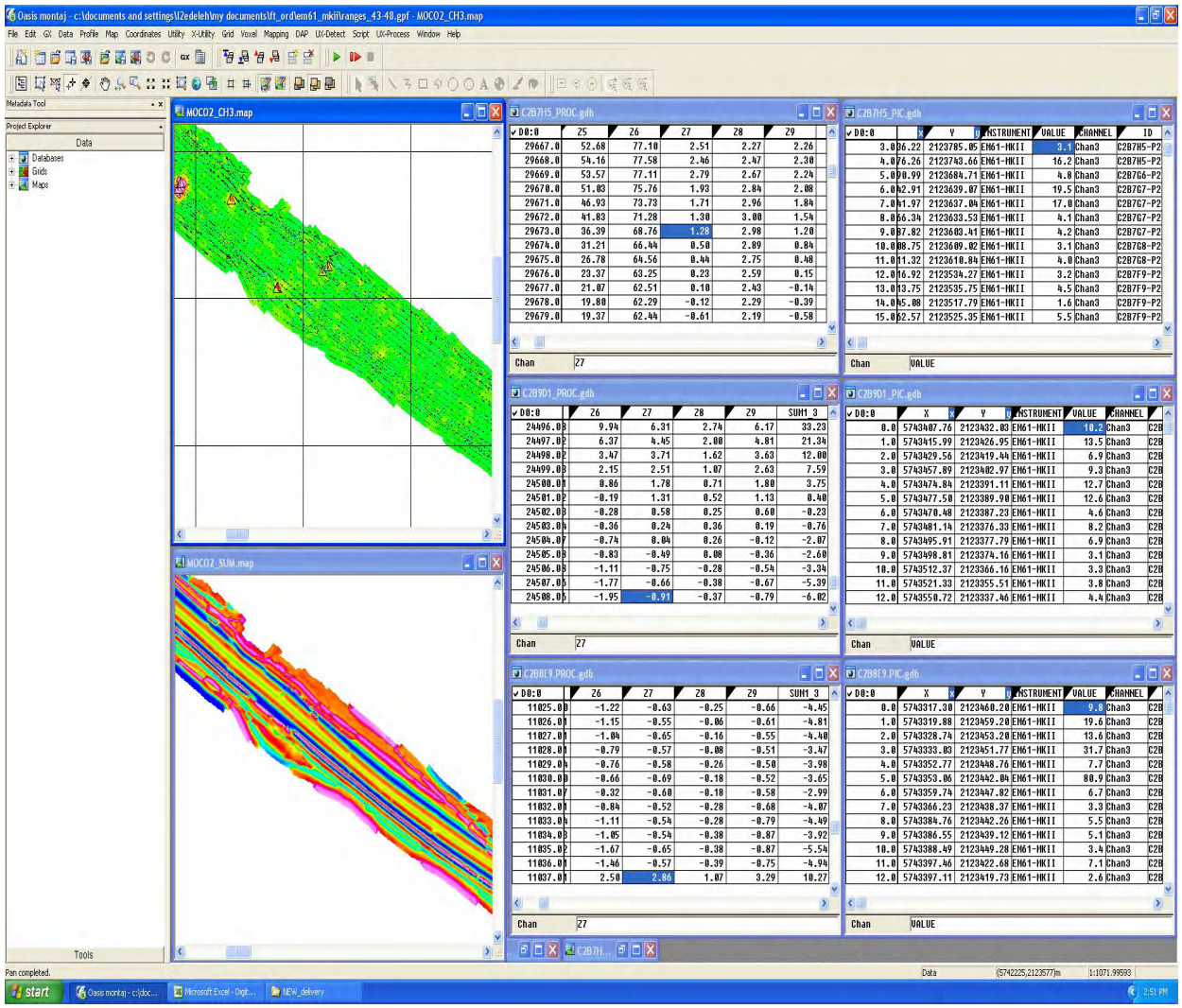


Figure 8. Screen grab showing plotted data when leveling of all data has not been completed. Top left shows plot of channel three data while plot on bottom left is sum channel (channels 1 to 3). Here channel 1 data had not been leveled.

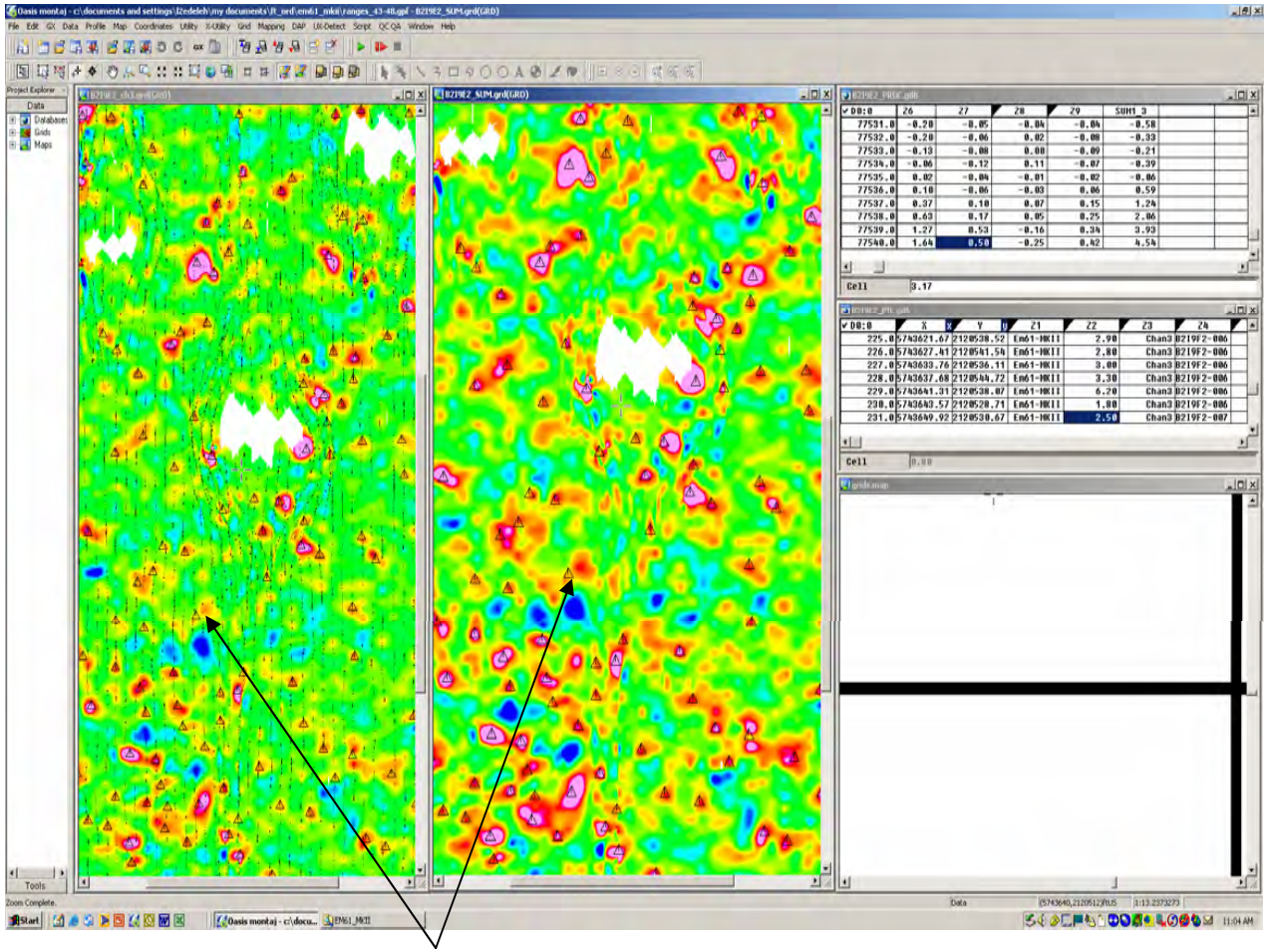


Figure 9. Screen grab showing where one anomaly pick was questioned. Here the anomaly pick lies between 2 peaks. Item was discussed at a QA/QC Geophysics meeting.

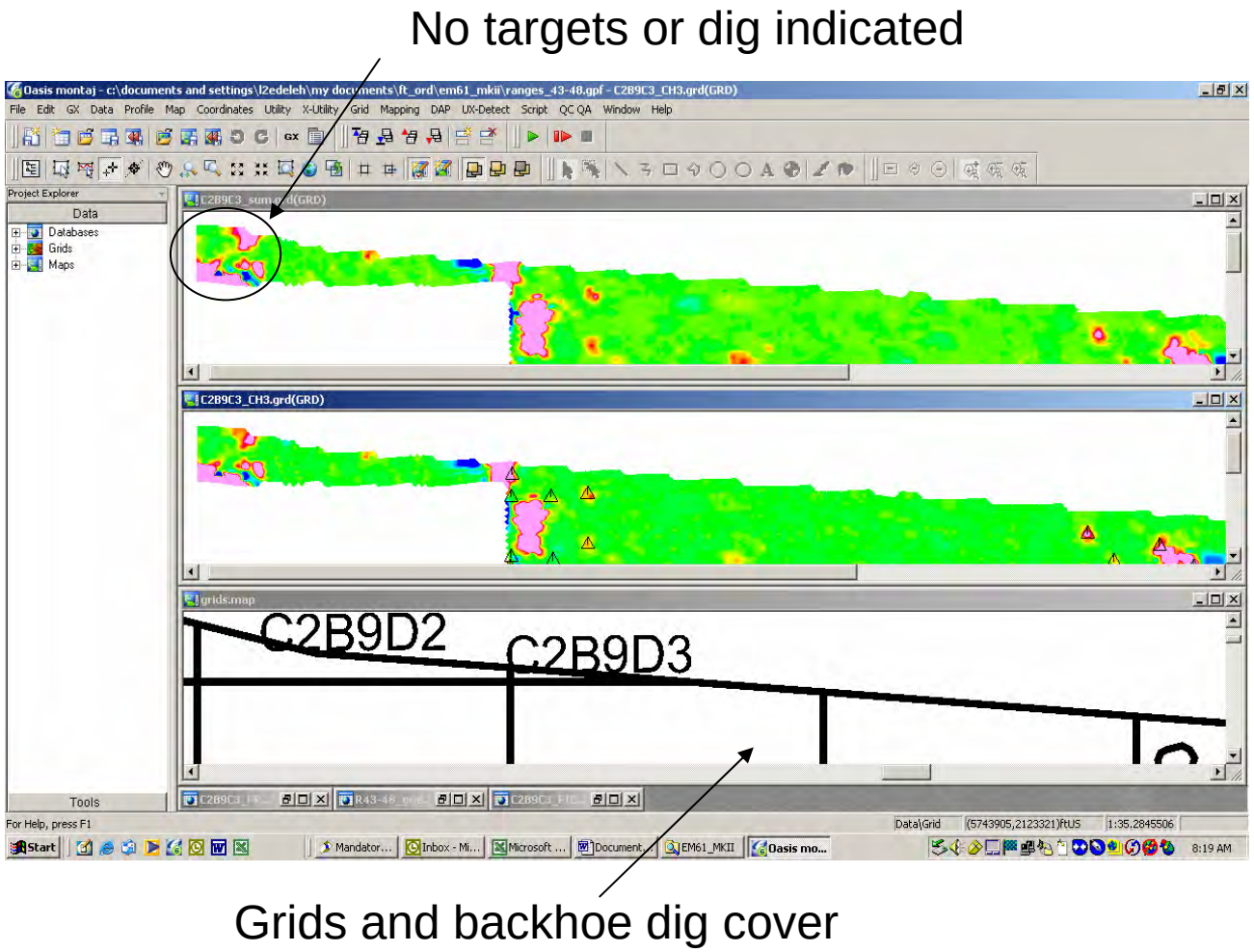


Figure 10. Anomaly in upper left corner was not picked in original data deliverable. After discussion at QA/QC Geophysics Meeting it was determined that anomaly had been picked but was not included on pick list. Data was re-delivered with pick within 1 day of notification.

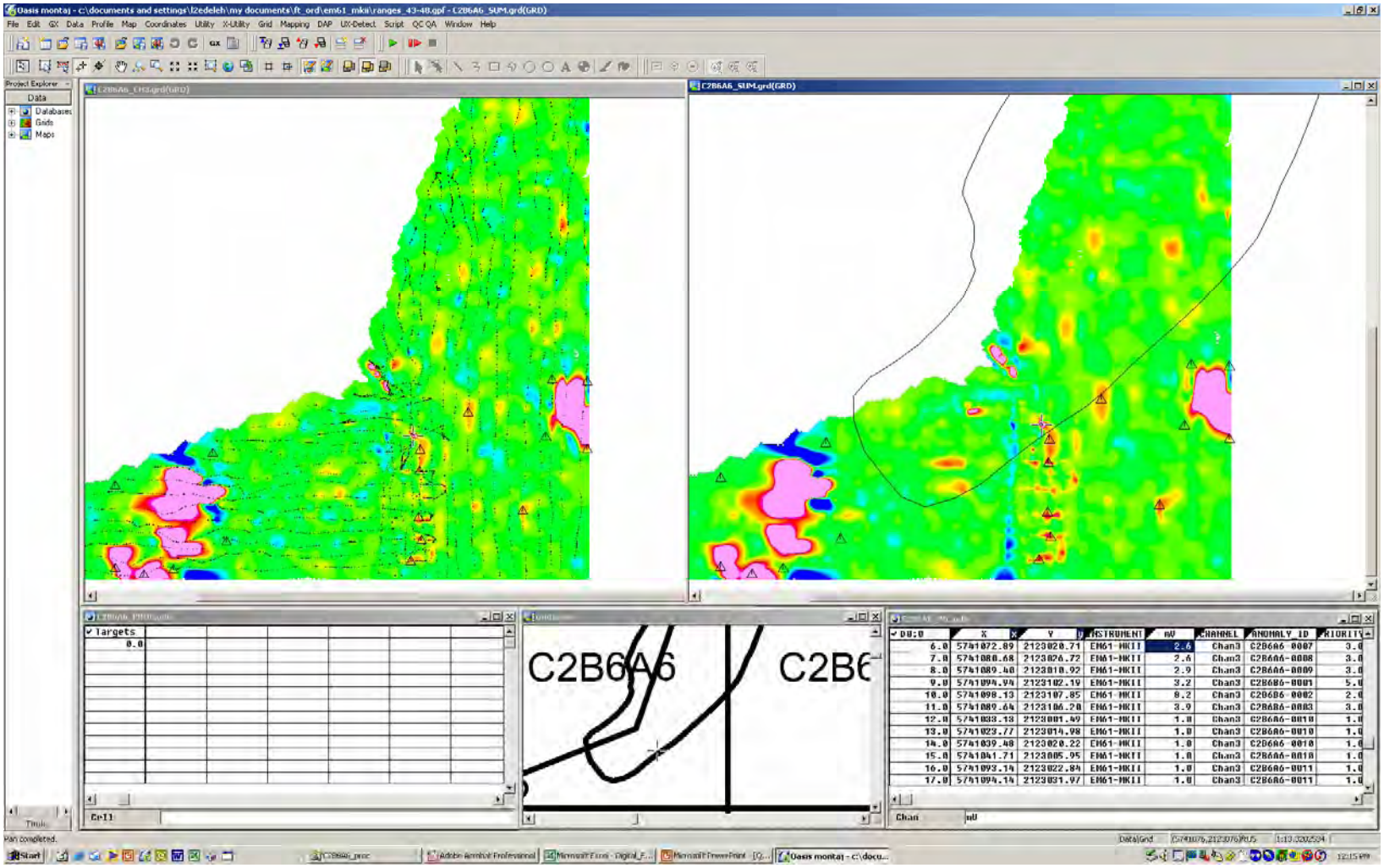


Figure 11. Bright anomalies in center of plots results from the geophysicist driving the vehicle pulling the towed array taking tight corners. Such anomalies may be picked as targets when it is likely they are noise.

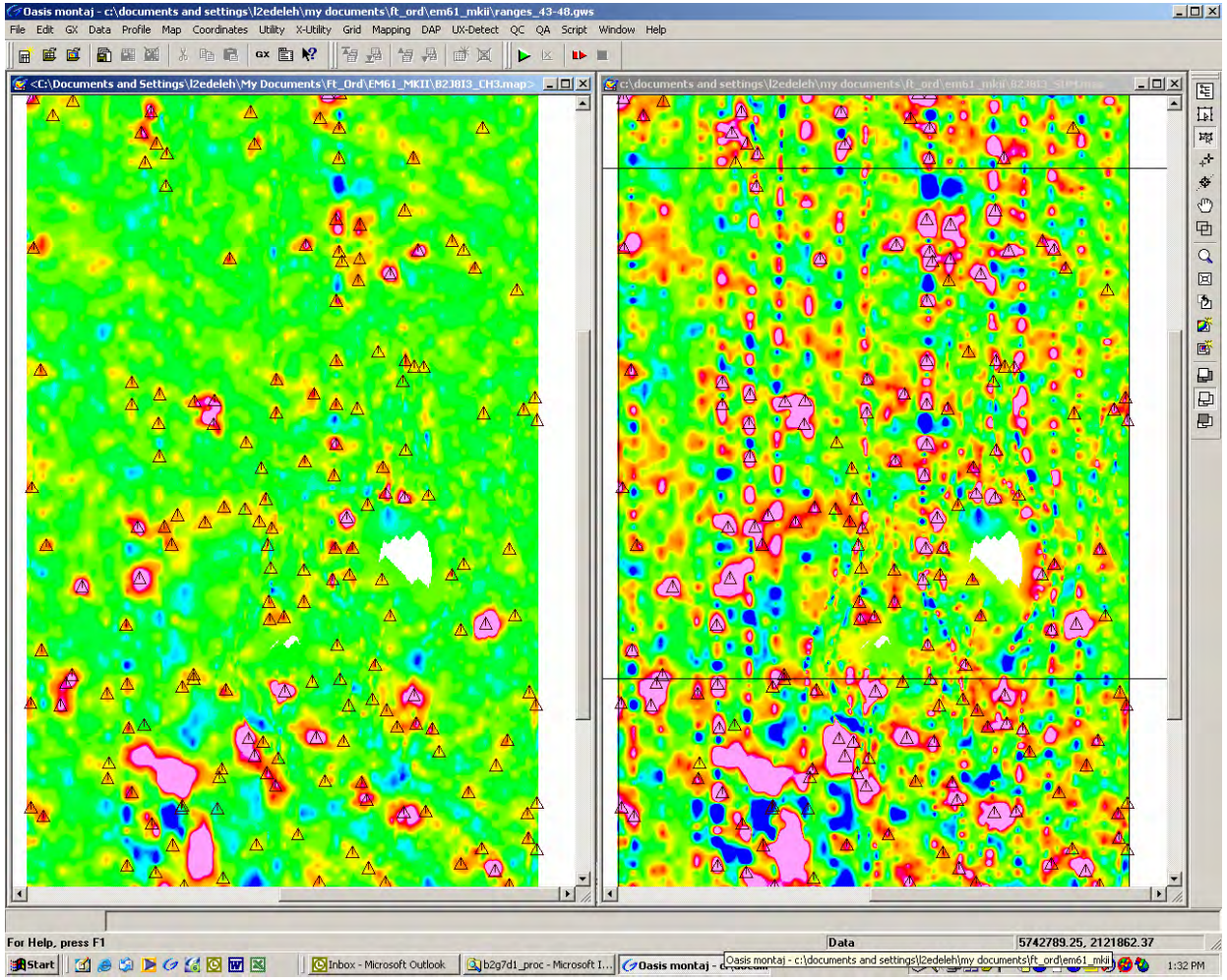


Figure 12. Noisy data from grid block B2J8I3. Data from this grid block was allowed due to failure to identify this possibility in the DQO process, thus no pass-fail criteria had been established to cover data "reasonableness."

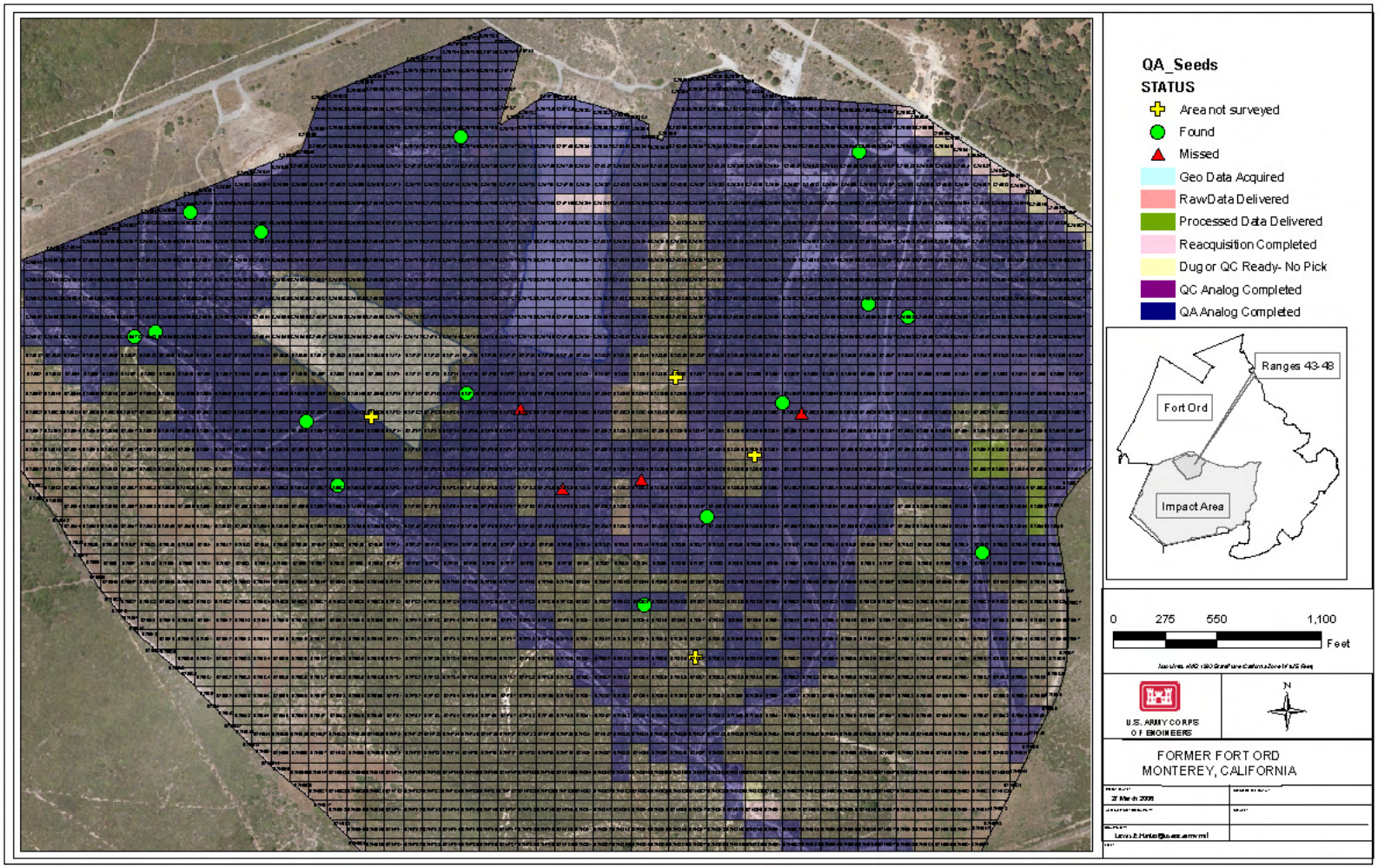


Figure 13. Map showing status of QA seeds.

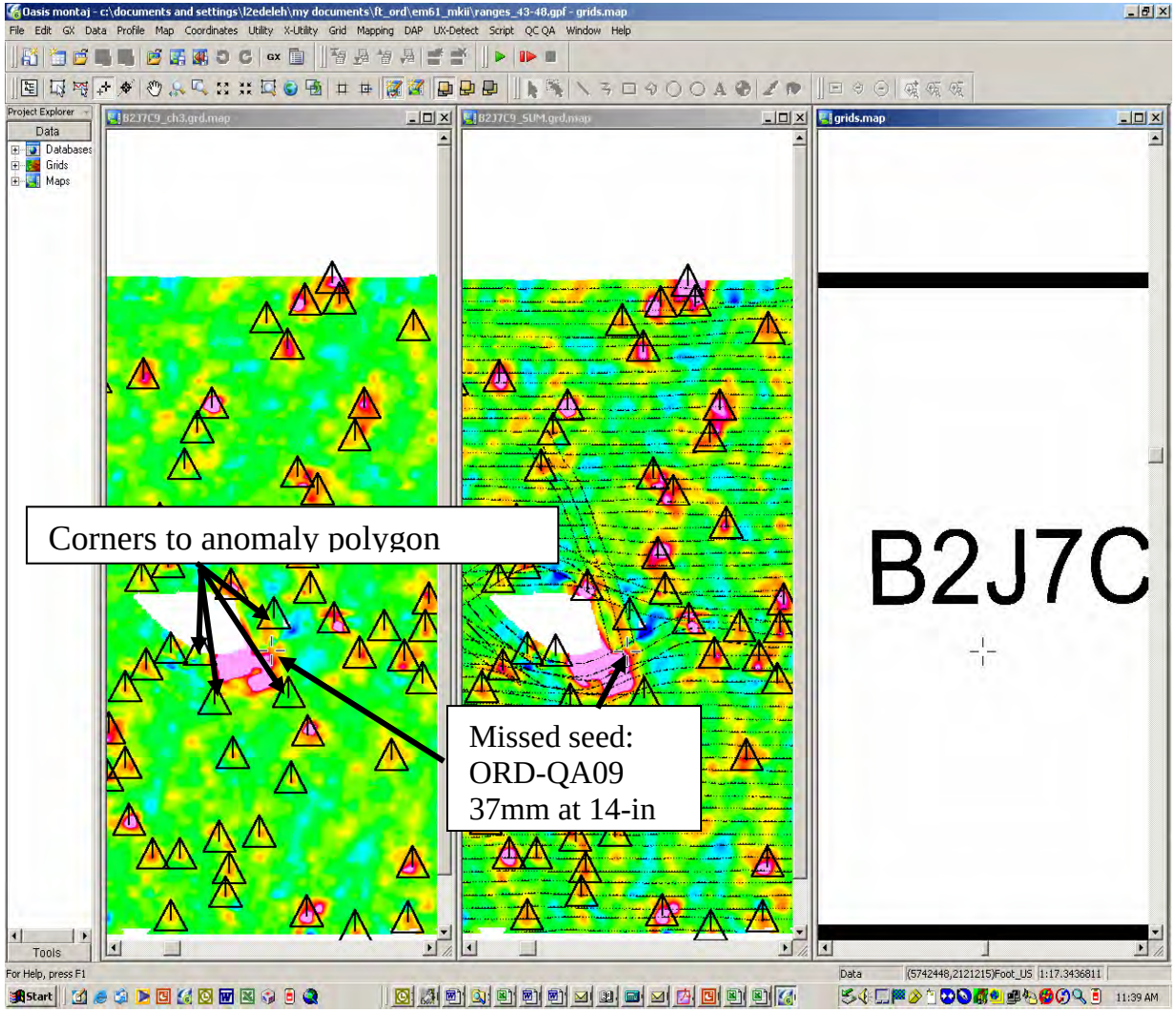


Figure 14. Screen grab showing location of seed ORD-QA09 that was located within an anomaly polygon identified by Parsons.

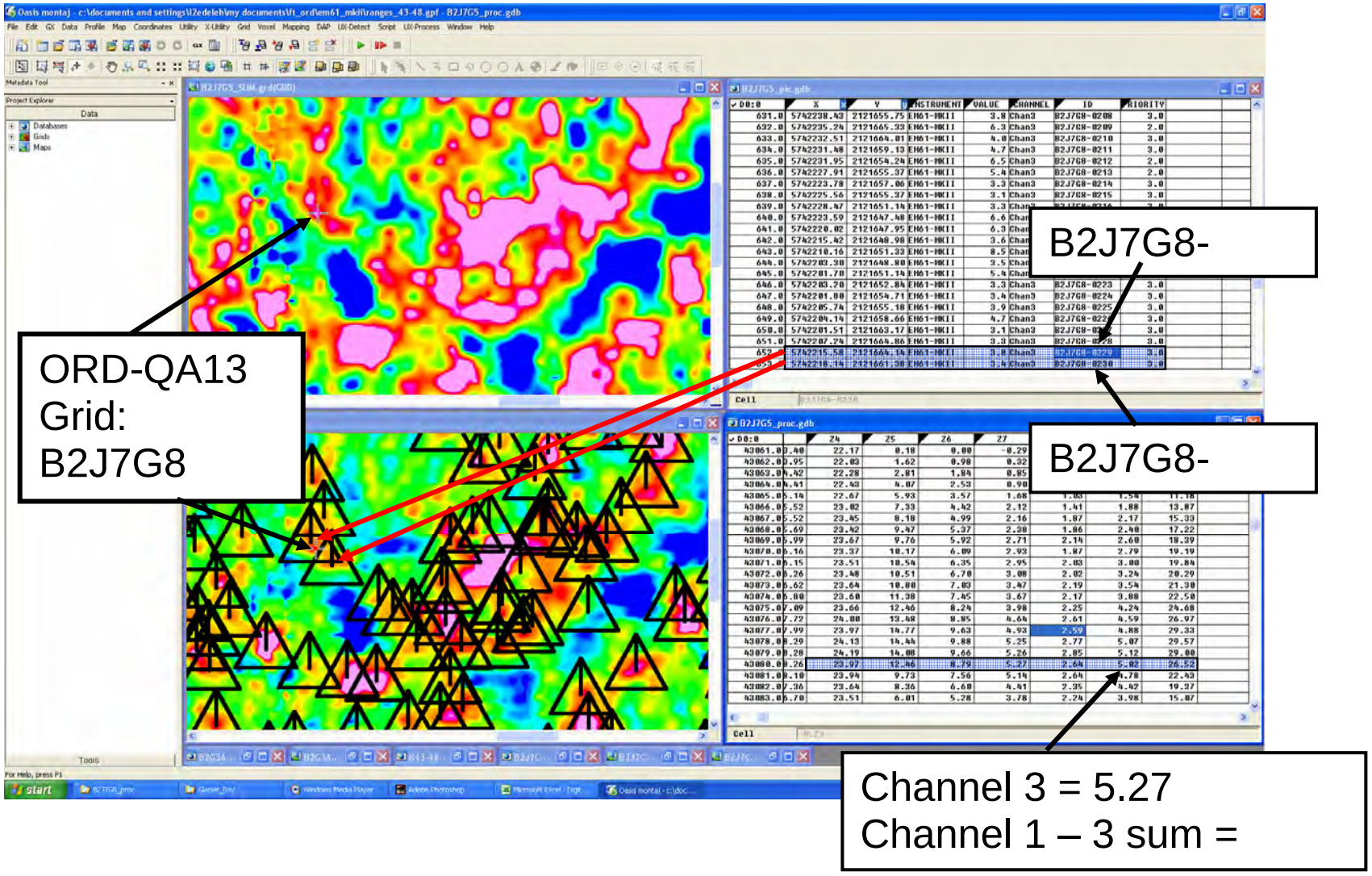


Figure 15. Screen grad showing the location of seed ORD-QA13 that was missed during analog and digital excavations.

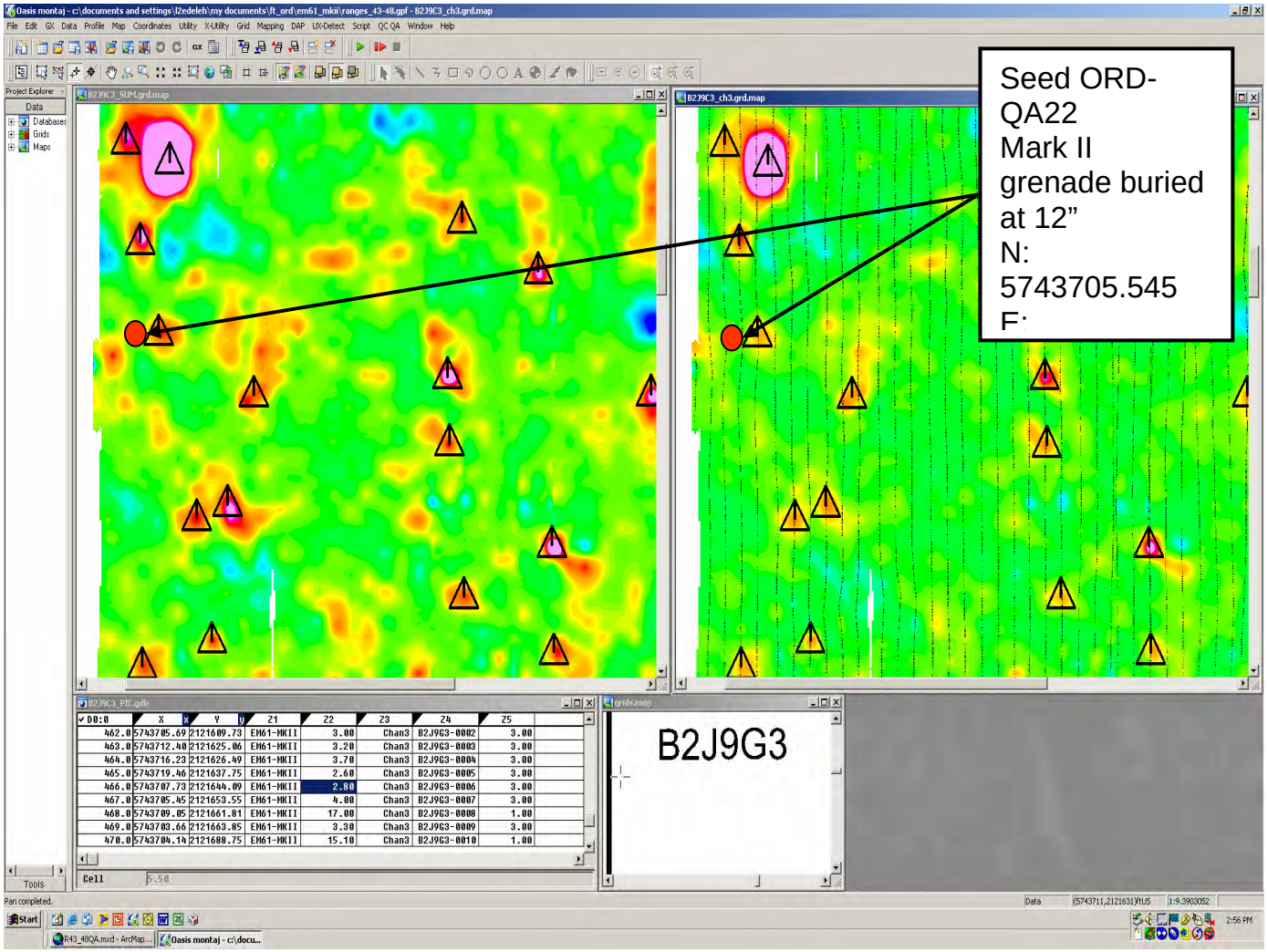


Figure 16. Screen grad showing the location of seed ORD-QA22 that was missed during analog and digital excavations.

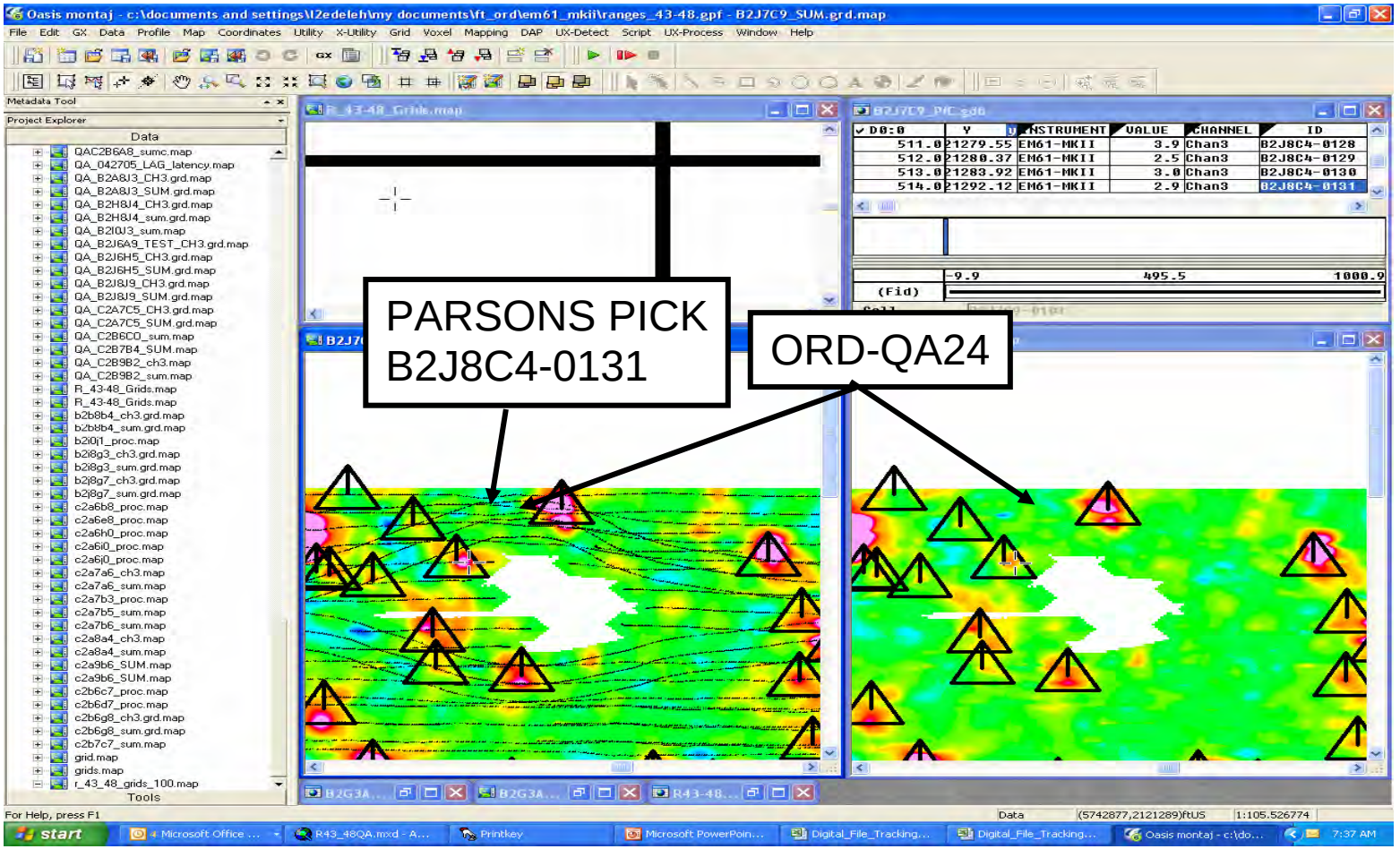


Figure 17. Screen grad showing the location of seed ORD-QA24 that was located near a tree and was missed by both analog and digital excavations.

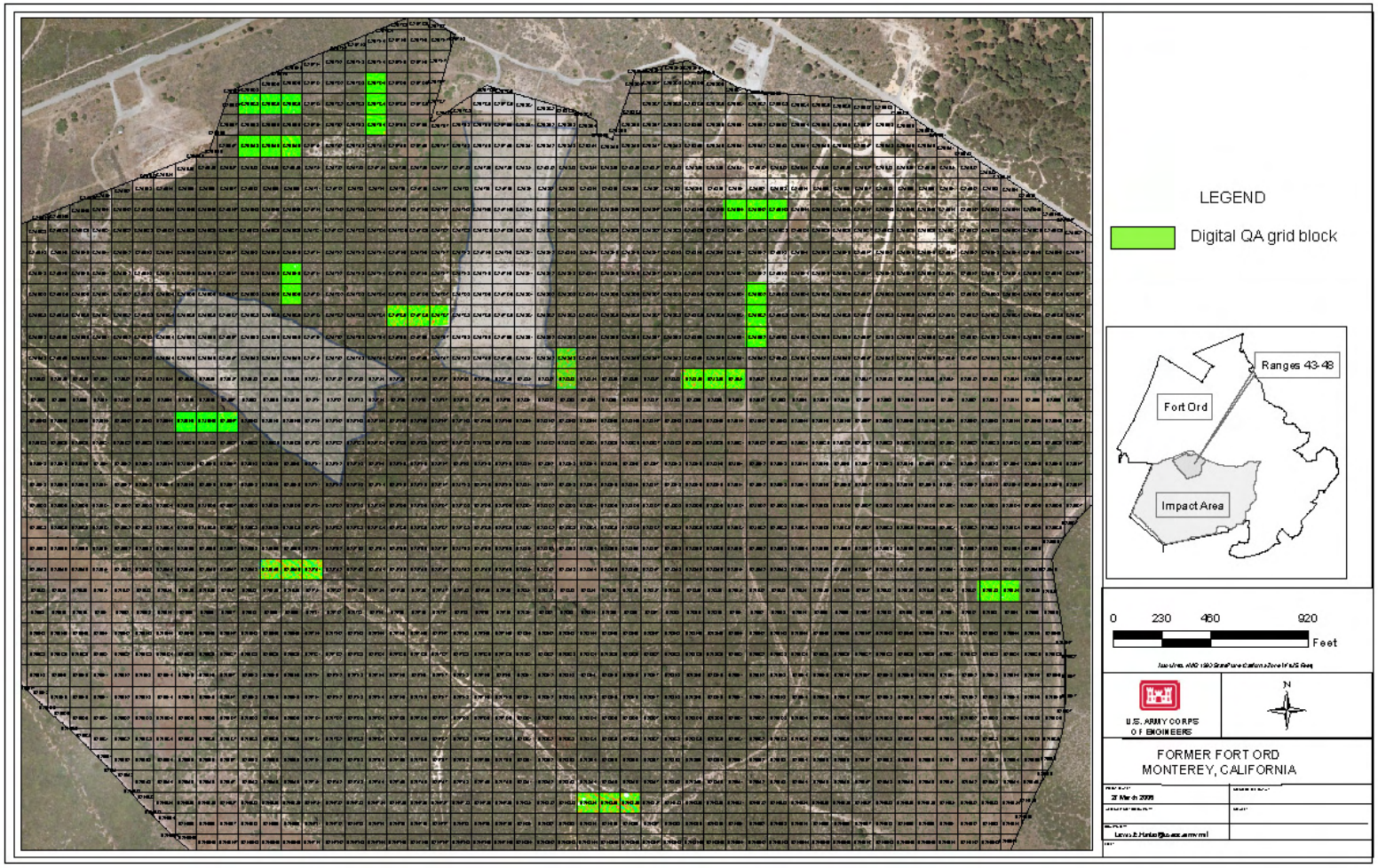


Figure 18. Locations of grid blocks that were QA surveyed with digital geophysical mapping.

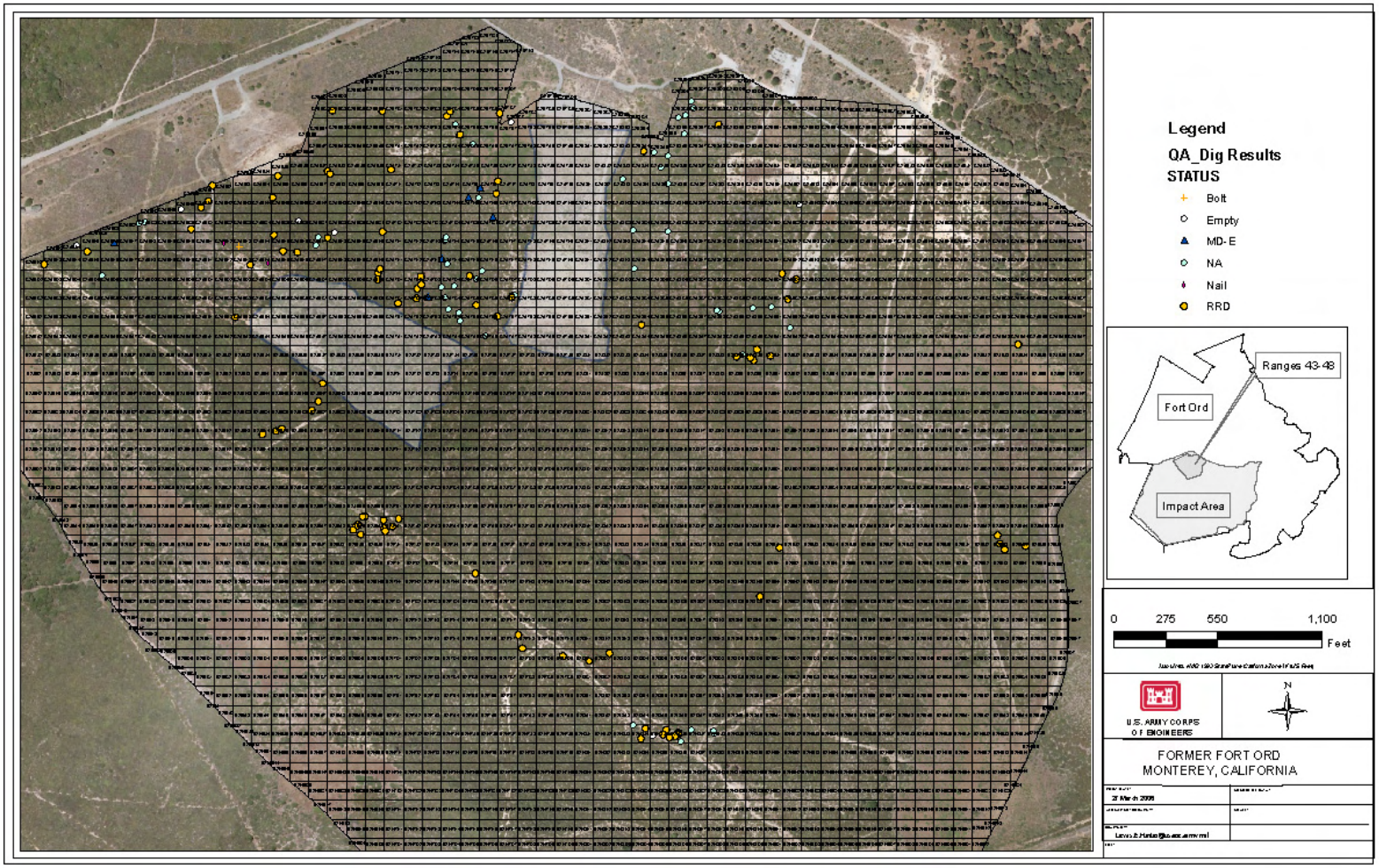


Figure 19. QA dig results.

Appendix A

QA Procedures for Digital Geophysics

This memo was drafted to establish procedural guidelines that will be used by the U.S. Army Corps of Engineers, Sacramento District (CESPK) in their QA role at Fort Ord. The intent is to define a series of procedures by which the Corps will observe and validate the military munitions response (MMR).

Field Geophysical Surveys

QA oversight will include random, unannounced visits to observe the Parsons digital geophysics teams. Oversight will include verification of proper set up and calibration checks. These procedures are those associated with the use of an EM61-MKII. These include:

1. System set up: It is assumed that once production surveys begin, either as single system (man portable) or towed array, the configuration of the system will not very and the system will not be broken down and re-assembled each day. Thus, daily operations will include checking all of the cable attachments, assuring that all fittings and fasteners are tight, and that the EM61 cables are attached to the GPS.
2. System warm-up: System should be turned on and allowed to warm up for a minimum of 5-minutes.
3. Turn of GPS: Turn system on and verify RTK fix. Throughout day, especially during production survey the operator needs to periodically verify RTK fix. RTK fix also needs to be verified during position check.
4. Cable shake: With system running all of the cables should be shaken and “wiggled” at each end while also visually monitoring the data screen as it updates on the Juniper hand-held (man-portable) or computer screen (towed array). Acceptance criteria will be fluctuations below 2 mV on Channel 3. Test is to be performed at least once a day, or when erratic data is observed that cannot be adequately defined by other alternatives.
5. Static test: Data will be collected over a period of 2 minutes. During that time the coils are not to be moved nor will personnel walk within 1 m of the coils to eliminate potential noise. Man-portable unit will be laid against an object or leaned so that handle rests on ground so that system does not move. Acceptance will occur if background noise is below 2 mV. Test must be performed at least once per day.
    a. File nomenclature: mmddyyX where mm = month, dd = day, yy = year and X is designator for “Static Test"
6. Spike test: A 2-in galvanized steel pipe fitting will be used as a spike (in accordance with current Parsons procedures). Prior to test a new file should be started. The system will be run a minimum of 10 seconds to document background then the spike will be placed below the center of the bottom coil (coils are to be aligned parallel to ground surface) and data will be collected for at least another 10 seconds. Prior test indicate the spike should

be around 105 mV; however, acceptance criteria is that repeat spike tests should be within 20%. Test is to be run at the beginning and end of each survey.

a. File nomenclature: A#A#A#S where A#A#A# = grid block ID and S = "Start Spike"

b. File nomenclature: A#A#A#E where A#A#A# = grid block ID and S = "End Spike"

7. Lag test: The spike will be placed on the ground in an area near the grid block to be surveyed but away from any known anomalies (thus, Schonstedt or EM61 sweep should be done first to evaluate background acceptance). A new file will be started and 4-transects will be run in an east-west or north-south direction. Direction is to be same as those to be run in accompanying grid block. Data will be collected as a single file. Transects are to run along a single line that starts 3 m to one side of spike and extends 3 m beyond spike. Transects are to be run back and forth, 2-times in each direction. There are no acceptance criteria for data is to be used during processing phase to determine lag/latency correction. Test is to be run for each grid block.

   a. File nomenclature: A#A#A#? where A#A#A# ?= grid block ID and ? = "Lag Test"

8. Position test: GPS antenna will be set up directly above a corner stake. The GPS reading will be read directly off of GPS handheld unit and the data recorded in the PDA. For acceptance the recorded position must be within 0.5 ft of the previously defined stake coordinate.

9. Logging:

   a. Is RTK fix maintained throughout? If lost, how long and what was team response. Short drops (<0.5 min) in RTK fix acceptable and can be extrapolated during post processing.

   b. Walking speed: N/A

   c. Towed array speed: must be below 2.5 mph

   d. Battery voltage must remain above 11.8 V. Batteries should be swapped about every 2 hr 15 min.

   e. Line must be straight

   f. Line spacing ~every 2 ft

   g. System bounce should be within "reasonable range" – this will be professional judgment; if bouncing looks too bad topic should be discussed with team geophysicist. Bouncing will create noise be creating high frequency changes in sensor separation from ground and creating cable shake. These will combine to create random noise that may lead to subsequent data rejection during processing, QC and or QA review.

Digital Data

100 percent of the data files generated by the process was reviewed by QA. This took place as a two-step process: 1) 100% scan of file headers and summery sheets, and 2) 25 to 50% remapping of the processed data. The percentage of files remapped started at 50%in some form. QA oversight will include random, unannounced visits to observe the Parsons digital geophysics teams. Oversight will include verification of proper set up and calibration checks. These procedures are those associated with the use of an EM61-MKII. These include:

Digital Geophysics Data Management and Processing

1. Dat61
2. Import data to Geosoft
3. Evaluate “Spike” data
4. Lag Test
5. Data leveling
6. Grid generation
7. Plot map
8. raw data delivery
9. graph all channels
10. low pass filter
11. anomaly selection
12. dig/target list generation
13. export processed data and target list

Appendix B

QA/QA Geophysical Meeting Agendas and Minutes

FORMER FORT ORD OE CLEANUP
Geophysical Conference Call Minutes
March 31, 2004
1400-1500 Hours

Attendees:

Name	Organization	Position	Phone/Email
Hunter, Lewis	USACE-SPK	Geophysicist	(916) 557-5368 lewis.e.hunter@usace.army.mil
Kittner, Tony	USACE-SPK	Geophysicist	(435) 831-3537 Tony.Kittner@usace.army.mil
Murray, Craig	Parsons	Project Geophysicist	(831) 884-2318 craig.murray@parsons.com

Discussion:

- Inclinometer – C. Murray suggested that using an inclinometer with the towed array on the Ranges 43-48 project could reduce the positional error caused by GPS sensor sway on steep slopes. Inclinometers that produce digital output of pitch, roll, and yaw are available in the $1000 range and would likely be easy to integrate into a towed array data acquisition system. Several presentations at the UXO forum addressed the issue of sensor orientation and the negative effects of tilted sensors on detection and discrimination abilities. L. Hunter and T. Kittner agreed that collecting this data would be technically beneficial, but the approval of the additional cost of the equipment would need to go through Juan Koponen. Before implementation it was recommented that Parson's conduct tests at Badger Flats to evaluate the best location for placing the inclinometer on the sled and to evaluate potential interference. L. Hunter will contact Bob Selfridge about specific equipment that USACE has experience using.
- New Geonics EM61-Mk2 calibration coil – Geonics has introduced a new, small (~10cm diameter) coil that attaches to the EM61-Mk2 and is designed to be used as a check on calibration. The coil should allow the calibration checks to be more consistent than the current method of placing a metal object under the system. The cost of the calibration coil is $570 per unit. The total cost of equipping all four Fort Ord EM61-Mk2 sensors with the coil would be $2280. T. Kittner and L. Hunter approve of using the coil from a technical perspective and recommended that C. Murray prepare a list of pros and cons for purchasing the coils and present the lists to Juan Koponen. When L. Hunter speaks with Bob Selfridge about the inclinometer, he will also ask about Huntsville's position on these new coils.
- EM61-Mk2 Top Coil – C. Murray suggested removing the top coils from the EM61-Mk2 systems and using the 4 time gate mode with only the bottom coil. The top coil data has not been used for anomaly selection or depth estimates for the past couple of years. He pointed out that removing the top coil would 1) reduce the weight of the system 2) increase the structural integrity of the EM61-Mk2 and 3) expose less equipment to the risk of damage in the field. A recently damaged top coil prompted this suggestion. T. Kittner recommended repairing or replacing that top coil.
- Early start collecting data in five grid – C. Murray stated that Parsons may geophysically survey about 5 grids to test out the full process at Ranges 43-48. L. Hunter and T. Kittner

approved this limited data collection prior to QA seeding as long as Parsons lets CESPK know which grids have been surveyed.

- Munitions Database – L. Hunter requested that Parsons provide information related to the maximum depth certain items have been found at Fort Ord (not including in pits) to support the development of a QA seeding plan. C. Murray will have the Parsons GIS manager, Andrew Hands contact L. Hunter regarding this request.

Action Items (due dates in parentheses):

- Parsons to prepare meeting minutes and distribute to the following: Jennifer Brown, David Brown, Mike Cormier, Gary Griffith, Andrew Hands, Clinton Huckins, Tamir Klaff, Juan Koponen, Craig Murray, Lyle Shurtleff, Sharon Troutman, Wayne Wright. (10-21-03)

Next Meeting:

Tuesday, October 21, 0830 – Parsons Trailer 3 Conference Room

FORMER FORT ORD OE CLEANUP
Geophysical Conference Call Minutes
August 3, 2004
1500-1600 Hours

Attendees:

Name	Organization	Position	Phone/Email
Hoekstra, Bart	Parsons	Senior Geophysicist	(303) 764-8717 bart.hoekstra@parsons.com
Hunter, Lewis	USACE-SPK	Geophysicist	(916) 557-5368 lewis.e.hunter@usace.army.mil
Johansen, Erik	Parsons	QC Geophysicist	(831) 884-2330 erik.johansen@parsons.com
Murray, Craig	Parsons	Project Geophysicist	(831) 884-2318 craig.murray@parsons.com
Stiebel, Cary	USACE-SPK	GIS Specialist	(831) 884-9925 ext. 235 cary.a.stiebel@usace.army.mil
Troutman, Sharon	Parsons	Geophysical Database Manager	(831) 884-2325 sharon.troutman@parsons.com

Discussion:

- L. Hunter requested that Parsons air any discussion/concerns that they have – none were offered.
- L. Hunter requested that the different file types in data deliveries be described to him (C. Murray reviewed these files with him after the meeting).
- E. Johansen asked if the CESPK is providing feedback about missed QA seed items. L. Hunter responded that if any seed items are missed CESPK would inform Parsons.
- L. Hunter requested that corrections be made to some of the data summary reports or file headers. He requested the raw data summary report for gridblock C2B7F2 (after the meeting it was determined that this report had been delivered separate from the data). He also requested that two gridblocks (C2B7G4 and C2B6E9) delivered with mismatching filtering parameters in the processed data summary report and the data file header be corrected.
- L. Hunter requested that C. Murray discuss some anomalies below the 3mV threshold (some selected, others not selected) in the future. Some discussion between C. Murray and L. Hunter followed the meeting.
- L. Hunter inquired about maps delivered with the processed data. C. Murray responded that Parsons produces maps of the geophysical data for the AAR.
- C. Stiebel inspired a discussion about consolidating all digital geophysical data from Fort Ord to support land transfer and the anticipated requests from developers. Different formats and data management strategies were discussed. Parsons recommended creating geographically tagged images (i. e. GeoTiffs) from the processed data. Such images were delivered for the

Seaside, Moco2 and most recent DRO data, but may not have been created for earlier projects.

- L. Hunter requested that the raw and processed data summary reports be described to him. C. Murray recommended that this review should be postponed because changes are currently being made to the format of these reports.
- L. Hunter requested that the line number for spike and static QC tests be consistently reported on the raw data summary reports.
- L. Hunter requested that the delivered data on the FTP site be placed in dated directories within the Geophysical Data directory.

FORMER FORT ORD OE CLEANUP
Geophysical Conference Call Minutes
August 18, 2004
800-900 Hours

Attendees:

Name	Organization	Position	Phone/Email
Asch, Ted	USGS	Geophysicist	(303) 236-2489 tasch@usgs.gov
Hunter, Lewis	USACE-SPK	Geophysicist	(916) 557-5368 lewis.e.hunter@usace.army.mil
Koponen, Juan	USACE-SPK	Project Manager	(831) 884-9925 x233 juan.koponen@usace.army.mil
Murray, Craig	Parsons	Project Geophysicist	(831) 884-2318 craig.murray@parsons.com

Discussion:

- The plan for testing the capabilities of the EM61-Mk2 for detecting ordnance under asphalt was discussed. The scope of the test as proposed by Parsons was expanded to include three surveys over a 40-ft square test grid.
    1. After cutting the asphalt but prior to placing any items
    2. After placing 37mm projectiles at 12 inches bgs in all six holes
    3. After placing 37mm projectiles at 18 inches in all six holes

  Four of the items will be placed vertically and two will be placed horizontally in line with the survey transects (1 under asphalt, 1 outside the asphalt area).
    - T. Asch stated that there will need to be a caveat in the report about the possible differences between the soil under the asphalt and the soil away from the asphalt.
    - C. Murray was concerned that by using a single pair of horizontally placed items, other variations in the response (i.e. slight depth differences, differences between sensor to item distances, differences between seed items) could be mistakenly attributed to the asphalt. C. Murray expressed his preference for using three pairs of identically placed items to account for these variations.
    - C. Murray expressed his preference for placing the items at shallow depths (10 inches) to ensure a response well above the noise level.
    - L. Hunter requested that the plan be revised to state that a 2-ft line spacing will be used with lines crossing directly over the item locations.
- L. Hunter pointed out discrepancies in the last survey date for several gridblocks (C2A7C7, C2A6D0, C2A7B3, C2A7C1, and C2A7G8) between the data file header and the summary reports. C. Murray stated that those deliveries would be rechecked and any revised files would be redelivered.
- L. Hunter said he likes the new raw data summary report format, but pointed out that the site conditions and terrain fields have been blank for all surveys since the new format was implemented. C. Murray suggested that these fields may not have any data in them to display on the report.

- L. Hunter pointed out that the Raw Data Summary Sheet for gridblock C2A6B8 listed Lea Antonelis (not Lea McKinstry or Kyle Antonelis). C. Murray stated that this would be corrected and redelivered.
- L. Hunter inquired about a large anomaly on the northern boarder of gridblock C2A7C7 that had not been selected during processing. C. Murray checked the data and it turned out that this anomaly was located in an area that had previously been investigated with a backhoe. The anomaly was not selected in accordance with FVF Ranges 43-48-0002.
    - L. Hunter and T. Asch requested that the fact that this anomaly was not selected for that reason be indicated on one of the filed delivered. C. Murray suggested delivering the shape file that includes all backhoe digs to date in Ranges 43-48.

FORMER FORT ORD OE CLEANUP
Geophysical Meeting Minutes
August 26, 2004
900-1000 Hours

Attendees:

Name	Organization	Position	Phone/Email
Hunter, Lewis	USACE-SPK	Geophysicist	(916) 557-5368 lewis.e.hunter@usace.army.mil
Johansen, Erik	Parsons	QC Geophysicist	(831) 884-2330 erik.johansen@parsons.com
Murray, Craig	Parsons	Project Geophysicist	(831) 884-2318 craig.murray@parsons.com
Troutman, Sharon	Parsons	Geophysical Database Manager	(831) 884-2325 sharon.troutman@parsons.com

Discussion:

- L. Hunter requested that Parsons provide several datasets on a weekly basis. He requested a shape file that shows the grid that are 1) analog removal complete, 2) processed geophysical data delivered, and 3) QA ready. He also requested that Parsons deliver the results of digital excavations in a spreadsheet format. C. Murray will work with S. Troutman and A. Hands to accommodate these requests.
- C. Murray stated that there is an area where the excavation results have been almost all 22mm Sub-calibers, even the anomalies at the agreed upon 3mV anomaly picking threshold. These results suggest that anomalies just below the threshold may be caused by other 22mm Sub-calibers at slightly deeper depths. Lowering the threshold would likely result in finding more 22mm Sub-calibers and increasing the false positive rate. C. Murray asked if a 22mm Sub-caliber at 18 inches bgs found during a digital QA survey would result in a QA failure. L. Hunter stated that this question would be discussed at a QA meeting later in the day.
    - C. Murray was invited to participate a portion of this meeting with L. Hunter, J. Esparza, and C. Huckins later in the day to further discuss the area west of Range 45 with numerous 22mm Sub-caliber items. During this meeting J. Esparza clarified that the 37mm Projectile is the item of concern for this project and therefore a 22mm Sub-caliber found by QA would not result in a QA failure. However, QA finding a 22mm Sub-caliber would initiate an investigation into why it was not found prior to QA and might result in changes to the process. J. Esparza asked C. Murray if Parsons is selecting any anomalies below the 3mV threshold. C. Murray responded that the geophysical data processors are reviewing all data, even below the threshold, and they are selecting some anomalies slightly below the threshold based on additional characteristics such as appearance on multiple profile lines or broad signatures. C. Murray estimated that these anomalies constitute approximately 1% of all anomalies selected to date on the Ranges 43-48 project.

- L. Hunter suggested that the Argo could be modified with a PTO throttle control.
- Discrepancies between data file headers and the data delivery summary reports mentioned at the 18 August meeting have been addressed and the causes of these discrepancies have been resolved.
- L. Hunter requested that future QA surveys be conducted with the towed array system instead of the single person towed system. QA will probably survey about three grids once per month.
- L. Hunter will be coming again the week of September 14th and Tony Kitner is planning to come to the site for a week in October.

FORMER FORT ORD OE CLEANUP
Geophysical Meeting Minutes
August 26, 2004
900-1000 Hours

Attendees:

Name	Organization	Position	Phone/Email
Hunter, Lewis	USACE-SPK	Geophysicist	(916) 557-5368 lewis.e.hunter@usace.army.mil
Johansen, Erik	Parsons	QC Geophysicist	(831) 884-2330 erik.johansen@parsons.com
Murray, Craig	Parsons	Project Geophysicist	(831) 884-2318 craig.murray@parsons.com
Troutman, Sharon	Parsons	Geophysical Database Manager	(831) 884-2325 sharon.troutman@parsons.com

Discussion:

- L. Hunter requested that Parsons provide several datasets on a weekly basis. He requested a shape file that shows the grid that are 1) analog removal complete, 2) processed geophysical data delivered, and 3) QA ready. He also requested that Parsons deliver the results of digital excavations in a spreadsheet format. C. Murray will work with S. Troutman and A. Hands to accommodate these requests.
- C. Murray stated that there is an area where the excavation results have been almost all 22mm Sub-calibers, even the anomalies at the agreed upon 3mV anomaly picking threshold. These results suggest that anomalies just below the threshold may be caused by other 22mm Sub-calibers at slightly deeper depths. Lowering the threshold would likely result in finding more 22mm Sub-calibers and increasing the false positive rate. C. Murray asked if a 22mm Sub-caliber at 18 inches bgs found during a digital QA survey would result in a QA failure. L. Hunter stated that this question would be discussed at a QA meeting later in the day.
    - C. Murray was invited to participate a portion of this meeting with L. Hunter, J. Esparza, and C. Huckins later in the day to further discuss the area west of Range 45 with numerous 22mm Sub-caliber items. During this meeting J. Esparza clarified that the 37mm Projectile is the item of concern for this project and therefore a 22mm Sub-caliber found by QA would not result in a QA failure. However, QA finding a 22mm Sub-caliber would initiate an investigation into why it was not found prior to QA and might result in changes to the process. J. Esparza asked C. Murray if Parsons is selecting any anomalies below the 3mV threshold. C. Murray responded that the geophysical data processors are reviewing all data, even below the threshold, and they are selecting some anomalies slightly below the threshold based on additional characteristics such as appearance on multiple profile lines or broad signatures. C. Murray estimated that these anomalies constitute approximately 1% of all anomalies selected to date on the Ranges 43-48 project.

- L. Hunter suggested that the Argo could be modified with a PTO throttle control.
- Discrepancies between data file headers and the data delivery summary reports mentioned at the 18 August meeting have been addressed and the causes of these discrepancies have been resolved.
- L. Hunter requested that future QA surveys be conducted with the towed array system instead of the single person towed system. QA will probably survey about three grids once per month.
- L. Hunter will be coming again the week of September 14th and Tony Kitner is planning to come to the site for a week in October.

FORMER FORT ORD OE CLEANUP
Geophysical Meeting Minutes
August 26, 2004
900-1000 Hours

Attendees:

Name	Organization	Position	Phone/Email
Hunter, Lewis	USACE-SPK	Geophysicist	(916) 557-5368 lewis.e.hunter@usace.army.mil
Johansen, Erik	Parsons	QC Geophysicist	(831) 884-2330 erik.johansen@parsons.com
Murray, Craig	Parsons	Project Geophysicist	(831) 884-2318 craig.murray@parsons.com
Troutman, Sharon	Parsons	Geophysical Database Manager	(831) 884-2325 sharon.troutman@parsons.com

Discussion:

- L. Hunter requested that Parsons provide several datasets on a weekly basis. He requested a shape file that shows the grid that are 1) analog removal complete, 2) processed geophysical data delivered, and 3) QA ready. He also requested that Parsons deliver the results of digital excavations in a spreadsheet format. C. Murray will work with S. Troutman and A. Hands to accommodate these requests.
- C. Murray stated that there is an area where the excavation results have been almost all 22mm Sub-calibers, even the anomalies at the agreed upon 3mV anomaly picking threshold. These results suggest that anomalies just below the threshold may be caused by other 22mm Sub-calibers at slightly deeper depths. Lowering the threshold would likely result in finding more 22mm Sub-calibers and increasing the false positive rate. C. Murray asked if a 22mm Sub-caliber at 18 inches bgs found during a digital QA survey would result in a QA failure. L. Hunter stated that this question would be discussed at a QA meeting later in the day.
    - C. Murray was invited to participate a portion of this meeting with L. Hunter, J. Esparza, and C. Huckins later in the day to further discuss the area west of Range 45 with numerous 22mm Sub-caliber items. During this meeting J. Esparza clarified that the 37mm Projectile is the item of concern for this project and therefore a 22mm Sub-caliber found by QA would not result in a QA failure. However, QA finding a 22mm Sub-caliber would initiate an investigation into why it was not found prior to QA and might result in changes to the process. J. Esparza asked C. Murray if Parsons is selecting any anomalies below the 3mV threshold. C. Murray responded that the geophysical data processors are reviewing all data, even below the threshold, and they are selecting some anomalies slightly below the threshold based on additional characteristics such as appearance on multiple profile lines or broad signatures. C. Murray estimated that these anomalies constitute approximately 1% of all anomalies selected to date on the Ranges 43-48 project.

- L. Hunter suggested that the Argo could be modified with a PTO throttle control.
- Discrepancies between data file headers and the data delivery summary reports mentioned at the 18 August meeting have been addressed and the causes of these discrepancies have been resolved.
- L. Hunter requested that future QA surveys be conducted with the towed array system instead of the single person towed system. QA will probably survey about three grids once per month.
- L. Hunter will be coming again the week of September 14th and Tony Kitner is planning to come to the site for a week in October.

FORMER FORT ORD OE CLEANUP
Geophysical Meeting Minutes
October 19, 2004
900-1000 Hours

Attendees:

Name	Organization	Position	Phone/Email
Acsh, Ted	USGS	Geophysicist	303-236-2489 tasch@usgs.gov
Hunter, Lewis	USACE-SPK	Geophysicist	(916) 557-5368 lewis.e.hunter@usace.army.mil
Kothleitner, Andreas	Parsons	QC Manager	(831) 884-2313 andreas.kothleitner@parsons.com
Murray, Craig	Parsons	Project Geophysicist	(831) 884-2318 craig.murray@parsons.com
Troutman, Sharon	Parsons	Geophysical Database Manager	(831) 884-2325 sharon.troutman@parsons.com

Discussion:

- Parsons is testing the digital excavation results form requested by L. Hunter at the last meeting. L. Hunter stated that he did not need the form for at least another week.
- Jim Drysdale will be here next week for QA.
- L. Hunter requested that Parsons check the data acquisition dates for gridblock C2A6D0 as the data file header and data delivery summary report are inconsistent.
- L. Hunter requested that Parsons recheck gridblock C2A6H2 for three data gaps that L. Hunter reports are larger than the acceptable size.
- T. Asch asked if Parsons knows what action will follow on the completion of the Asphalt Test. C. Murray suggested that L. Hunter could ask at the Tuesday government meeting.
- There was discussion about the grids along Dammit road with very high anomaly densities. C. Murray stated that digital excavation on those grids started yesterday and the preliminary results are mostly fragments with one expended signal flare.
- T. Asch expressed the concern that there may be a misunderstanding about the role of digital geophysics in the Range 43-48 process. C. Murray offered to bring up this topic at the Parsons-COE Tuesday meeting.

Action Items (due dates in parentheses):

- Parsons to prepare meeting minutes and distribute to the following: Jennifer Brown, David Brown, Mike Cormier, Gary Griffith, Juan Koponen, Andrew Hands, Cary Stiebel, Lew Hunter, Tony Kitner, Craig Murray, Lyle Shurtleff, Sharon Troutman, Andreas Kothleitner, Erik Johansen. (10-27-04).

Next Meeting: Tuesday November 2, 2004

FORMER FORT ORD MM CLEANUP
Geophysical Meeting Minutes
November 10, 2004
900-1000 Hours

Attendees:

Name	Organization	Position	Phone/Email
Acsh, Ted	USGS	Geophysicist	303-236-2489 tasch@usgs.gov
Hunter, Lewis	USACE-SPK	Geophysicist	(916) 557-5368 lewis.e.hunter@usace.army.mil
Johansen, Erik	Parsons	QC Geophysicist	(831) 884-2330 erik.johansen@parsons.com
Kothleitner, Andreas	Parsons	QC Manager	(831) 884-2313 andreas.kothleitner@parsons.com
Murray, Craig	Parsons	Project Geophysicist	(831) 884-2318 craig.murray@parsons.com
Troutman, Sharon	Parsons	Geophysical Database Manager	(831) 884-2325 sharon.troutman@parsons.com

Discussion:

- Parsons demonstrated the Digital QA excavation PDA form for L. Hunter. L. Hunter will provide real data to S. Troutman to load into the form. The consensus was that the results of digital QA digs will be tracked in the Parsons database and separately by L. Hunter.
- Parsons redelivered the data file for gridblock C2A6D0 with the data delivery date corrected in the header.
- Parsons rechecked gridblock C2A6H2 for data gaps and found that the data conform with the coverage criteria in the Ranges 43-48 Site Specific Work Plan.
- Parsons is expecting to receive a pair of spread-spectrum modems on loan to test at the Ranges 43-48 site.
- There are one full and one part-time geophysical team currently and there will be two geophysical teams starting 11/16/2004.
- T. Asch asked what QC seeded items have been found by the digital process to date. A. Kothleitner reported that the digital geophysical process has not missed any seeds in Ranges 43-48 to date.
- The maintenance agreement for Geosoft licenses are up for renewal at the end of December and Parsons plans to renew five of the six licenses. The sixth license is being used by Tony Kittner and may be returned to Parsons.
- L. Hunter requested a review of the data processing for the transect sampling in WGBA. C. Murray and E. Johansen reviewed these procedures with him after the meeting.
- L. Hunter pointed out the an FVF is needed to clarify that latency tests and corrections are not being done for the WGBA transect sampling project. C. Murray will prepare an FVF to document this difference from the procedures used in Ranges 43-48.

- L. Hunter provided the following comments from his QA review of data deliveries:
    - WGBA gridblocks do not have a field sketch, this is understandable since these gridblocks contain several hundred grids and a sketch would not be useful.
    - Gridblock B2G3A0 was delivered with no raw data summary report and the anomaly selction file had no header. (After the meeting it was discovered that the raw data summary report had been delivered the day after the data files. A revised version of the anomaly selection file was delivered on 11/109/2004)
    - Gridblocks C2A8A4 and C2A7A6 have anomaly selections located off the peak of anomalies. Parsons will review and redeliver revised anomaly selection files for these gridblocks.
    - L. Hunter had difficulties telling the difference between regular and polygon anomalies in gridblock B2J7I5 and other gridblocks. Several technical solutions to this difficulty were suggested.
- The transect sampling in WGBA will be complete soon, except for areas with very heavy vegetation and areas restricted due to the pending California Tiger Salamander ruling.

Action Items (due dates in parentheses):

- Parsons to prepare meeting minutes and distribute to the following: Jennifer Brown, David Brown, Mike Cormier, Gary Griffith, Juan Koponen, Andrew Hands, Cary Stiebel, Lew Hunter, Tony Kitner, Craig Murray, Lyle Shurtleff, Sharon Troutman, Andreas Kothleitner, Erik Johansen. (11-24-04).

Next Meeting: Tuesday November 23, 2004

FORMER FORT ORD MMRP
QC-QA Meeting Minutes
December 8, 2004
0830-1000 Hours

Attendees:

Name	Organization	Position	Phone/Email
Asch, Ted	USGS	Geophysicist	303-236-2489 tasch@usgs.gov
Hunter, Lewis	USACE-SPK	Geophysicist	(916) 557-5368 lewis.e.hunter@usace.army.mil
Johansen, Erik	Parsons	QC Geophysicist	(831) 884-2330 erik.johansen@parsons.com
Kothleitner, Andreas	Parsons	QC Manager	(831) 884-2313 andreas.kothleitner@parsons.com
Murray, Craig	Parsons	Project Geophysicist	(831) 884-2318 craig.murray@parsons.com

Discussion:

- Raw Data Summary Reports. Ten gridblocks were originally delivered without attached data summary reports. All of these raw data summary reports were delivered separately at a later date. C. Murray explained that this delay was caused by a change in the way spike test data is documented in the PDAs. This change allows spike test results for all three sensors of the towed array to be displayed on the Raw Data Summary Report. Parsons feels this change is an improvement to the reporting system.
- Gridblock C2B8B6 has a data gap caused by the edge of a steep berm. All concurred that the polygon anomaly covering the berm data gap should be enlarged to cover the entire data gap.
- Gridblock B2J8I3. The data from this gridblock is noisier than others in Ranges 43-48. T. Asch stated that the gridblock should be resurveyed. C. Murray explained that E. Johansen had identified this gridblock as noisy prior to delivering the data to COE, but Parsons came to the consensus that reacquiring the extra anomalies caused by the noise would be acceptable and more cost effective than resurveying the entire gridblock. A consensus was reached among all present to move forward with this data and Parsons will report any increase in the number of unsuccessfully reacquired anomalies in this gridblock. In addition, a text block will be added to the processed data summary report in which Parsons will be able to communicate the decision making process for similar situations in the future. T. Asch proposed that L. Hunter discuss with Juan Koponen a change to Parsons work plan to address noise caused by mud or clay stuck to the towed array wheels.
- L. Hunter asked about a QC procedure document for the Watkins Gate Burn Area Geophysical Transect Sampling. A consensus was reached that this topic would be addressed next week when L. Hunter was on site.
- The Watkins Gate Burn Area Geophysical Transect Sampling is 85% complete. Remaining areas include those off limits for CTS protection and other areas with thick manzanita vegetation which will require hand pulled data collection.

FORMER FORT ORD MMRP
Geophysical Meeting Minutes
January 13, 2005
0930-1100 Hours

Attendees:

Name	Organization	Position	Phone/Email
Asch, Ted	USGS	Geophysicist	303-236-2489 tasch@usgs.gov
Hunter, Lewis	USACE-SPK	Geophysicist	(916) 557-5368 lewis.e.hunter@usace.army.mil
Johansen, Erik	Parsons	QC Geophysicist	(831) 884-2330 erik.johansen@parsons.com
Kothleitner, Andreas	Parsons	QC Manager	(831) 884-2313 andreas.kothleitner@parsons.com
Murray, Craig	Parsons	Project Geophysicist	(831) 884-2318 craig.murray@parsons.com
Troutman, Sharon	Parsons	Geophysical DB Manager	(831) 884-2325 sharon.troutman@parsons.com

Discussion:

- Advanced Processing - A revised document describing the methods to be evaluated and the cost benefit analysis will be sent soon.
- Current team strength – One data acquisition team and two reacquisition teams.
- Spread Spectrum Modem – Parsons tested the Freewave spread spectrum modem with the hope that using this new technology would eliminate down time for geophysical teams caused by radio interference with others using the same radio channels. However, when the Freewave radios were tested at the Ranges 43-48 site they appeared to be more constrained to line-of-sight use than the current, single frequency radios. This limitation could be overcome by using one or more repeaters, but that would significantly increase the cost of using these radios. While radio interference was a significant problem in August-October, in the last couple of months Parsons has experienced much less down time due to radio interference. Parsons will not be pursuing spread spectrum radios again, unless the interference problem resurfaces. A different model of spread spectrum modem, the Intuicom, is reportedly less constrained to line-of-sight use than the Freewave.
- Data deliveries – L. Hunter pointed out the following:
    - Gridblock C2A9B7 – The comment box is too small for the text. [*Further review of the delivery forms for this gridblock revealed that the comment box showed the entire comment*]
    - Gridblock C2B8A9 – Two picks corresponded with the backhoe polygon boundary. E. Johansen responded that these selections were made intentionally to ensure that items near the edge of backhoe digs would not be left in the ground.

  - Gridblock C2B8B6 – The signature and note keepers name on the raw data summary report were different. [*Further review of the delivery forms revealed that the signature and name did match for this gridblock*]
  - Gridblock C2B8C9 – There was not signature or electronic name on the second summary report. Parsons will revise this form and redeliver it including the signature and electronic name.
  - Gridblock C2B9D2 – No anomalies in the picklist delivered to COE. [*Parsons subsequently delivered a revised list including the picks in this grid*]
- Several digital QA digs were excavated by QA personnel with no failures.
- Five additional grids were surveyed by L. Hunter, accompanied by Parsons personnel.
- Gridblock C2A8F8 – This grid is adjacent to a block of grids that are not being addressed due to the abundance of metal. The digital EM61-Mk2 data collected after the analog removal is too cluttered to select individual anomalies. Anomalies were selected in this grid using a 10mV threshold to identify the larger items. These items will be removed, then the grid will be resurveyed and anomalies will be reselected using the standard method from the new dataset. These anomalies will then be excavated.
- T. Kitner plans to be at Fort Ord the week of January 24. L. Hunter plans to be at fort Ord the week of January 31.

FORMER FORT ORD MMRP
Geophysical Meeting Minutes
February 22, 2005
0930-1100 Hours

Attendees:

Name	Organization	Position	Phone/Email
Asch, Ted	USGS	Geophysicist	303-236-2489 tasch@usgs.gov
Hunter, Lewis	USACE-SPK	Geophysicist	(916) 557-5368 lewis.e.hunter@usace.army.mil
Johansen, Erik	Parsons	QC Geophysicist	(831) 884-2330 erik.johansen@parsons.com
Kothleitner, Andreas	Parsons	QC Manager	(831) 884-2313 andreas.kothleitner@parsons.com
Murray, Craig	Parsons	Project Geophysicist	(831) 884-2318 craig.murray@parsons.com

Discussion:

- Field operations: Currently there is one data acquisition team (averaging 2.2 acres/day overall, 1.3 acres/day last week), two reacquisition teams (averaging 267.4 anomalies/day overall, 375 anomalies/day last week), and one digital excavation team (averaging 123.5 anomalies/day overall and 125.4 last week).
- There was some discussion about an AT-4 that was found near surface by one of the analog teams. This item was found with an EM61-Mk2 and was not found with the Schonstedt. L. Hunter requested that Parsons document that this item was found with the EM61-Mk2 in the After Action Report.
- Using the EM61 for reacquisition or digital excavation. The bottom coil response of an EM61 is equivalent to the channel 3 response of an EM61-Mk2, as long as the coil sizes are the same. Parsons has rented an EM61 and tested it over a test item and the readings are repeatable for the two systems. L. Hunter deferred approving the use of the EM61 on this project to T. Asch. T. Asch approved it.
- Several datasets were reviewed because L. Hunter identified data gaps. However, as a result of discussions, it was determined that he was using the default blanking distance instead of the 2-ft distance specified in the Ranges 43-48 Site Specific Work Plan. A consensus was reached that these datasets conform to the data coverage requirements.
- L. Hunter pointed out an anomaly between anomalies B2J9F1-0027 and B2J9F1-0028 that was not selected for excavation. A consensus was reached that this anomaly will be resolved during the intrusive investigation of the two anomalies on either side of it.
- L. Hunter pointed out that the coordinates for anomaly B2I9F2-0004 are offset from the peak of the anomaly. A consensus was reached that the anomaly is within the search radius for the reacquisition and excavation teams, so the source of the anomaly will be removed.

- L. Hunter pointed out that gridblock B2J6C5 was delivered without a raw data summary report and the response values for the Geo-polygon vertices are not consistently 1. Parsons redelivered the anomaly selection and raw data summary reports on 2/15/2005.
- Juan and L. Hunter approved the advanced processing method for reducing the number of anomalies selected in ranges 43-48. L. Hunter requested that Parsons apply this technique to anomaly selections not yet reacquired to maximize the cost savings. He also requested that Parsons track the number of anomalies eliminated by this approach.
- L. Hunter plans to visit the Fort Ord site from 2/22/2005 through 2/24/2005 and will collect QA survey data on 2/23/2005.

FORMER FORT ORD MMRP
Geophysical Meeting Minutes
March 31, 2005
0900-1000 Hours

Attendees:

Name	Organization	Position	Phone/Email
Asch, Ted	USGS	Geophysicist	303-236-2489 tasch@usgs.gov
Hunter, Lewis	USACE-SPK	Geophysicist	(916) 557-5368 lewis.e.hunter@usace.army.mil
Baptiste, John	Parsons	QC Geophysicist	(831) 884-2330 john.baptiste@parsons.com
Kothleitner, Andreas	Parsons	QC Manager	(831) 884-2313 andreas.kothleitner@parsons.com
Murray, Craig	Parsons	Project Geophysicist	(831) 884-2318 craig.murray@parsons.com
Troutman, Sharon	Parsons	Geophysical Database	(831) 884-2325 Sharon.troutman@parsons.com

Discussion:

- Field operations: Currently there is one data acquisition team (averaging 2.1 acres/team-day overall, 1.0 acres/team-day last week), three reacquisition teams (averaging 319.8 anomalies/team-day overall, 378.9 anomalies/team-day last week), and four digital excavation teams (averaging 128.1 anomalies/team-day overall and 123.6 anomalies/team-day last week).
- Three field geophysicists are departing Fort Ord on 3/31/2005, leaving six field geophysicists. Next week there will be two data acquisition teams and one or two reacquisition teams.
- Parsons reported that approximately 8% of selected anomalies are not reacquired successfully in the field.
- To date, 792 grids have been geophysically surveyed and 1172 have had analog removal completed, leaving 380 grids still to be surveyed. 401 grids have passed QC inspections.
- The four QC seeded items that have not been recovered by the digital process were discussed. Three of these were selected by the data processor and assigned to be excavated, but were not recovered by the digital excavation team. The last one was not selected by the data processor because there was no anomaly in the data. When checked with an EM61-Mk2 in the field the response from this item (35mm subcaliber) did not exceed the 3mV selection threshold.
- The one QA seed item (Mk2 hand grenade at 12 inches bgs in grid B2J9G3) that was not recovered was discussed. It did not produce an anomaly in the data collected by Parsons. This item was later investigated in the field and was found by using a GPS to relocate its position. The maximum EM61-Mk2 response at that location was 1.5mV. L. Hunter stated that while this item was missed, it does not necessarily constitute a failure.

- Advanced processing update. C. Murray reported that the advanced processing method of eliminating low amplitude anomalies has been applied to all previously collected data and continues to be applied to data being collected. Earlier this week the total number of anomalies elimitated by the method was approximately 2300, with 308 reselected as a QC measure on this process. 75 of these QC reselected anomalies have been excavated and all have resulted in either a false positive or a fragment (MD-F).
- QA review of Digital Files
    - The processed data had not been delivered for grids B2J7F0, C2B8D3, and B2I8G3 whose raw datasets were delivered in early March. *Parsons subsequently delivered these files on 3/31/2005.*
    - The processed data summary report was not delivered for grid B2I8J3. *Parsons subsequently delivered this file on 3/31/2005.*
    - L. Hunter requested a redelivery of the raw data for gridblock B2I8I6 because the original delivery contained the data for gridblock B2I7D0. *C. Murray could not find the error but Parsons redelivered the data.*
    - L. Hunter reported a discrepancy between delivery dates listed in the header of different data files associated with gridblock B2I7D0. *Parsons redelivered the data.*
    - Linear trending anomalies within gridblock B2I8C1 were discussed. C. Murray stated that these coincide with linear berms that appear to have been bulldozed. The false alarm rate in these grids has been similar to the rates experience in the rest of the project.
- The possibility of QA using one of Parsons Towed arrays to collect QA data was discussed. C. Murray expressed concern that this would cause a slip in the schedule. If the goal is to survey 3% of the site, QA will need to cover a total of 35 grids. 19 have been completed so far, leaving only 16 to complete.
- L. Hunter reported that QA digital excavations have resulted in mostly small arms and fragments.

FORMER FORT ORD MMRP
Geophysical Meeting Minutes
April 14, 2005
0900-1000 Hours

Attendees:

Name	Organization	Position	Phone/Email
Hunter, Lewis	USACE-SPK	Geophysicist	(916) 557-5368 lewis.e.hunter@usace.army.mil
Johansen, Erik	Parsons	QC Geophysicist	(831) 884-2330 erik.johansen@parsons.com
Kothleitner, Andreas	Parsons	QC Manager	(831) 884-2313 andreas.kothleitner@parsons.com
Murray, Craig	Parsons	Project Geophysicist	(831) 884-2318 craig.murray@parsons.com
Troutman, Sharon	Parsons	Geophysical Database	(831) 884-2325 Sharon.troutman@parsons.com

Discussion:

- Field operations: Currently there are two data acquisition teams (averaging 2.1 acres/team-day overall, 1.6 acres/team-day last week), one reacquisition team (averaging 323 anomalies/team-day overall, 325 anomalies/team-day last week), and four digital excavation teams (averaging 128 anomalies/team-day overall and 134 anomalies/team-day last week).
- The ARGO is currently down for repairs and may need to go back to the dealer. A second tractor will be rented to replace it (expected delivery Monday) for the short term.
- Field work in Watkins Gate Burn Area has been completed.
- 862 grids have been surveyed to date and 406 have passed the QC inspection.
- L. Hunter expressed that he had an initial concern regarding how the new tractor towed array team was using the tire marks to guide data collection lanes, possibly resulting in data gaps, but observed how the team was able to make corrections using the real-time telemetered tracking data. L. Hunter indicated that this was not a QA issue at that time, but requested QC to monitor closely.
- L.Hunter discussed field QA audit that identified lack of cable shake test being performed by one of the data acquisition teams. L.Hunter requested that QC remind teams (which Erik Johansen had already done) that this was a standard test to be performed daily. L. Hunter indicated he would not fail the grid based on this observation unless QA review observed excessively "spiked" data.

Appendix C

Corrective Action Requests

CORRECTIVE ACTION REQUEST | NO. :CESPK-ED-GG-FY05-0001

Originator: Lewis Hunter **Date Issued:** 25 April 2005

Issued to: Andreas Kothleitner, Parsons
Project: Former Ft Ord, Ranges 43 – 48 clean-up
CESPK Project Manager: Juan Koponen
CESPK Project Safety Officer: Clinton Huckins
Response Due:

Description of Condition Found: (As observed or reported)
Recurring QC issues are being found in the data deliverables. These include miss-matching of survey dates between header files and data summary sheets, missing summary sheets, errors in gridblock naming and associated grids included within the gridblock, and missing spike data. Frequency of such occurrences has increased with increasing data production. Parsons is requested to review back data deliveries back. Issues with data deliveries from 3/3 to 3/20 were discussed in a QA-Geo meeting on 4/14/05, the requested back check should focus on deliveries subsequent to 3/20/05. Parsons is requested to perform a route-cause analysis, and modify data delivery procedures to prevent such occurrences in the future. Any modified files resulting from this, and future modifications after initial delivery, should be identified with a filename extension "...._r".

(Appropriate personnel, i.e. contractor PM, Safety Officer, Team Leader, etc., receiving the CAR will provide the following information to the originator by the "Response Due" date above. Please contact the originator if you have any questions)

Actual Cause: (Appropriate personnel will investigate and determine cause of condition reported above. Actual cause should be stated as specifically as possible).
The review of this CAR determined that there were four separate conditions documented in the narrative above. The conditions with their cause are listed below;

1. Miss-matching of survey dates between header files and data summary sheets = human error (data entry)
2. Missing summary sheets = there is not an overall final review in the current process conducted prior to customer delivery
3. Errors in gridblock naming and associated grids included within the gridblock = human error (data entry)
4. Missing spike data = no procedure to ensure that a spike test is conducted in the event of an equipment failure (this condition has only occurred after an equipment failure)

Action Taken to Correct Condition: (Corrective Action should address root cause, not the symptom).
QC Geo developed a spreadsheet tracking log to identify the four conditions listed above and has re-delivered corrected data to address the conditions specified in this CAR. The re-delivery was completed on 4/25/05 and 5/9/05. The Parsons team evaluated the recommendation to rename redelivered data files with the extension "...._r" but determined that final data files should be named with the appropriate file name which does not include the recommended "..._r" extension.

Action Taken to Monitor Effectiveness of Corrective Action: (Generate data as proof. State the monitoring method put in place and who is responsible for reviewing data.)
QC Geo will maintain a spreadsheet tracking log for deliverable data (see attachment) to ensure data consistency and accuracy. In addition, QC Geo will verify that all preventive actions are continuously being implemented by the appropriate personnel.

Team Manager Signature/Title/Date Signed: (Form must be signed before returning)
Andreas Kothleitner Quality Control Manager 5/9/05

CORRECTIVE ACTION REQUEST | NO. :CESPK-ED-GG-FY05-0001

(Government Use Only)

Review of Corrective Action:

1) Has condition improved? ✓ Yes ___ No
2) Additional corrective action required? ___ Yes ___ No

Comments:

CORRECTIVE ACTION REQUEST | NO. :CESPK-ED-GG-FY05-0002

Originator: Lewis Hunter **Date Issued:** 23 May 2005

Issued to: Andreas Kothleitner, Parsons
Project: Former Ft Ord, Watkins Gate Burn Area
CESPK Project Manager: Juan Koponen
CESPK Project Safety Officer: Clinton Huckins
Response Due: 2 June 2005

Description of Condition Found: (As observed or reported)

Data deliverables included in the "WGBA TIP: Geophysical Transect Sampling" report contained multiple discrepancies and missing standardization data. These include mismatching of survey dates between header files and data summary sheets, mismatched data collection frequencies, and missing data headers. Parsons is required to review the data deliveries and correct these issues, perform a route-cause analysis, and update data the database since these files are to represent the "Final" deliveries. Issues regarding missing standardization data have previously been discussed with the Project Geophysicist and response was submitted at time of writing CAR and it thus under review.

(Appropriate personnel, i.e. contractor PM, Safety Officer, Team Leader, etc., receiving the CAR will provide the following information to the originator by the "Response Due" date above. Please contact the originator if you have any questions)

Actual Cause: (Appropriate personnel will investigate and determine cause of condition reported above. Actual cause should be stated as specifically as possible).

1. Miss-matching of survey dates between header files and data summary sheets = human error (data entry)
2. Data collection frequencies were mismatched between the header file and data summary sheets = human error (data entry)
3. Missing data headers = human error
4. Missing spike data = no procedure to ensure that a spike test is conducted in the event of an equipment failure (this condition occurred on one occasion after an equipment failure) in addition to a field team's unfamiliarity with the Programmatic Work Plan (PWP)

Action Taken to Correct Condition: (Corrective Action should address root cause, not the symptom).

- QC Geo developed a spreadsheet tracking log (provided as an attachment in response to CAR# CESPK-ED-GG-FY05-0001) to identify conditions listed above. All associated data is being re-checked, corrections will be made and the re-delivery of this data will occur in conjunction with the final delivery of the WGBA Geo transect sampling TIP.

Action Taken to Prevent Recurrence: .

- The Project Geophysicist has developed a macro to identify discrepancies between data file information and data summary sheets. This macro will be executed prior to any future final data deliveries.

Action Taken to Monitor Effectiveness of Corrective Action: (Generate data as proof. State the monitoring method put in place and who is responsible for reviewing data.)

- The Project Geophysical department will maintain the spreadsheet tracking log, as discussed above, for deliverable data to ensure data consistency and accuracy
- The output of the developed macro will be subjected to verification sampling.

CORRECTIVE ACTION REQUEST | NO. :CESPK-ED-GG-FY05-0002

Team Manager Signature/Title/Date Signed: (Form must be signed before returning)

Greg Kreiser / QC Manager / 6.2.05

(Government Use Only)

Review of Corrective Action:

1) Has condition improved? ___ Yes ___ No
2) Additional corrective action required? ___ Yes ___ No

Comments:

CORRECTIVE ACTION REQUEST | NO. :CESPK-ED-GG-FY05-0003a

Originator: Clinton Huckins **Date Issued:** 6 June 2005

Issued to: Andreas Kothleitner, Parsons
Project: Former Ft Ord, Ranges 43 – 48 Clean-up
CESPK Project Manager: Juan Koponen
CESPK Project Safety Officer: Clinton Huckins
Response Due: 15 June 2005

Description of Condition Found: (As observed or reported)

Seed item ORD-QA09 was not recovered during clean-up operations. Item was a 37 mm round buried horizontally at 14-in in grid B2J7C0. Review of the processed data found that the item was located in a polygon area (B2J7C0-0085) identified during digital geophysical processing and anomaly picking. Item was buried prior to analog geophysical surveys thus survived the entire process. Item should have been recovered during analog and/or geophysical surveys. Item was located by QA using a Schonstedt and removed on 06 June 2005.

(Appropriate personnel, i.e. contractor PM, Safety Officer, Team Leader, etc., receiving the CAR will provide the following information to the originator by the "Response Due" date above. Please contact the originator if you have any questions)

Actual Cause: (Appropriate personnel will investigate and determine cause of condition reported above. Actual cause should be stated as specifically as possible).
The UXO excavation team did not thoroughly complete the post verification of the geophysical polygon indicated in the description. Not all anomalies greater than the Project established threshold of 3 millivolts (mV) were removed.

Action Taken to Correct Condition: (Corrective Action should address root cause, not the symptom).
This geophysical polygon will be reinvestigated by a digital excavation team to ensure that all anomalies greater than 3 mV are removed.

Action Taken to Prevent Recurrence:
It was re-emphasized to all UXO team leaders of the importance to conduct a final EM61-Mk 2 verification of the entire geophysical polygon under investigation to ensure that there are no responses above 3mV remaining.

Action Taken to Monitor Effectiveness of Corrective Action: (Generate data as proof. State the monitoring method put in place and who is responsible for reviewing data.)
QC will conduct a bias sampling of geophysical polygons during normal grid inspection efforts.

Team Manager Signature/Title/Date Signed: (Form must be signed before returning)
S 12/13/06

(Government Use Only)
Review of Corrective Action:
1) Has condition improved? ___ Yes ___ No
2) Additional corrective action required? ___ Yes ___ No

Comments:

Original Signed Copy Missing

CORRECTIVE ACTION REQUEST | NO. :CESPK-ED-GG-FY05-0003b

Originator: Lewis Hunter **Date Issued:** 11 Aug 2005

Issued to: Mike Coons, Parsons
Project: Former Ft Ord, Watkins Gate Burn Area
CESPK Project Manager: Chris Prescott
CESPK Project Safety Officer: Clinton Huckins
Response Due: 22 Aug 2005

Description of Condition Found: (As observed or reported)

Review of the June deliveries identified that at least 1 Raw data summary sheet was not delivered with the raw data nor has it subsequently been delivered. It was also noted that delivery of several processed files were delayed between 8 days to 4 weeks following delivery of raw files. Following completion of digital data collection tracking file was reviewed and at least 1 process summary sheet is missing from the week of April 18 – 22. Missing files should be delivered and explanation of delivery delays provided.

(Appropriate personnel, i.e. contractor PM, Safety Officer, Team Leader, etc., receiving the CAR will provide the following information to the originator by the "Response Due" date above. Please contact the originator if you have any questions)

Actual Cause: (Appropriate personnel will investigate and determine cause of condition reported above. Actual cause should be stated as specifically as possible).

1) After creating the raw data summary sheet for gridblock B2J8J2, the QC reviewer did not copy the pdf file into the correct zip file for delivery.
2) Delivery of several processed files was delayed between 8 days and 4 weeks because other geophysical tasks related to change in plans for Range 45 required all geophysical resources available.
3) Reviewing Parsons' records of deliveries from the week of April 18-22 confirmed that all processed data delivery zip files in this time period included the correct processed data summary sheets. Lew Hunter indicated during a subsequent phone conversation that he had searched his hard drive for the processed data summary sheet for gridblock B2J9D8 and had not located it. The actual cause of this missing file is not known, but a copy of the file is attached.

Action Taken to Correct Condition: (Corrective Action should address root cause, not the symptom).

1) Copies of the raw data summary sheet for gridblock B2J8J2 and the processed data summary sheet for gridblock B2J9D8 will be provided to CESPK. Future delivered zip files will be checked by the Project Geophysicist after they are uploaded to the FTP site for delivery to ensure that the appropriate data summary sheets are included.
2) Parsons will consult with CESPK in the future when project changes will impact data delivery schedules to discuss project priorities.

Action Taken to Prevent Recurrence:

1) Future delivered zip files will be checked by the Project Geophysicist after they are uploaded to the FTP site for delivery to ensure that the appropriate data summary sheets are included.
2) Parsons will consult with CESPK in the future when project changes will impact data delivery schedules to discuss project priorities.

Form 1401, 15 April 1997

CORRECTIVE ACTION REQUEST | NO. :CESPK-ED-GG-FY05-0003b

Action Taken to Monitor Effectiveness of Corrective Action: (Generate data as proof. State the monitoring method put in place and who is responsible for reviewing data.)

1) Future delivered zip files will be re-checked by a member of the QC staff after they are uploaded to the FTP site for delivery to ensure that the appropriate data summary sheets are included.
2) Parsons Project Geophysicist will monitor datasets awaiting processed delivery and will notify the CESPK Geophysicist if it appears that the data delivery schedule will not be met.

Team Manager Signature/Title/Date Signed: (Form must be signed before returning)

12/10/06

(Government Use Only)

Review of Corrective Action:

1) Has condition improved? ___ Yes ___ No
2) Additional corrective action required? ___ Yes ___ No

Comments:

Original Signed copy missing

Form 1401, 15 April 1997

Possible corrective actions for CAR 100605:

Digital: None, the item was inside the drip line of a tree area and was below selection threshold for selection.

Analog: Item was detectable with a Schonstedt (moderately weak signal). QC accompanied QA personnel out to verify and recover item.

Selected By Huck 10/01/01

Proposed corrective action #1. Have tree area(s) in this grid re-surveyed by Schonstedt and excavate encountered anomalies.

Proposed corrective action #2. Have Schonstedt team resurvey and excavate anomalies encountered of tree areas in grids that were cleared by the same team for a period of 8 work days (2 work weeks) before and after date of clearance of grid B2J8C4. and Digital Polygons

Proposed corrective action #3. Have grid B2J8C4 100% resurveyed by Schonstedt team and excavate anomalies encountered.

CORRECTIVE ACTION REQUEST | NO. :CESPK-ED-GG-FY05-0004

Originator: Lewis Hunter **Date Issued:** 6 October 2005

Issued to: Mike Coon, Parsons
Project: Former Ft Ord, Ranges 43 – 48 Clean-up
CESPK Project Manager: Chris Prescott
CESPK Project Safety Officer: Clinton Huckins
Response Due: 13 October 2005

Description of Condition Found: (As observed or reported)

Review of grid status maps delivered 10.04.05 indicates that grid B2J8C4 has passed QC review and been turned over to QA (Fig 1). This grid has QA seed ORD-QA24 located near the northern boundary. The seed is a M30 grenade buried at 9". Review of the processed data shows that this seed was located w/in 1.5 ft of the anomaly identified B2J8C4-0122 (Fig. 2). The seed's coordinates are 2121291.76, 5742860.09.

(Appropriate personnel, i.e. contractor PM, Safety Officer, Team Leader, etc., receiving the CAR will provide the following information to the originator by the "Response Due" date above. Please contact the originator if you have any questions)

Actual Cause: (Appropriate personnel will investigate and determine cause of condition reported above. Actual cause should be stated as specifically as possible).

Digital: ORD-QA24 was located approximately 3 feet from a 4mV anomaly that was originally numbered B2J8C4-0131. This anomaly was eliminated when the advanced processing was applied to the dataset because its width, 1.6-ft, was below the cutoff width, 1.7-ft. ORD-QA24 was located close to a tree at the edge of the area where geophysical data was collected.
Field investigation with an EM61-Mk2 at the seed item location measured a 2.5mV anomaly due to the seed item and a 3mV anomaly 3 feet to the west, close to the location of the anomaly originally numbered B2J8C4-0131. The item was also determined to be detectable with a Schonstedt GA-52Cx.
Based on the above, the item was missed by the digital process for one or both of the following reasons:

1. The nearby tree prevented data collection over the peak of the anomaly caused by ORD-QA24.
2. The anomaly caused by ORD-QA24 was a lower magnitude than the 3mV anomaly selection threshold used for this project.

Analog: At recovery of the QA item the Schonstedt responded with a faint but audible signal. Small pieces of metallic debris needed to be scraped from the surface area above the item before it was detectable. Due to the large amount of metallic debris (frag) in this area the detection process requires extensive scraping of surface areas to remove the clutter of debris so that the areas below the clutter can effectively be surveyed. The apparent cause was that not enough of the surface debris was scraped away prior to surveying this particular spot.

Action Taken to Correct Condition: (Corrective Action should address root cause, not the symptom).

The action taken to correct this condition is; a Schonstedt UXO team will analog resurvey any tree areas in which the digital survey was impeded in grid B2J8C4.

Action Taken to Prevent Recurrence:

All UXO personnel will receive a refresher on the procedure of scraping surface clutter to ensure the most effective analog survey possible.

CORRECTIVE ACTION REQUEST | NO. :CESPK-ED-GG-FY05-0004

Action Taken to Monitor Effectiveness of Corrective Action: (Generate data as proof. State the monitoring method put in place and who is responsible for reviewing data.)

UXO QC personnel have re-visited eight areas were trees have prevented digital survey and will continue to check tree areas in grids as they become available for the QC process.

Team Manager Signature/Title/Date Signed: (Form must be signed before returning)

Barry Griffith 11/1/05

(Government Use Only)

Review of Corrective Action:

1) Has condition improved? ___ Yes ___ No
2) Additional corrective action required? ___ Yes ___ No

Comments:

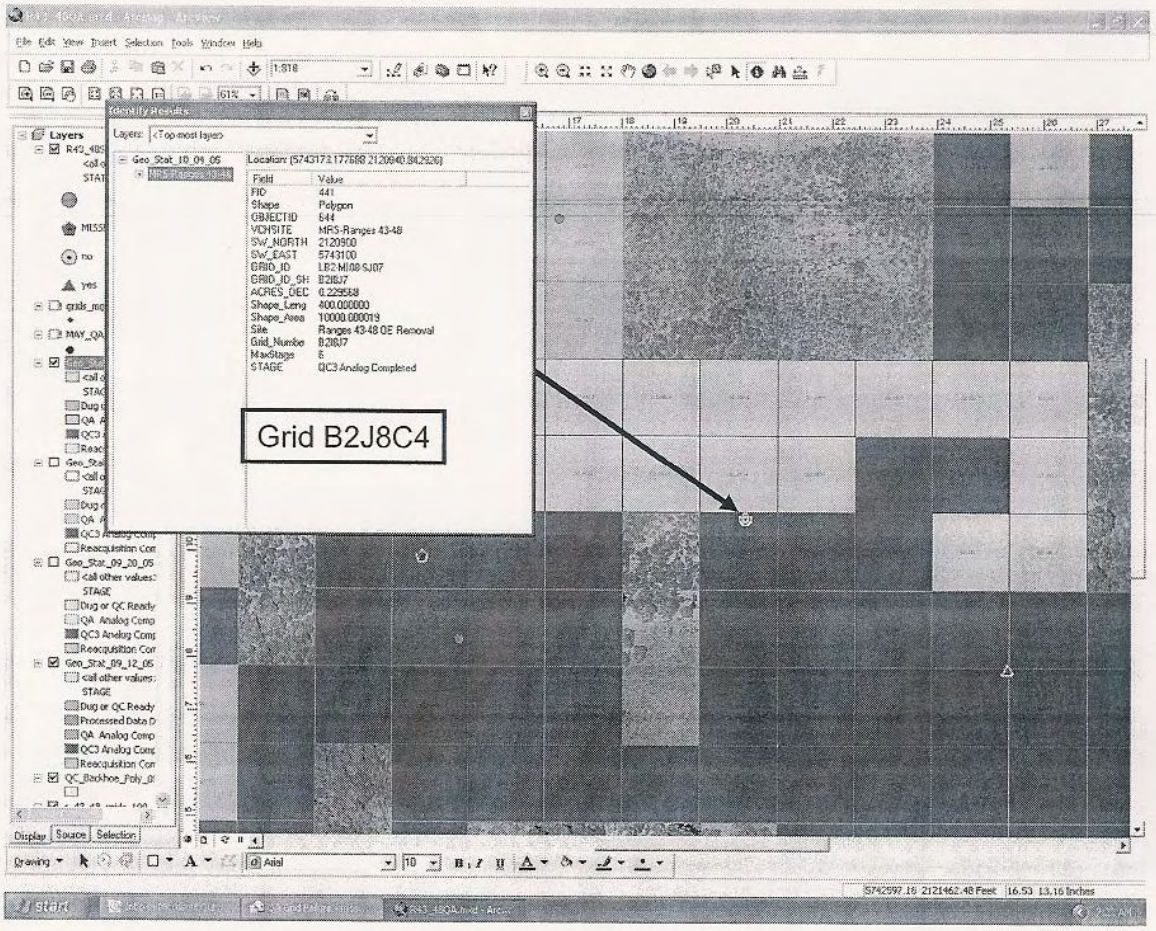


Figure 1. Screen grab indicating location of ORD-QA24 in grid B2J8C4 on status map delivered on 10.4.05.

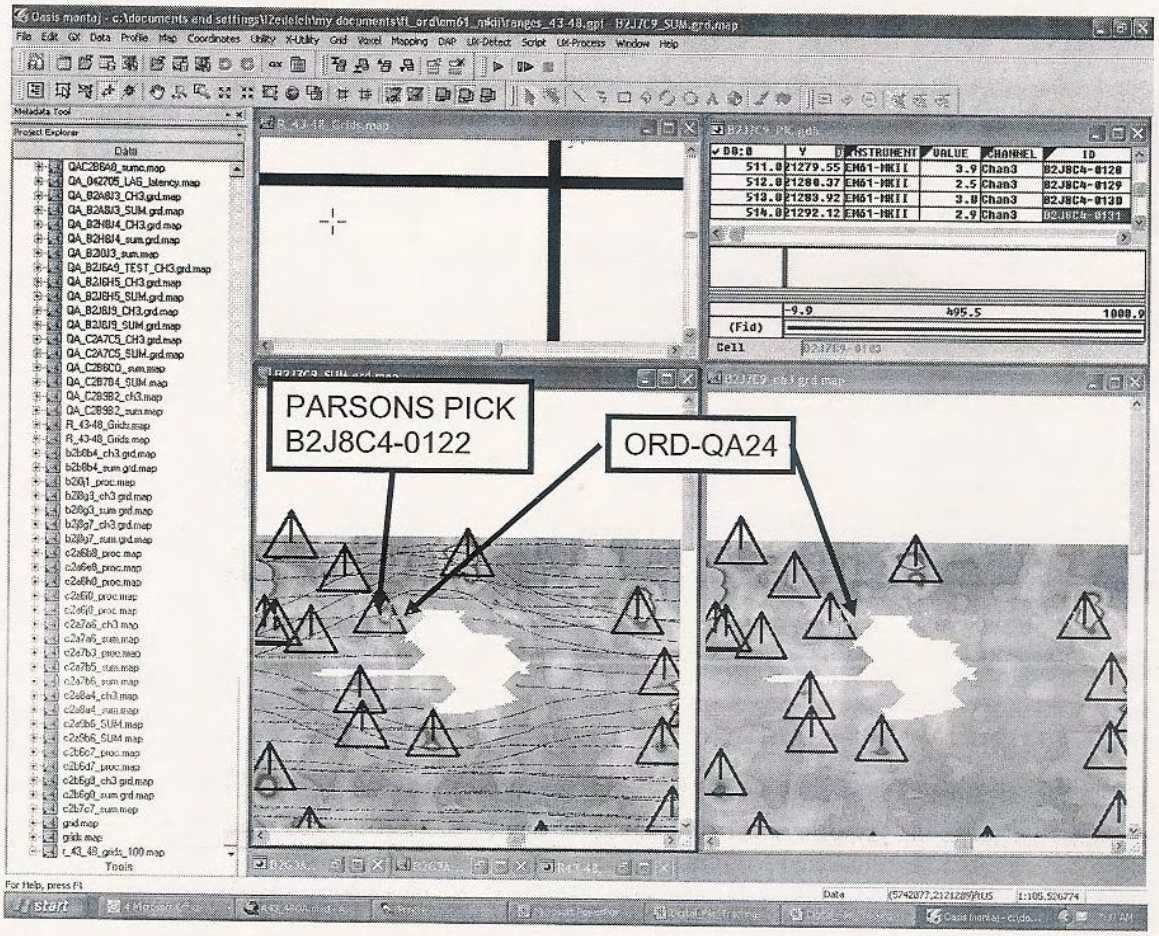
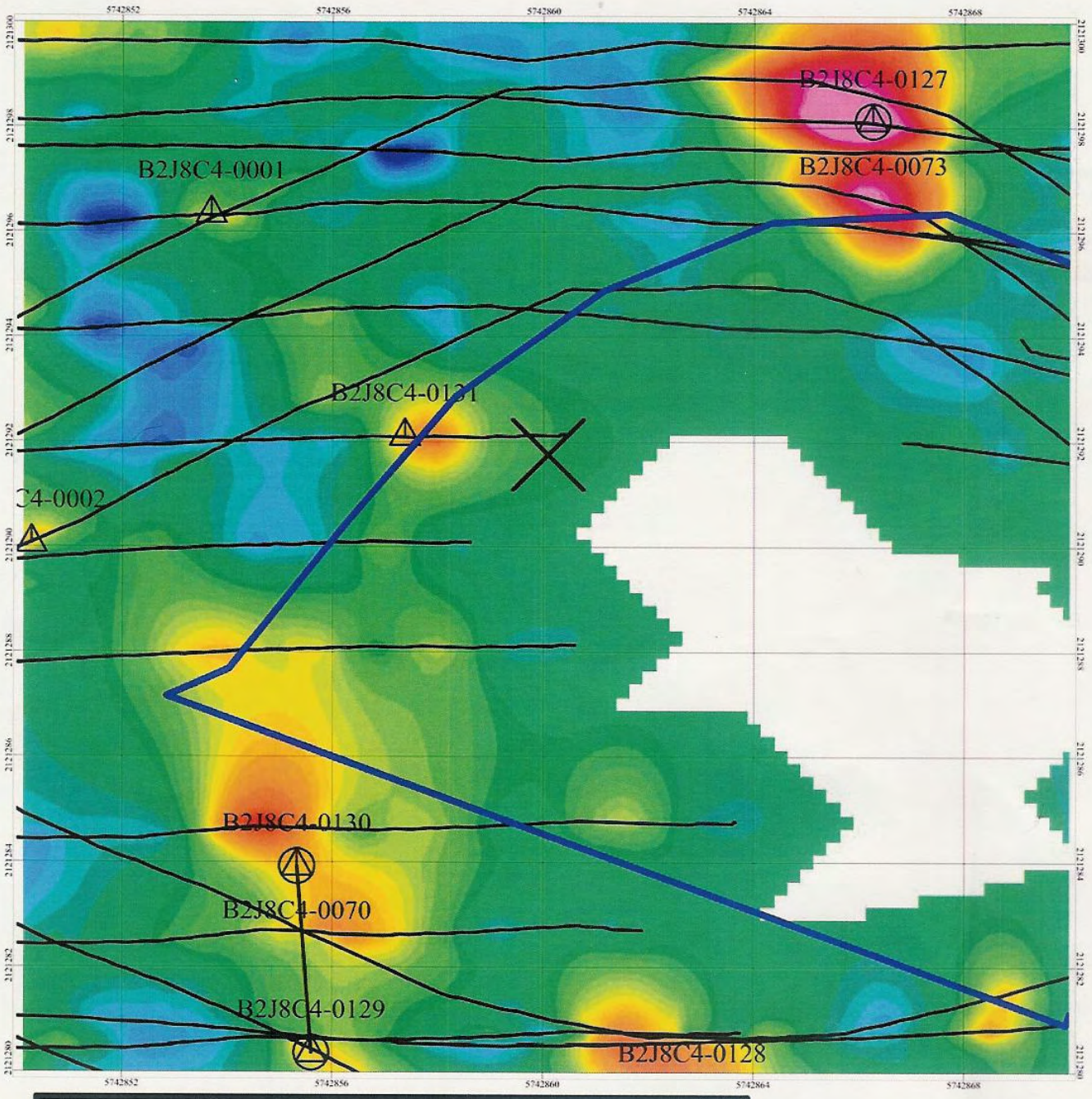


Figure 2. Screen-grab of Geosoft windows showing data from grid-block B2J7C9, which includes grid B2J8C4.



Legend

Anomaly ID
Pre-AP Anomaly

Anomaly ID
Post-AP Anomaly

ORD-QA24 Seed Item

EM61-Mk2 Path

Tree Dripline

1 0 1 2
US survey foot
NAD83 / Lambert Conic Conformal (2SP)

CAR 100605: Seed Item ORD-QA24

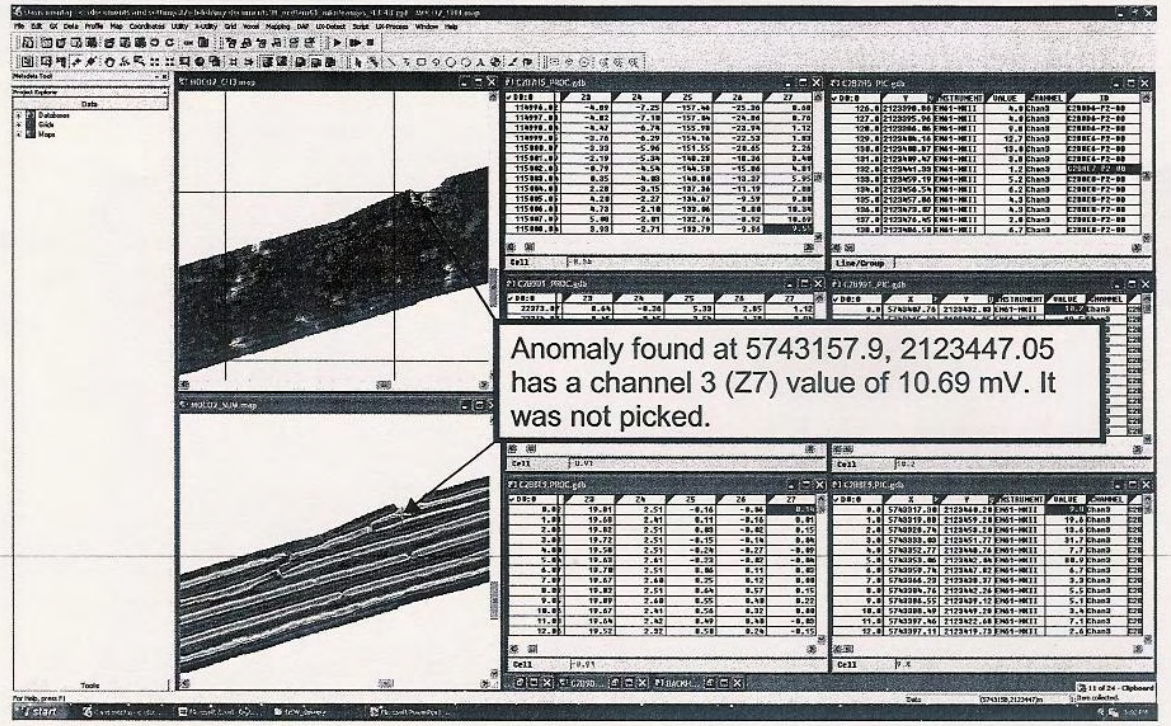


Figure 1. Screen grab showing un-selected anomaly.

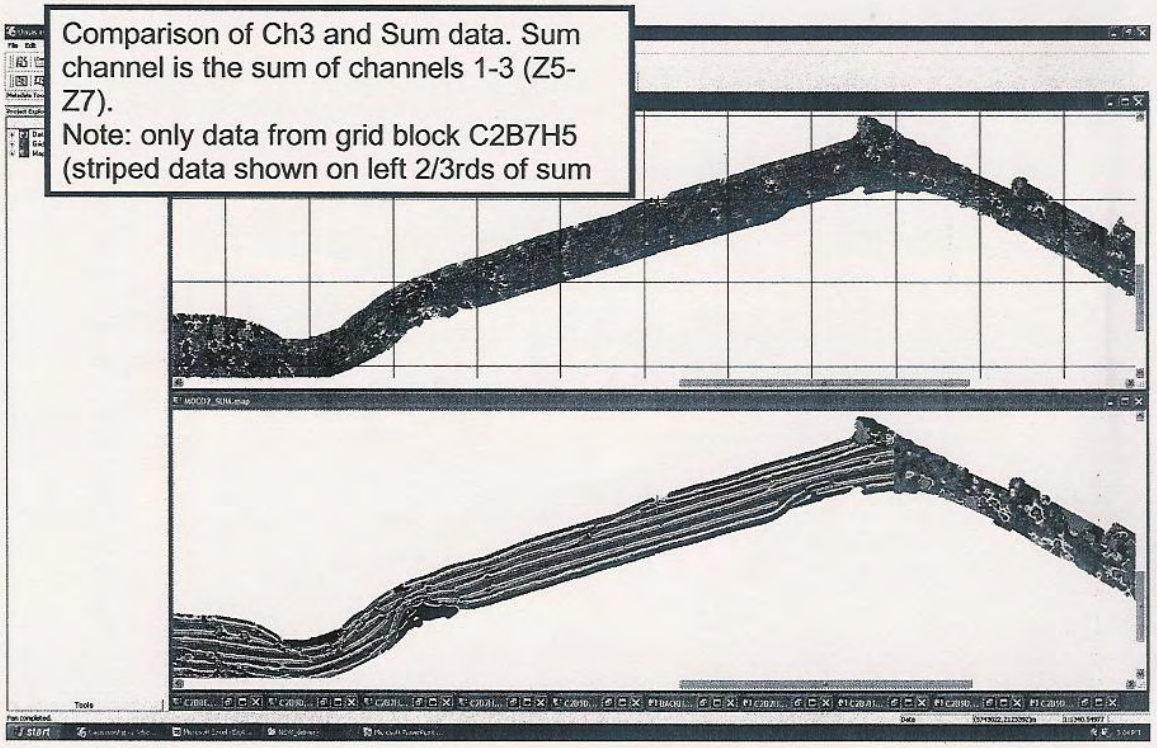


Figure 2. Screen-grab of Geosoft windows showing striping in data and contrast along eastern boundary of grid block C2B7H5.

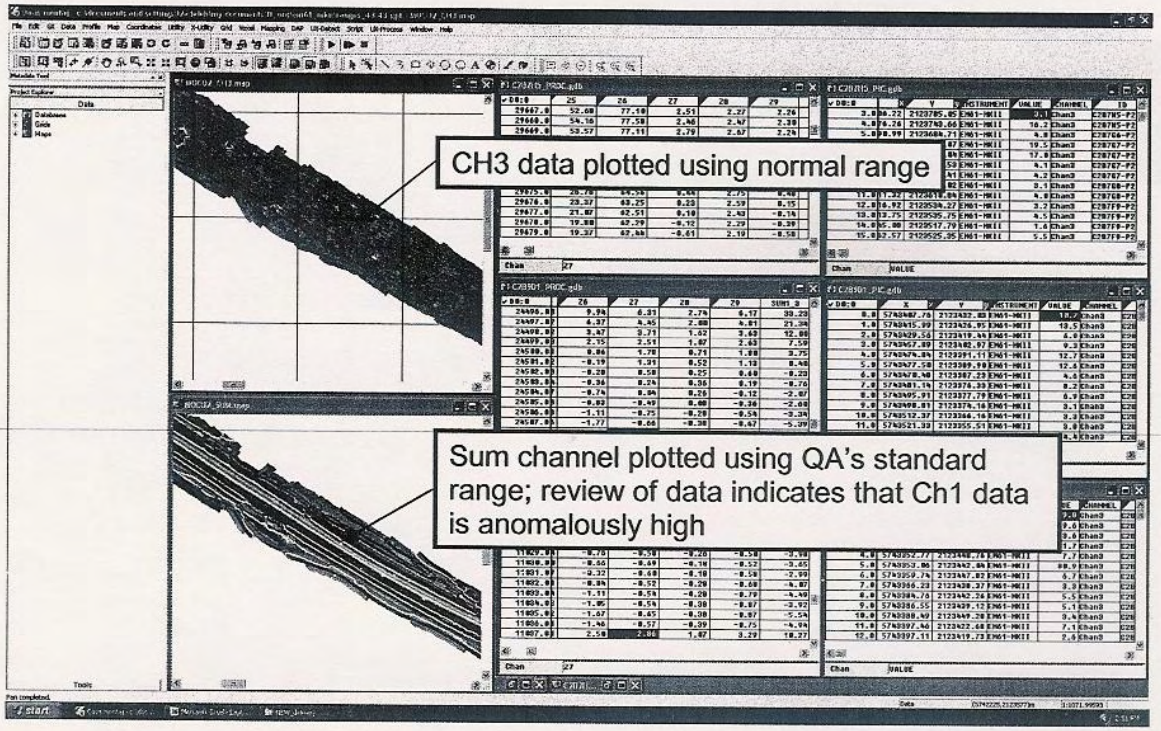


Figure 3. Close-up view showing details of the striping in the sum channel caused by the channel 1 data.

CORRECTIVE ACTION REQUEST | NO. :CESPK-ED-GG-FY05-0005

Originator: Lewis Hunter **Date Issued:** 24 October 2005

Issued to: Mike Coon, Parsons
Project: Former Ft Ord, Ranges 43 – 48 Clean-up
CESPK Project Manager: Chris Prescott
CESPK Project Safety Officer: Clinton Huckins
Response Due: 1 November 2005

Description of Condition Found: (As observed or reported)

Two issues were identified while reviewing recent data collected over the MOCO2 roads just north of range 45.

1. An anomaly with a channel 3 value > 10 mV was not identified in the pick list as a target. The anomaly is located at 5743157.9, 2123447.05 (Figure 1). QA does not have a grid or back hoe cover to identify exact grid or it this anomaly is located within a backhoe polygon.
2. There is a problem with the Channel 1 data for grid block C2B7H5. Data in columns Z1 and Z5 appear anomalously high when compared to other datasets. Data causes sum of channels 1-3 to become "striped" and does not match up with neighboring grid blocks (Figures 2 and 3).

Parsons is requested to provide feedback on these two finding.

(Appropriate personnel, i.e. contractor PM, Safety Officer, Team Leader, etc., receiving the CAR will provide the following information to the originator by the "Response Due" date above. Please contact the originator if you have any questions)

Actual Cause: (Appropriate personnel will investigate and determine cause of condition reported above. Actual cause should be stated as specifically as possible).

1. The anomaly described above was not selected for intrusive investigation because it is located outside the project area. See attached map.
2. The channel 1 data was not leveled in the processed data file. This data channel is not used for Parsons' anomaly selections, so no changes to the dig list will be made, and this change does not effect the removal action.

Action Taken to Correct Condition: (Corrective Action should address root cause, not the symptom).

1. No action necessary.
2. The processed data file for gridblock C2B7H5 will be redelivered after leveling channel 1.

Action Taken to Prevent Recurrence:

1. No action necessary.
2. Future processed data files will be reviewed prior to delivery to CESPK to ensure that channel 1 has been leveled. Geophysical data processors will be instructed to level all data channels, even the ones that are not used for interpretation.

Action Taken to Monitor Effectiveness of Corrective Action: (Generate data as proof. State the monitoring method put in place and who is responsible for reviewing data.)

1. No action necessary.
2. The geophysical processor performing QC checks on the datasets prior to delivery will document in the project database that data processing (including leveling) has been performed appropriately.

CORRECTIVE ACTION REQUEST | NO. :CESPK-ED-GG-FY05-0005

Team Manager Signature/Title/Date Signed: (Form must be signed before returning)

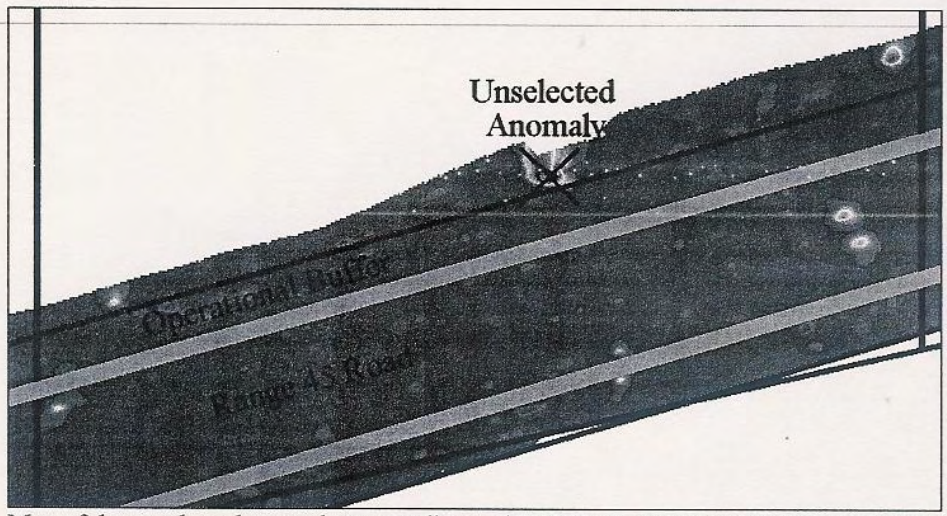
Barry Griffith 10/25/05

(Government Use Only)

Review of Corrective Action:

1) Has condition improved? ___ Yes ___ No
2) Additional corrective action required? ___ Yes ___ No

Comments:



Map of the unselected anomaly at coordinates (5743157.9, 2123447.05) with project area defined.

CORRECTIVE ACTION REQUEST | NO. :CESPK-ED-GG-FY05-0006

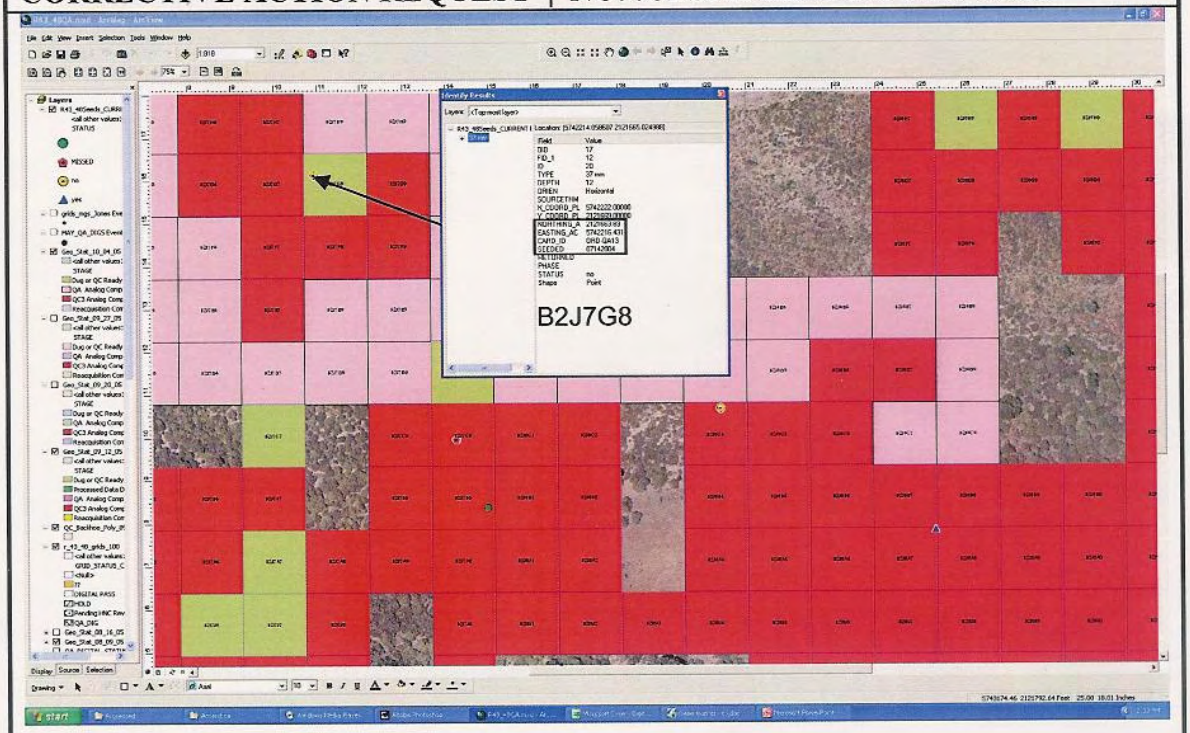


Fig 2: Screen grab showing location of seed QA-13 in grid B2J7G8.

(Appropriate personnel, i.e. contractor PM, Safety Officer, Team Leader, etc., receiving the CAR will provide the following information to the originator by the "Response Due" date above. Please contact the originator if you have any questions)

Actual Cause: (Appropriate personnel will investigate and determine cause of condition reported above. Actual cause should be stated as specifically as possible). *Flag number 229 was located approximately 10" to the west of the seed item which should have resulted in the seed item being discovered. Due to heavy saturation of anomalous debris in the area when portions of the anomalous debris are moved the signal changes. Improper excavation techniques are the suspect cause of this condition.*

Action Taken to Correct Condition: (Corrective Action should address root cause, not the symptom). *Of the 236 digs assigned in this grid, 24 (10%) dig locations will be reassigned to the UXO QC and re-investigated to verify the effectiveness of the overall excavation process in this grid. The 24 selected dig sites will be selected by the QC department based on original survey data, reacquisition data and dig results.*

Action Taken to Prevent Recurrence:

Not applicable, contract at end.

Action Taken to Monitor Effectiveness of Corrective Action: (Generate data as proof. State the monitoring method put in place and who is responsible for reviewing data.)

Not applicable, contract at end.

Team Manager Signature/Title/Date Signed: (Form must be signed before returning)

11/22/05

CORRECTIVE ACTION REQUEST | NO. :CESPK-ED-GG-FY05-0006

(Government Use Only)

Review of Corrective Action:

1) Has condition improved? ___ Yes ___ No
2) Additional corrective action required? ___ Yes ___ No

Comments:

CORRECTIVE ACTION REQUEST | NO. :CESPK-ED-GG-FY05-0006

Originator: Lewis Hunter **Date Issued:** 21 November 2005

Issued to: Mike Coon, Parsons
Project: Former Ft Ord, Ranges 43 – 48 Clean-up
CESPK Project Manager: Chris Prescott
CESPK Project Safety Officer: Clinton Huckins
Response Due: 1 December 2005

Description of Condition Found: (As observed or reported)

Missed seed (QA-13) in grid B2J7G8 was a 37mm buried at 12-in depth. QA safety specialist recovered item after grid was released by QC. Item was not detectable with Schonstedt but was observed with EM61-MKII. Seed was located between B2J7G8-229 and B2J7G8-230 and corresponded to a channel 3 response of 5.27 mV in the original data (See figures).

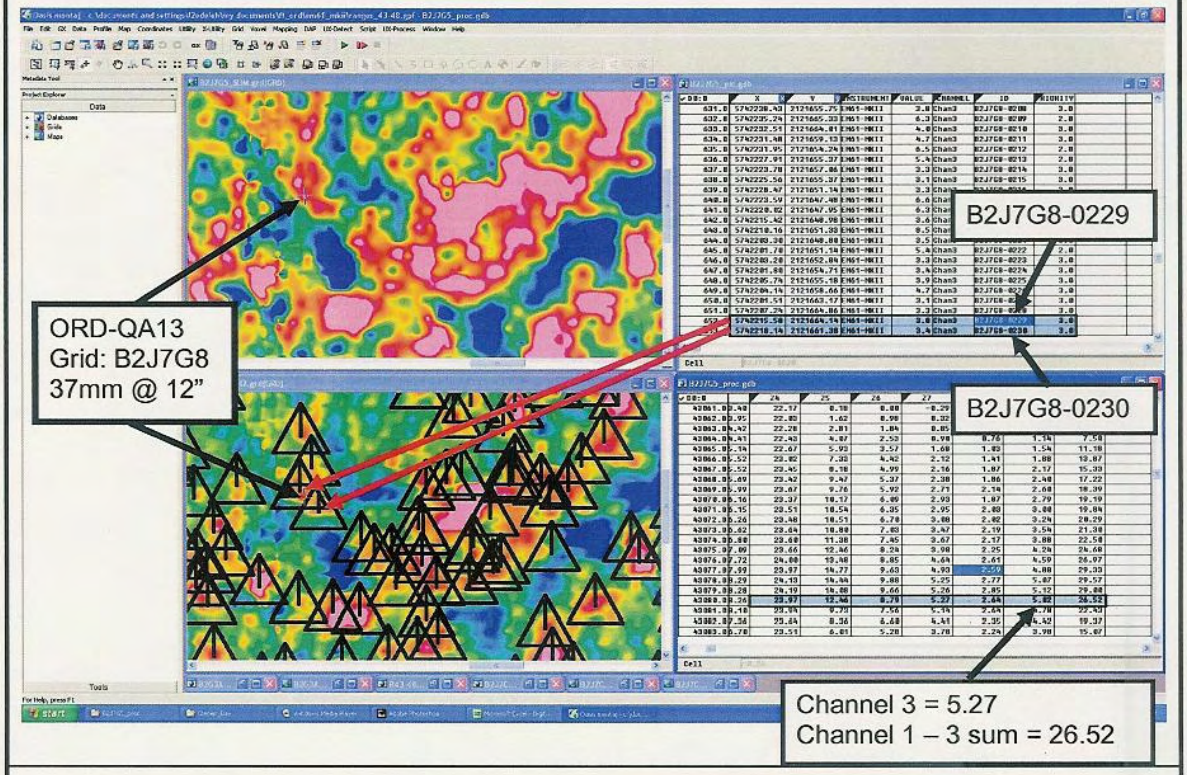


Fig.1: screen grab showing delivered data with target picks superimposed.

CORRECTIVE ACTION REQUEST | NO. :CESPK-ED-GG-FY06-0001

Originator: Lewis Hunter **Date Issued:** 14 February 2006

Issued to: Mike Coon, Parsons
Project: Former Ft Ord, Ranges 43 – 48 Clean-up (MOCO.2 AAR)
CESPK Project Manager: Chris Prescott
CESPK Project Safety Officer: Clinton Huckins
Response Due: 21 February 2006

Description of Condition Found: (As observed or reported)

Calculation and plotting of sum channel for grid block C2B7H5 yielded anomalous results when plotted against other Phase II data. Review of data indicated that data in channels Z1 and Z5 have not been appropriately leveled. This issue was second item in CAR issued 24 October 2005 and has not been resolve and remains in "Final" data being submitted as part of MOCO.2 AAR. Data must be leveled and resubmitted for grid block C2B7H5.

From CAR issued 24 October 2005:

> "2. There is a problem with the Channel 1 data for grid block C2B7H5. Data in columns Z1 and Z5 appear anomalously high when compared to other datasets. Data causes sum of channels 1-3 to become "striped" and does not match up with neighboring grid blocks….."

Parsons is requested to resubmit data from grid block C2B7H5.

(Appropriate personnel, i.e. contractor PM, Safety Officer, Team Leader, etc., receiving the CAR will provide the following information to the originator by the "Response Due" date above. Please contact the originator if you have any questions)

Actual Cause: (Appropriate personnel will investigate and determine cause of condition reported above. Actual cause should be stated as specifically as possible).

The original processed data file for gridblock C2B7H5 with unleveled channel 1 data was delivered on 10/17/05 using the standard naming protocol of C2B7H5_proc.zip. The revised file with leveled channel 1 data was delivered on 10/25/2006 with a non-standard name of C2B7H5_re-proc.zip. When gathering the files together for inclusion in the report only the files with standard names were gathered and those with duplicates were examined to identify the appropriate file to include with the report. This process resulted in only the originally delivered file being examined.

Action Taken to Correct Condition: (Corrective Action should address root cause, not the symptom).
Re-name the redelivered file with the standard naming convention so it is included with the next version of the MOCO.2 AAR.

Action Taken to Prevent Recurrence:
Review redelivered files associated with past CARs to ensure that they follow the standard naming convention. For raw data files the name should be [GRIDBLOCK}_raw.xyz. For processed data files the name should be [GRIDBLOCK]_proc.xyz.

Action Taken to Monitor Effectiveness of Corrective Action: (Generate data as proof. State the monitoring method put in place and who is responsible for reviewing data.)
The list of redelivered files associated with past CARs is included below. After the Project Geophysicist corrects any incorrectly named files, the QC Manager will review the list to ensure all files are correctly named.

CORRECTIVE ACTION REQUEST | NO. :CESPK-ED-GG-FY06-0001

Correct File Name	Redelivery Date
B2J8J2_raw.pdf	8/18/2005
B2J9D8_proc.pdf	8/18/2005
C2B7H5_proc.xyz	10/25/2005

Team Manager Signature/Title/Date Signed: (Form must be signed before returning)

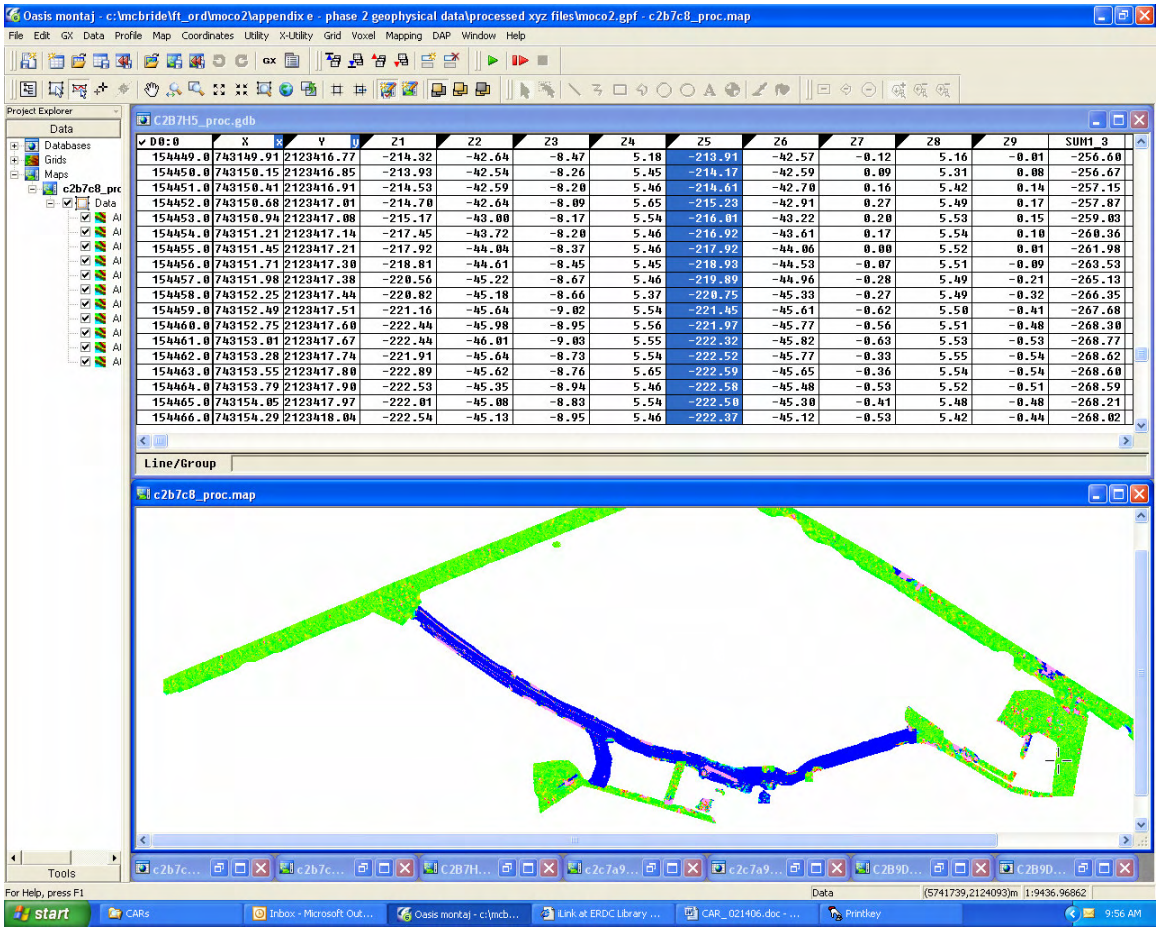
QCM; 02/15/2006

(Government Use Only)

Review of Corrective Action:

1) Has condition improved? ___ Yes ___ No
2) Additional corrective action required? ___ Yes ___ No

Comments:



Screen grab showing anomalous response of data from grid block C2B7H5. Review of data columns and comparison to adjacent files indicates that data in columns Z1 and Z5 are anomalously high indicating that they have not been leveled as indicated by contractor's response to original CAR.

Appendix D

QA DIGITAL GEOPHYSICAL MAPPING PLAN FOR RANGES 43 – 48

1.0 OVERVIEW OF USACE QA

A quality management program includes defining specific processes for ensuring that program and project objectives are properly delineated and attained. The general objective of geophysical investigations is to efficiently locate OE for proper evaluation, recovery, and disposition. The project team defines a project's specific geophysical investigation objectives, which must be risk-based, measurable, and attainable.

QC is an evaluation performed by the contractor to ensure that the work performed meets prescribed requirements and complies with applicable laws, regulations, and sound technical practices.

QA is a review by the USACE of the overall effectiveness of the contractor's QC program, processes, and compliance of work by others. The QA procedures are the process by which the Government fulfills its responsibility of being certain that QC is functioning and that site operations were performed in accordance with (IAW) a Site-Specific Work Plan (SSWP).

2.0 DIGITAL QA PROCEDURES

A digital QA program will be implemented during the Contractor's digital geophysical operations. The QA plan is designed to monitor:

(1) Operator performance
(2) Equipment performance
(3) Operator/Equipment procedures
(4) UXO detection to depths of concern
(5) Removal of UXO of concern

Digital QA procedures include the observation of field QC procedures and activities by the contractor, conducting and collecting site-specific data to comprehensively analyze the entire digital geophysical survey—from data acquisition to processing and interpretation. A seeding program will be implemented to provide the Government with quantitative abilities to monitor the Contractor's performance. This oversight will include field observations of the Contractor, detailed analysis of a subset of the contractor's field data, independent evaluation of about 5% of the survey grids and quantitative analysis of the seed detection data. The collected data from the contractor will be used to evaluate:

(1) Signal levels and repeatability (compared to QC and QA surveying)
(2) Precision and accuracy of locations
(3) Adequacy of site coverage from survey track plots
(4) Detection capabilities of the instruments (from signal response levels in the site-specific soil and vegetation conditions).

(5) Performance of personnel.

Geophysical instrument operators will be evaluated by observing their instrument operation, data acquisition, and reacquisition procedures. Geophysical data processors will be evaluated by analyzing the quality of the data processing, as shown in the initial and final processed data files and the target selection/interpretation results listed in the dig sheets. The digital QA process will entail five other major components that are described in subsections 2.1–2.5:

(1) Monitoring the clearance of metallic clutter from the surface
(2) Monitoring the acquisition of digital field data
(3) Monitoring the management of digital data
(4) Independent surveying
(5) Seeding OE-scrap and OE-simulant targets

2.1 MONITORING CLEARANCE OF SURFACE CLUTTER

The USACE OE Safety Specialist (OESS) will monitor the clearance of metallic objects from the surface, which will be performed before the digital geophysical survey begins to reduce surficial noise and increase the probability that deeper OE targets are detected.

2.2 MONITORING DIGITAL FIELD DATA ACQUISITION

USACE geophysicists will monitor and evaluate the acquired and processed data, consisting of about 90% verification review and 10% raw data review. Any data that indicates one the following problems will be noted and then reacquired and/or reprocessed by the Contractor:

(1) Missing survey lines within a grid.
(2) Data “gaps” along survey lines.
(3) Bowing out of survey lines beyond 50% of survey line spacing.
(4) Unreasonable data “spikes.”
(5) Data incongruity across survey grids (data levels in one grid are not reasonably compatible with data levels in neighboring grids).
(6) Inadequate data density along survey traverse.
(7) Lack of accurate, precise locations; survey line orientation.
(8) Inadequate/incomplete site survey coverage.
(9) Missing, incomplete, or noncompliant instrument standardization checks.

2.3 MONITORING THE MANAGEMENT OF DIGITAL DATA

All raw and processed data files will be checked to ensure that they follow an appropriate and informative naming convention reflecting the grids surveyed as outlined in the DID’s. The USACE geophysicists will check that the Contractor manages the field and processed data in a professional manner, including organization, daily maintenance, and complete documentation. The transfer and delivery of data will be monitored for meeting the agreed-upon deadlines. The accompanying documentation will be checked for completeness and accuracy. The USACE geophysicists will evaluate digital planimetric maps of the processed data, survey transects, and Contractor QC survey results. QC dig sheets and post-excavation

information will also be evaluated. The USACE geophysicists will ensure that the Contractor geophysicists give full and careful consideration to all target responses.

2.4 INDEPENDENT SURVEYING

USACE geophysicists will conduct independent digital QA surveys of the investigation area with the same digital equipment used by the Contractor. The number of grids and the amount of each grid subject to a digital QA survey is determined on a project-specific basis. In the beginning of the project, 5 – 10% of the grids will be QA surveyed until the Government is satisfied that the contractor is meeting their DQOs. The independent surveys will then be incrementally reduced as long as satisfactory results are achieved. The goal is to achieve a 1.5 to 2% overall QA survey rate; however, if discrepancies in the Contractor's results are observed then the QA survey rate will be increased back to the initial level until the Government is satisfied that DQOs are again being met. A minimal amount of QA field surveying is necessary to record signal levels, instrument responses, and effects of vegetation and topography. This data will be used to check that the Contractor's data is correct, consistent, and accurately represents the surveyed area. The overall goal of achieving a 1.5 to 2% digital QA survey is deemed appropriate to meet the needs of the QA program in combination with the other components described in section 2, and it meets the recommended minimum acreages listed in Table 7.4 of EM 1110-1-4009. The Parsons QCM will track the digital QC survey.

2.5 QA SEEDING PROGRAM

The two most important, and distinct, design components of the QA OE seeding program are 1) an evaluation of the Contractor's detection capabilities of the specific munitions of concern and 2) an evaluation of the spatial survey coverage of the area under investigation. The first design component is necessary in order to determine that the munitions of concern are detected to the best degree and at the highest levels of quality of the Exploration Geophysics industry. Previously recovered, site-specific OE-Scrap items must be utilized to meet the needs of this QA program requirement. The second design component is necessary to ensure that the investigation area is completely and thoroughly surveyed. Simulants consisting of 6-inch pieces of iron rebar will be used to satisfy this design component. In addition to the primary design components, the results of previous OE investigations will be evaluated to identify patterns in past errors of detection and in survey comprehensiveness.

Data on ordnance occurrence and geophysical detection are presented in Table 1. The calculated worst-case depths are from EM-1110-1-4009 and assume vertical penetration at muzzle velocities of a non-deforming projectile, thus represent maximum theoretical boundaries. Similarly, the static test results from the Ordnance Discrimination and Detection Study (ODDS) represent system limitations of a particular geophysical system (EM61) in a free-air test, thus indicate upper bounds on a systems ability to detect a target in an ideal situation. Depths presented are for best and worst case scenarios for detection based on target orientation. The data from the Field Trial Sites (FTS) from the ODDS report as well as those from the OE-15DRO.1-2 and MOCO2 After Action Reports (AAR) list the maximum depth at which select ordnance items were found. Seeding criteria for inert OE items will utilize

these theoretical and field based data such that munitions specific burial depths will reflect the detection capabilities demonstrated in the ODDS report and field encountered maximum depths. The final column represents data extracted from the Fort Ord Master Military Munitions Database compiled by Parsons. It should be noted that some of these depths approach or exceed the worst case scenarios and may represent buried targets. The full download of data is presented in Appendix A.

As a validation step, a few munitions may be placed between the calculated depths of maximum penetration and the theoretical maximum depths of detection; however, a majority of the seeds will be placed in the vicinity of the maximum occurrence depth (based on most up to date information at time of seeding) and within the limits of the ODDS static test results for maximum depth of detection.

Table 1. Typical maximum observed and maximum depths of detection.

Munitions	Calculated* Depth of Penetration in sand (inches)	ODDS Static tests - EM61 (best/worse) (inches)	ODDS Field Trial Site Data (FTS 1, 2, 4, & 6) Max depths (inches)	Parsons OE-15DRO.1-2 AAR Max Depths (inches)	Parsons MOCO2 AAR Max depths (inches)	Fort Ord MM Master Database**
22 mm subcal	16.8	12/12	--	--	10	36
20 mm projectile	46.8	--	2	--	--	6
37 mm projectile	46.8	18/12	24	24	4	48
57 mm projectile	32.4	--	16	8	3	18
75 mm projectile	46.8	24/24	12	8	18	48
105 mm projectile	92.4	48/48	--	--	42	--
155 mm projectile	168	72/72	28	--	--	24
40 mm granade (e.g., Mk19/M203)	2.4	--	3	--	2	48
Rifle granades (e.g., M9)	1.2	24/24	30	12	3	48
2.36-in rocket	4.8	24/24	24	28	6	24
3.5-in rocket	9.6	48/36	10	4	--	72
4.2 in mortar	49.2	--	25	--	--	--
60 mm mortar	13.2	36/24	12	8	30	30
81 mm mortar	32.4	36/24	30	4	10	39
Stokes 3-in mortar	39.6	48/36	--	--	--	48
Hand granade	1.2	12/12	3	4	20	48
Hand granade fuzes	--	--	6	--	12	36***

*From Table 7.3 in EM-1110-1-4009
** See appended sheets
***Buried

The suite of inert targets (simulants) used will reflect:

(1) most frequently recovered items
(2) “High risk” items
(3) “Hard” to detect items

Each simulant will be clearly marked (painted orange), and inventoried with a serial number for easy identification after recovery. USACE will seed approximately 1 target per 4 acres (Selfridge, CEHNC, personal communication).

The target simulants (rebar) will also be placed in random grids throughout the area of investigation in locations to assess spatial survey coverage. Grid focus areas include:

(1) Changes in gradient
(2) Near obstacles (including areas where the GPS drops out)
(3) Grid boundaries
(4) Site boundaries

The rebar simulants will be placed either vertically or horizontally in the soil so their tops lie just below the ground surface.

The locations of the QA –seeds will be recorded with a Leica RTK GPS with approximately 1 cm horizontal accuracy. These locations will be held confidential from the contractor until the pertinent grids have been digitally surveyed.

Appendix A: Maximum depths of munitions occurrence from the Fort Ord Military Munitions Database

Item Description	MaxOfiDepth	AvgOfDepth	StDevOfDepth
2.36 INCH WARHEAD W/OUT FUZE (OE Model Unknown)	0	0.0	
20mm Projectiles, TP, M220 (OE Model Unknown)	0	0.0	
75mm HE PROJECTILE (OE Model Unknown)	0	0.0	
81mm, ILLUMINATION, MORTAR ROUND (OE Model Unknown)	0	0.0	
activator, mine, AT, prac, M1	19	13.5	7.8
ANTITANK, MINE (OE Model Unknown)	0	0.0	
base, coupling, firing device	3	0.7	1.2
BLASTING CAP FROM MK 2 HAND GRENADE (OE Model Unknown)	12	12.0	0.0
BLOCKS, C4 (OE Model Unknown)	0	0.0	
BLOCKS, DEMO, C4 (OE Model Unknown)	0	0.0	
BULK PYROTECHNIC MATERIAL, RESIDUE (OE Model Unknown)	5	5.0	
BULK, HE (OE Model Unknown)	24	15.0	12.7
burster, field, incen, M4	0	0.0	
CANISTER, SMOKE, 155mm (OE Model Unknown)	36	36.0	
CANISTER, SMOKE, YELLOW, C-8 (UK) (OE Model Unknown)	0	0.0	
cap, blasting, electric, M6	48	8.8	12.0
cap, blasting, non-electric, M7	48	14.3	22.6
CARTRIDGE CASE, 106MM, M93B1 (OE Model Unknown)	0	0.0	
cartridge case, 40mm	14	5.0	6.4
CARTRIDGE, 20mm, TP, M204 (OE Model Unknown)	1	1.0	
CARTRIDGE, 35mm, RIOT, CONTROL E 23 (OE Model Unknown)	48	48.0	
CARTRIDGE, 37MM, HE (OE Model Unknown)	0	0.0	
CARTRIDGE, 40MM, MULTIPROJECTILE, M576 (OE Model Unknown)	0	0.0	
cartridge, 40mm, prac, M781	48	2.2	6.8
cartridge, grenade, auxiliary, M7	14	5.8	4.8
cartridge, ignition, M2 series	48	8.8	13.8
CARTRIDGE, IGNITION, TYPE UNKNOWN (OE Model Unknown)	12	12.0	

Item Description	MaxOfiDepth	AvgOfDepth	StDevOfDepth
charge, 0.25lbs, demolition	4	4.0	
charge, 0.25lbs, demolition, TNT	8	2.4	3.4
charge, 0.5lbs, demolition, TNT	30	9.8	10.6
charge, blk pwdr, prac grenade	8	8.0	
charge, nitrostarch, 0.25lb	18	11.3	7.0
CHARGE, PROPELLING, M1A1 (OE Model Unknown)	36	36.0	
COMMERCIAL FIRE WORKS, M150, BOMBS (OE Model Unknown)	0	0.0	
COMPOUND SLAG AND OEW (OE Model Unknown)	0	0.0	
COMPOUND, PYROTECHNIC (OE Model Unknown)	0	0.0	0.0
COMPOUND, SMOKE, BAG (OE Model Unknown)	0	0.0	0.0
cord, detonating	3	2.0	1.4
CORD, DETONATING (FEET) (OE Model Unknown)	1	1.0	
CTG, 20mm, HEI, M210 (OE Model Unknown)	0	0.0	
DETONATING CORD (OE Model Unknown)	0	0.0	0.0
Detonating Cord, PETN (Primacord)	0	0.0	
explosive, bulk, HE	0	0.0	0.0
firing device, pressure, M1A1	12	6.7	4.3
firing device, pull friction, M2	6	6.0	
firing device, pull, M1	12	8.4	4.6
firing device, release, M1	3	0.8	1.5
firing device, release, M5	12	6.5	6.0
firing device, tension/release, M3	6	3.0	3.0
flare, aircraft, parachute, M9A1	8	5.3	3.1
flare, parachute, trip, M48	40	8.5	13.4
flare, surface, trip, M49 series	48	5.3	8.1
FLARE, TYPE UNKNOWN (OE Model Unknown)	4	4.0	
fuse, time, blasting, M700	0	0.0	
fuze, bomb, nose, M103	24	12.0	17.0
fuze, chem, mine, AT, M600	0	0.0	
FUZE, GRENADE (OE Model Unknown)	0	0.0	0.0
fuze, grenade, hand, M10 series	60	5.7	10.3
fuze, grenade, hand, M204 series	30	3.6	6.2
fuze, grenade, hand, M206 series	12	6.2	4.0
fuze, grenade, hand, M213	36	12.3	11.6
fuze, grenade, hand, M215	0	0.0	0.0

Item Description	MaxOfiDepth	AvgOfDepth	StDevOfDepth
FUZE, GRENADE, HAND, MODEL UNKNOWN (OE Model Unknown)	1	1.0	
fuze, grenade, hand, prac, M205 series	39	5.5	7.2
fuze, grenade, hand, prac, M228	48	5.8	8.5
FUZE, GRENADE, HAND, UNKNOWN (OE Model Unknown)	2	2.0	
fuze, grenade, igniting, M201	8	5.0	2.9
fuze, mine, AT, prac, M604	3	0.7	1.1
fuze, mine, comb, M10 series	10	5.0	7.1
fuze, mine, comb, M6A1	12	12.0	
FUZE, PROJECTILE, BASE DETONATING, M534A1 (OE Model Unknown)	4	4.0	
fuze, projectile, BD, MK I	2	2.0	
fuze, projectile, comb, M1907	18	7.3	5.4
fuze, projectile, MTSQ, M772	0	0.0	
fuze, projectile, PD, M46	0	0.0	0.0
fuze, projectile, PD, M48 series	24	5.2	6.8
fuze, projectile, PD, M503 series	2	0.3	0.7
fuze, projectile, PD, M51 series	5	5.0	
fuze, projectile, PD, M52 series	6	2.0	3.5
fuze, projectile, PD, M521	9	5.3	3.2
fuze, projectile, PD, M8	4	3.5	0.7
fuze, projectile, PTTF, M84 series	0	0.0	
fuze, projectile, TSQ, M548	0	0.0	
fuze, rocket, BD, M404	12	6.0	8.5
fuze, trench mortar, PD, MK VI	12	7.3	6.4
GRENADE, FUZE (OE Model Unknown)	0	0.0	
GRENADE, GENERAL PURPOSE, PRACTICE, M75 (OE Model Unknown)	30	30.0	
grenade, hand, frag, M67	6	1.2	2.7
grenade, hand, frag, MK II	24	7.8	6.3
grenade, hand, illum, MK I	18	4.4	4.9
grenade, hand, incen, TH3, AN-M14	0	0.0	0.0
grenade, hand, offensive, MK III	0	0.0	
grenade, hand, prac, M30	12	5.2	2.8
grenade, hand, prac, M62	1	0.5	0.7
grenade, hand, prac, M69	12	2.5	3.6
grenade, hand, prac, MK II	36	5.8	5.9
GRENADE, HAND, RIOT, CN, M7 SERIES	12	6.7	5.0
grenade, hand, riot, CN1, ABC-M25A1	3	3.0	
grenade, hand, riot, CS, M7A3	24	6.4	5.7
grenade, hand, riot, CS-1, ABC-M25A2	12	3.6	5.4

Item Description	MaxOfiDepth	AvgOfDepth	StDevOfDepth
GRENADE, HAND, SMOKE, COMMERCIAL (OE Model Unknown)	12	12.0	
grenade, hand, smoke, HC, AN-M8	14	3.5	4.2
grenade, hand, smoke, M18 series	48	5.7	7.9
grenade, hand, smoke, M48	2	2.0	
grenade, hand, smoke, WP, M15	6	1.3	2.4
grenade, hand, smoke, WP, M34	0	0.0	
GRENADE, MK2 W/O FUZE (OE Model Unknown)	0	0.0	
grenade, rifle, AT, M9 series	36	5.7	7.5
grenade, rifle, HEAT, M28	14	14.0	
grenade, rifle, smoke, M22 series	48	8.9	11.3
grenade, rifle, smoke, M23 series	12	2.6	3.8
grenade, rifle, smoke, WP, M19A1	8	4.0	3.2
igniter, bomb, M23	0	0.0	0.0
Igniter, time fuse, blasting, M60	12	12.0	
MINE, ANITPERSONNEL, PRACTICE, M2A1B1 (OE Model Unknown)	18	18.0	
MINE, ANTITANK, PRACTICE, M7 (OE Model Unknown)	24	24.0	
MINE, AP, M2 TYPE (OE Model Unknown)	0	0.0	
MINE, AP, PRACTICE, NM, M17 (OE Model Unknown)	0	0.0	
mine, APERS, M18A1 (claymore)	0	0.0	
mine, APERS, prac, M8 series	48	38.0	16.5
mine, AT, prac, M1	18	5.5	3.1
mine, AT, prac, M10	0	0.0	0.0
mine, AT, prac, M12 series	8	4.3	2.6
mine, AT, prac, M20	1	1.0	
missile, guided, HEAT, M222 (Dragon)	12	6.0	8.5
missile, guided, prac, M231 (Dragon)	0	0.0	0.0
MK2 GRENADE FUZE MISSING (OE Model Unknown)	0	0.0	
ordnance components (see comments)	30	1.6	4.5
PERCUSSION CAP, 60mm, M4 (OE Model Unknown)	0	0.0	0.0
pot, 10lb, smoke, HC, screening, M1	36	11.8	9.0
pot, 2.5lb, smoke, HC, screening, M1	36	13.5	12.1
pot, smoke, HC, MK III	0	0.0	
primer, igniter tube, M5	12	12.0	
primer, igniter tube, M57	12	10.5	1.9
primer, ignition, percussion, M82	3	1.5	2.1
PROJECTILE, 20mm, HE (OE Model Unknown)	3	1.5	2.1

Item Description	MaxOfiDepth	AvgOfDepth	StDevOfDepth
PROJECTILE, 37MM (1 Pounder) (OE Model Unknown)	0	0.0	
PROJECTILE, 40mm, CS, M651 (OE Model Unknown)	12	12.0	
PROJECTILE, 40mm, FUZE (OE Model Unknown)	0	0.0	
PROJECTILE, 40mm, HE, M383 SERIES (HE BALL ONLY) (OE Model Unknown)	1	1.0	
PROJECTILE, 60mm, MORTAR, HE, M720 SERIES (W/M734 SERIES FUZE) (OE Model Unknown)	6	6.0	
PROJECTILE, 75mm, SHRAPNEL, M48 (OE Model Unknown)	6	6.0	
PROJECTILE, 8 INCH, HE, M106 SERIES (OE Model Unknown)	30	30.0	
PROJECTILE, 81MM, MORTAR (OE Model Unknown)	14	10.0	5.7
PROJECTILE, 81MM, MORTAR, PRACTICE (OE Model Unknown)	14	8.8	5.5
PROJECTILE, 81mm, MORTAR, SMOKE, WP, M375 SERIES (FUZE, W/BURSTER, NO WP) (OE Model Unknown)	0	0.0	
PROJECTILE, 84mm, HEAT, M134 (AT4) (OE Model Unknown)	0	0.0	
projector, livens, screening smoke, FM	16	7.8	7.5
projo, 105mm, HE, M1	0	0.0	0.0
projo, 105mm, illum, M314 series	0	0.0	0.0
projo, 105mm, smoke, M84 series	0	0.0	
projo, 14.5mm, subcal, prac, M181 series	6	2.7	2.1
projo, 155mm, HE, M1	0	0.0	0.0
projo, 155mm, illum, M485 series	0	0.0	
projo, 155mm, shrapnel, MK I	24	12.0	17.0
projo, 155mm, smoke, BE, M116 series	6	5.0	1.4
projo, 20mm, AP-I, M53	4	4.0	
projo, 20mm, HE-I, M56A3	2	2.0	
projo, 20mm, practice, MK105	0	0.0	
projo, 20mm, TP, M55A2	2	2.0	0.0
projo, 20mm, TP-T, M206A1	6	6.0	
projo, 22mm, subcal, prac, M744	36	0.0	0.8
projo, 25mm, subcal, M379	4	2.7	2.1
projo, 37mm, AP-T, M51 series	0	0.0	0.0
projo, 37mm, AP-T, M80	0	0.0	

Item Description	MaxOfiDepth	AvgOfDepth	StDevOfDepth
projo, 37mm, HE, M54	2	0.3	0.8
projo, 37mm, HE, M63	2	0.5	1.0
projo, 37mm, HE, MK II	8	4.2	2.7
projo, 37mm, LE, MK I	14	4.1	3.3
projo, 37mm, LE, MK II	5	1.0	1.6
projo, 37mm, TP, M63A1	0	0.0	
projo, 3inch, Hotchkiss	4	4.0	
projo, 3inch, mortar, HE, MK I	10	5.0	7.1
projo, 3inch, mortar, prac, MK I	48	10.2	8.2
projo, 4.2inch, mortar, HE, M3 series	32	6.6	11.1
projo, 4.2inch, mortar, HE, M329 series	0	0.0	0.0
projo, 4.2inch, mortar, smoke, WP, M328 series	8	4.0	5.7
projo, 40mm, cluster, white star, M585	2	0.3	0.8
projo, 40mm, CS, M651	0	0.0	0.0
projo, 40mm, HE, M381	12	0.4	1.6
projo, 40mm, HE, M383	3	0.6	1.0
projo, 40mm, HE, M384	10	1.3	3.3
projo, 40mm, HE, M386	0	0.0	0.0
projo, 40mm, HE, M397	0	0.0	0.0
projo, 40mm, HE, M406	6	1.3	2.2
projo, 40mm, HE, M441	4	1.7	2.1
projo, 40mm, HE, SF, M463	12	12.0	
projo, 40mm, HEDP, M430	0	0.0	0.0
projo, 40mm, HEDP, M433	2	0.3	0.8
projo, 40mm, HE-T, M677	1	0.5	0.7
projo, 40mm, parachute, illum, M583 series	24	2.3	6.5
projo, 40mm, parachute, star, M662	1	0.4	0.5
projo, 40mm, prac, M382	48	12.0	19.0
projo, 40mm, prac, M385	6	3.5	3.5
projo, 40mm, prac, M407A1	2	0.5	0.9
projo, 40mm, prac, M918	0	0.0	0.0
projo, 40mm, practice, model unknown	0	0.0	0.0
projo, 40mm, smoke, M680 series	3	1.0	1.7
projo, 40mm, smoke, M713 series	0	0.0	0.0
projo, 4inch, mortar, HE, MK I (stokes)	12	12.0	
projo, 4inch, mortar, prac, MK I	20	6.7	6.9
projo, 4inch, mortar, screening smoke, FM (stokes)	22	6.0	8.4
projo, 4inch, mortar, smoke, HC (stokes)	0	0.0	0.0
projo, 4inch, mortar, smoke, WP (stokes)	12	5.3	6.1
projo, 57mm, HE, M306 series	18	1.2	3.0

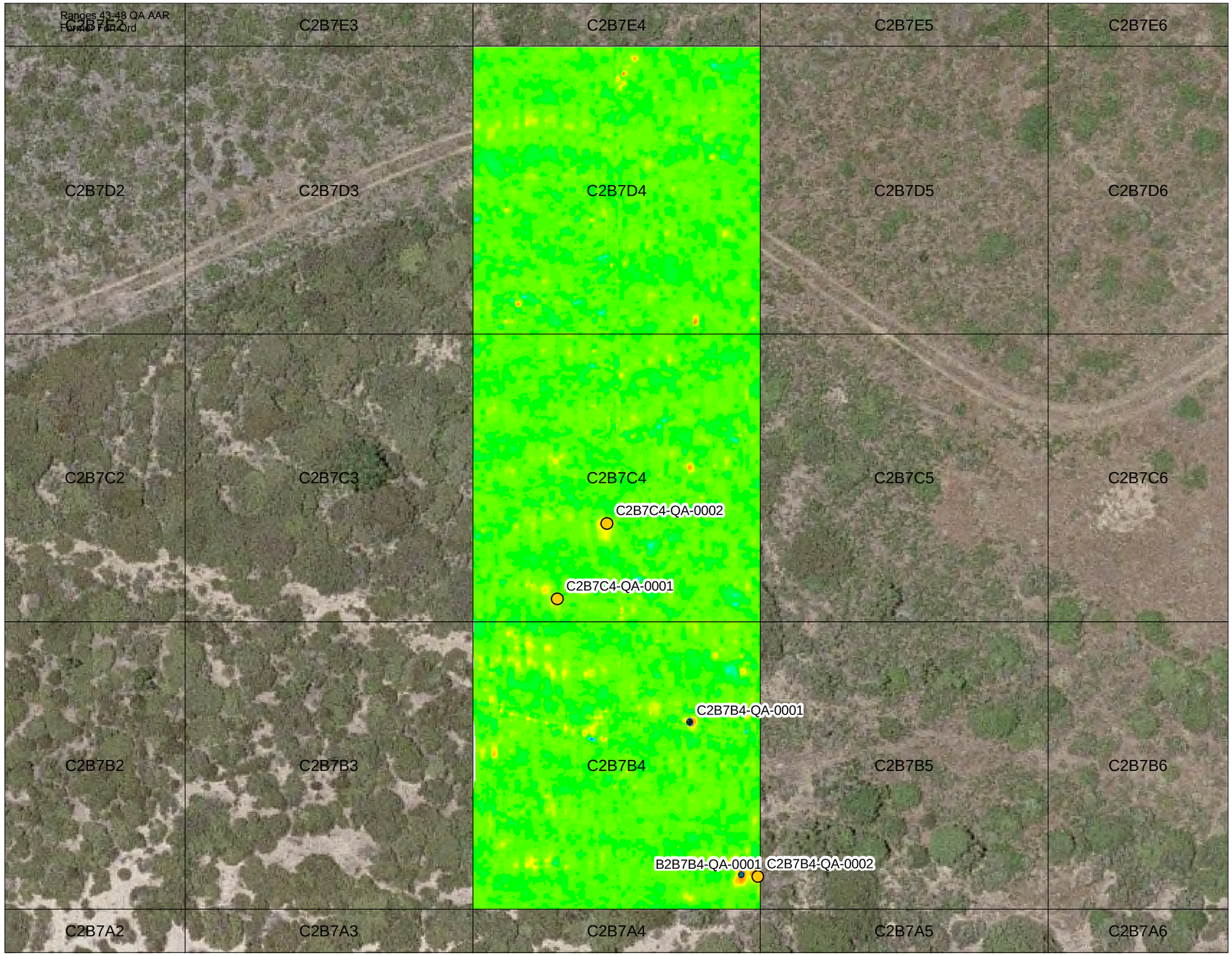
Item Description	MaxOfiDepth	AvgOfDepth	StDevOfDepth
projo, 57mm, HEAT, M307	0	0.0	0.0
projo, 57mm, smoke, WP, M308 series	0	0.0	
projo, 60mm, mortar, HE, M49 series	20	4.8	4.9
projo, 60mm, mortar, illum, M83 series	16	4.8	5.8
projo, 60mm, mortar, prac, M50 series	30	11.5	9.4
projo, 60mm, mortar, smoke, WP, M302	24	16.6	5.8
projo, 60mm, mortar, training, M69	12	12.0	
projo, 75mm, HE, French	0	0.0	
projo, 75mm, HE, M309	0	0.0	0.0
projo, 75mm, HE, M41A1	0	0.0	0.0
projo, 75mm, HE, M48	12	2.6	4.1
projo, 75mm, HE, MK I	48	8.6	12.5
projo, 75mm, Shrapnel, MK I	30	7.0	6.6
projo, 75mm, WP, M311	0	0.0	
projo, 76mm, canister, M363	12	12.0	
projo, 81mm, mortar, HE, M362	24	2.1	5.5
projo, 81mm, mortar, HE, M374 series	24	9.9	8.8
projo, 81mm, mortar, HE, M43 series	39	11.4	8.1
projo, 81mm, mortar, illum, M301 series	28	7.9	7.3
projo, 81mm, mortar, illum, M853A1	24	24.0	
projo, 81mm, mortar, prac, M43 series	27	6.3	7.5
projo, 81mm, mortar, smoke, WP, M375 series	12	6.0	8.5
projo, 81mm, mortar, smoke, WP, M57 series	12	6.5	7.8
projo, 84mm, HEAT, M136 series (AT-4)	9	0.1	0.8
projo, 90mm, HEAT, M348	0	0.0	0.0
projo, 90mm, HEAT, M371A1	0	0.0	0.0
projo, 90mm, HE-T, M71	0	0.0	
PROPELLANT WAFERS (OE Model Unknown)	4	4.0	
propellant, 60mm, waffers, mortar	30	21.0	12.7
PROPELLENT, WAFFERS, 60mm, MORTAR (OE Model Unknown)	12	12.0	
pyrotechnic mixture, illum	36	4.8	7.9
pyrotechnic mixture, smoke	3	0.8	1.5
RIFLE GRENADE SMOKE (OE Model Unknown)	0	0.0	
ROCKET MOTOR SIMULATOR (OE Model Unknown)	48	48.0	
rocket motor, 2.36inch	0	0.0	
rocket motor, 3.5inch	72	24.0	41.6
rocket motors, M222/M223 (DRAGON)	1	0.1	0.2
rocket, 2.36inch, HEAT, M6	24	4.3	6.3
rocket, 2.36inch, prac, M7	18	7.1	6.5

Item Description	MaxOfiDepth	AvgOfDepth	StDevOfDepth
rocket, 3.5inch, prac, M29 series	36	18.5	20.2
rocket, 35mm, subcal, prac, M73	23	1.8	3.1
ROCKET, 4.5 INCH, MK I, MOD 0 (OE Model Unknown)	0	0.0	
rocket, 4.5inch, barrage, HE, MK III	12	7.9	4.1
rocket, 66mm, HEAT, M72 series	3	0.0	0.2
rocket, 66mm, incen, TPA, M74	1	0.1	0.2
signal, ground, rifle, parachute, M17 series	14	4.3	4.0
signal, illum, aircraft, AN-M37 series	6	1.1	2.2
signal, illum, AN-M43 series	8	2.7	2.5
signal, illum, AN-M53A2 series	12	5.0	6.2
signal, illum, ground, M125 series	72	4.7	10.8
signal, illum, ground, M126 series	48	5.5	7.7
signal, illum, ground, M131	10	3.3	4.7
signal, illum, ground, M20A1	6	3.5	3.0
signal, illum, ground, M21A1	0	0.0	0.0
signal, illum, ground, M52A1	0	0.0	
signal, illum, ground, parachute, rifle, M19 series	48	7.0	10.1
signal, illum, M187	8	2.5	3.0
SIGNAL, ILLUMINATION, GROUND, GREEN STAR, PARACHUTE, M19A2 (BODY ONLY) (OE Scrap)	3	3.0	
SIGNAL, ILLUMINATION, GROUND, UNKNOWN (OE Model Unknown)	2	2.0	0.0
signal, smoke and illum, marine, AN-MK13,MOD 0	0	0.0	
signal, smoke, ground, M166 series	6	6.0	
signal, smoke, ground, M62 series	2	0.5	1.0
signal, smoke, ground, parachute, M128A1 series	0	0.0	0.0
simul., blast, stinger, civilian, M15	0	0.0	
simul., detonation, explosive, M80	3	1.3	1.5
simul., explosive boobytrap, flash, M117	12	3.5	5.7
simul., explosive boobytrap, illum, M118	18	13.0	7.1
simul., explosive boobytrap, whistling, M119	0	0.0	
simul., flash artillery, M110	24	7.0	8.6
simul., flash artillery, M21	0	0.0	
simul., grenade, hand, M116A1	8	3.0	3.5
simul., launching, AT, missile, M22	18	4.2	7.8
simul., projectile, airburst, M74 series	48	10.3	13.4
simul., projectile, groundburst, M115A2	24	6.5	8.7

Item Description	MaxOfiDepth	AvgOfDepth	StDevOfDepth
SIMULATOR, BLAST, MODEL UNKNOWN (OE Model Unknown)	3	2.0	1.4
squib, electric	24	14.7	11.4
squib, rocket, simulator	24	9.3	12.7
TUBE FLASH CTG CASE ARTILLERY (OE Model Unknown)	0	0.0	
WP FLARE, PARACHUTE (OE Model Unknown)	0	0.0	

Appendix E

QA Digital Geophysical Mapping



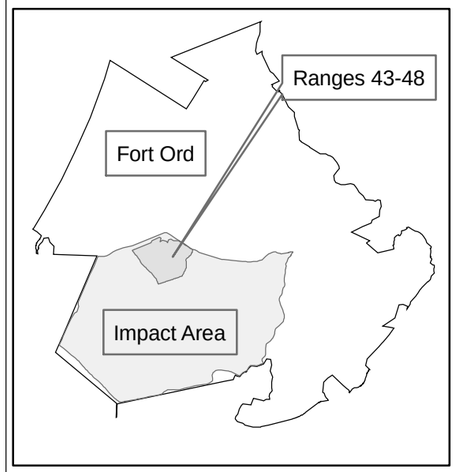
Legend

- QA_dig list_Final2 Events

QA_Anomalies

STATUS

- E Aluminum Foil
- (Empty
- # MD-E
- NA
- X Nail/Bolt
- RRD



0 20 40 80

Feet

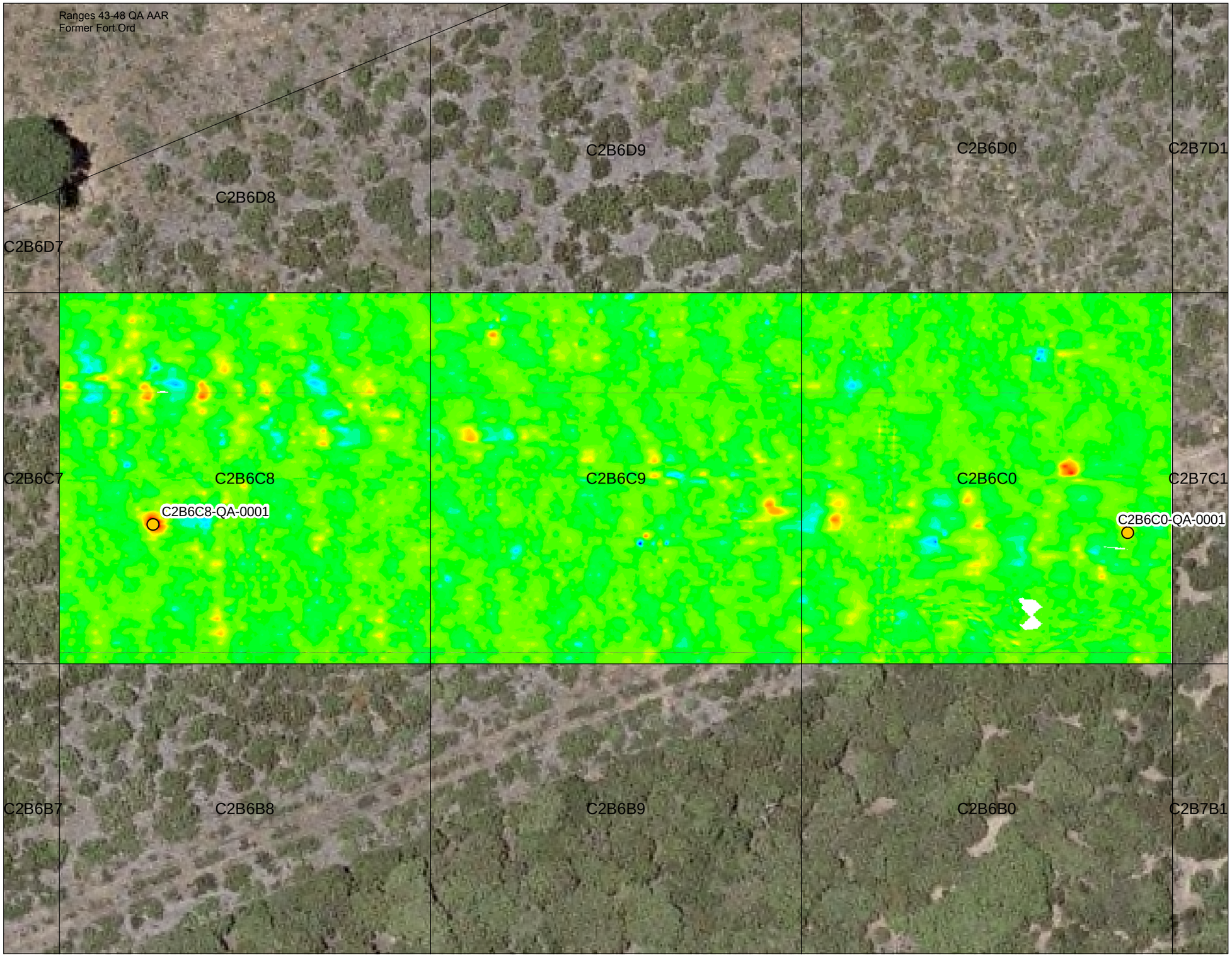
Map Units: NAD 1983 StatePlane California Zone IV (US Feet)

U.S. ARMY CORPS
OF ENGINEERS

FORMER FORT ORD
MONTEREY, CALIFORNIA

PRINT DATE: **27 March 2006**	SOURCE OF DATA:
AERIAL PHOTOGRAPHY:	SCALE:
DRAWN BY: Lewis.E.Hunter@usace.army.mil	
FILE:	10/11/06

Ranges 43-48 QA AAR
Former Fort Ord



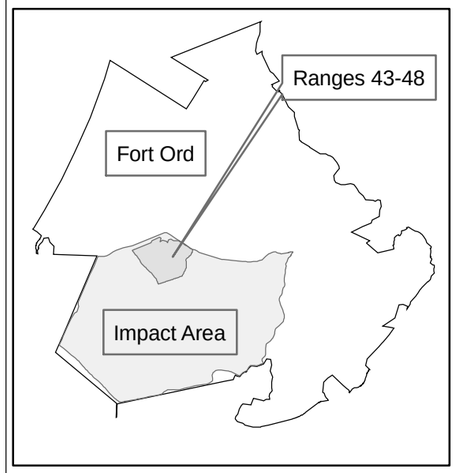
Legend

- QA_dig list_Final2 Events

QA_Anomalies

STATUS

- E Aluminum Foil
- (Empty
- # MD-E
- NA
- X Nail/Bolt
- RRD



0 15 30 60
Feet

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Ranges 43-48 QA AAR
Former Fort Ord

C2B6B7 C2B6B8 C2B6B9 C2B6B0 C2B7B1

C2B6A7 C2B6A8 C2B6A9 C2B6A0 C2B7A1

C2A6J7 C2A6J8 C2A6J9 C2A6J0 C2A7J1

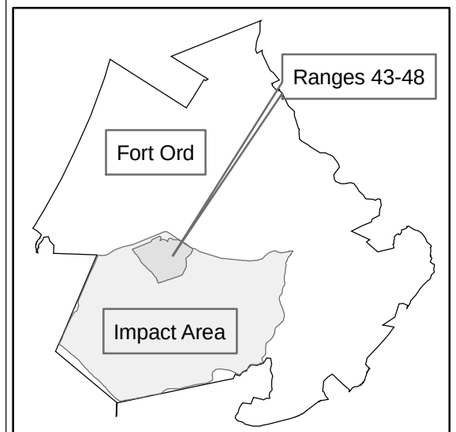
Legend

- QA_dig list_Final2 Events

QA_Anomalies

STATUS

- E Aluminum Foil
- (Empty
- # MD-E
- NA
- X Nail/Bolt
- RRD



0 15 30 60 Feet

Map Units: NAD 1983 StatePlane California Zone IV (US Feet)

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Ranges 43-48 QA AAR
Former Fort Ord

C2A8I0 C2A9I1 C2A9I2 C2A9I3 C2A9I4

C2A8H0 C2A9H1 C2A9H2 C2A9H3 C2A9H4

C2A9H2_QA_0001

C2A8G0 C2A9G1 C2A9G2 C2A9G3 C2A9G4

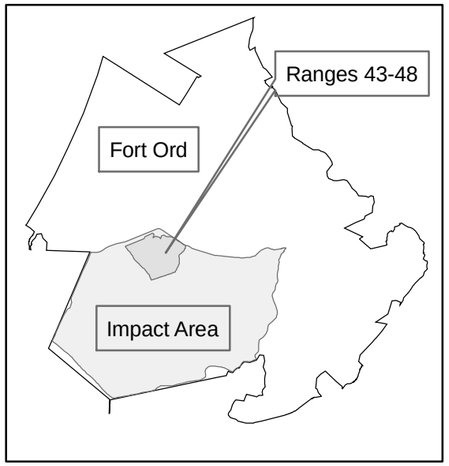
Legend

- QA_dig list_Final2 Events

QA_Anomalies

STATUS

- E Aluminum Foil
- (Empty
- # MD-E
- NA
- X Nail/Bolt
- RRD



0 15 30 60
Feet

Map Units: NAD 1983 StatePlane California Zone IV (US Feet)

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Ranges 43-48 QA AAR
Former Fort Ord

C2A7D5-QA-0001
C2A7D5-QA-0002
QA-C2A7C5-QA-0001
QA-C2A7C7-QA-0001
QA-C2A7C7-QA-0002
QA-C2A7C7-QA-0003
C2a7c7-QA-0001
C2A7B6-QA-0001
c2a7b4-QA-0002
c2a7b4-QA-0001

C2A7D4 C2A7D5 C2A7D6 C2A7D7 C2A7D8
C2A7C4 C2A7C5 C2A7C6 C2A7C7 C2A7C8
C2A7B4 C2A7B5 C2A7B6 C2A7B7 C2A7B8

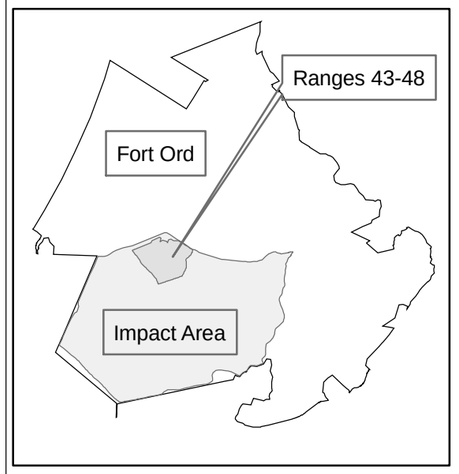
Legend

- QA_dig list_Final2 Events

QA_Anomalies

STATUS

- E Aluminum Foil
- (Empty
- # MD-E
- NA
- X Nail/Bolt
- RRD



0 15 30 60
Feet

Map Units: NAD 1983 StatePlane California Zone IV (US Feet)

U.S. ARMY CORPS
OF ENGINEERS

FORMER FORT ORD
MONTEREY, CALIFORNIA

PRINT DATE: 27 March 2006	SOURCE OF DATA:
AERIAL PHOTOGRAPHY:	SCALE:
DRAWN BY: Lewis.E.Hunter@usace.army.mil	
FILE:	10/11/06

Ranges 43-48 QA AAR
Former Fort Ord

C2A6F9 C2A6F0 C2A7F1
C2A6E9 C2A6E0 C2A7E1
C2A6D9 C2A6D0 C2A7D1
C2A6C9 C2A6C0 C2A7C1

C2A6E0-QA-0001
C2A6D0-QA-0001
C2A6D0-QA-0002

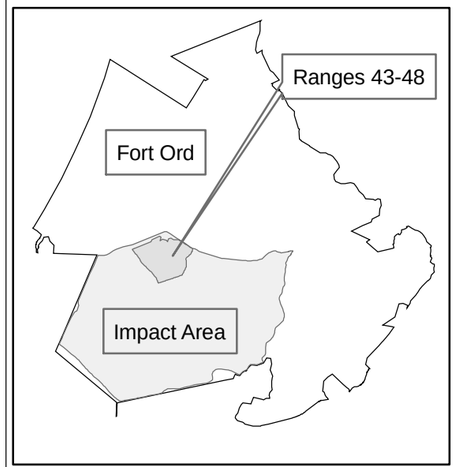
Legend

- QA_dig list_Final2 Events

QA_Anomalies

STATUS

- E Aluminum Foil
- (Empty
- # MD-E
- NA
- X Nail/Bolt
- RRD



0 12.5 25 50
Feet

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Ranges 43-48 QA AAR
Former Fort Ord

C2A8A8 C2A8A9 C2A8A0 C2A9A1 C2A9A2

B2J8J8 B2J8J9 B2J8J0 B2J9J1 B2J9J2

B2J8I8 B2J8I9 B2J8I0 B2J9I1 B2J9I2

QA-B2J8J0-QA-0002
QA-B2J8J9-QA-0002
QA-B2J8J9-QA-0001
QA-B2J8J9-QA-0003
QA-B2J8J0-QA-0003
QA-B2J8J0-QA-0001

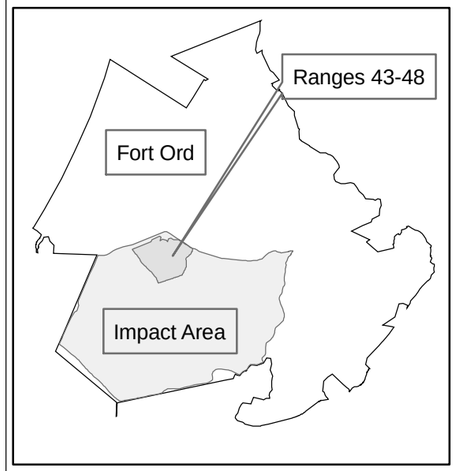
Legend

- QA_dig list_Final2 Events

QA_Anomalies

STATUS

- E Aluminum Foil
- (Empty
- # MD-E
- $ NA
- X Nail/Bolt
- RRD



0 15 30 60
Feet

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Ranges 43-48 QA AAR
Former Fort Ord

C2A8B2 C2A8B3 C2A8B4 C2A8A4-QA-0002

C2A8A2 C2A8A3 C2A8A4

QA-C2A8A3-QA-0002

QA-C2A8A3-QA-0001

QA-B2J8J3-QA-0005

QA-B2J8J3-QA-0001

B2J8J2 B2J8J3 B2J8J4

QA-B2J8J3-QA-0002 QA-B2J8J3-QA-0004

QA-B2J8J3-QA-0003

B2J8I2 B2J8I3 B2J8I4

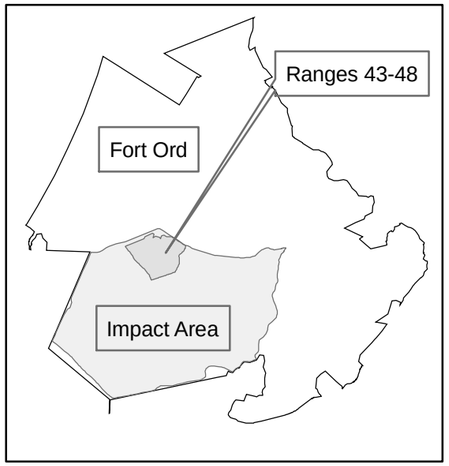
Legend

- QA_dig list_Final2 Events

QA_Anomalies

STATUS

- E Aluminum Foil
- (Empty
- # MD-E
- NA
- X Nail/Bolt
- RRD



0 12.5 25 50

Feet

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Ranges 43-48 QA AAR
Former Fort Ord

B2J6I4 B2J6I5 B2J6I6 B2J6I7 B2J6I8

QA-B2J6H5-QA-0002

B2J6H4 B2J6H5 B2J6H6 B2J6H7 B2J6H8

QA-B2J6H5-QA-0001

B2J6G4 B2J6G5 B2J6G6 B2J6G7 B2J6G8

B2J6G7-QA-0001

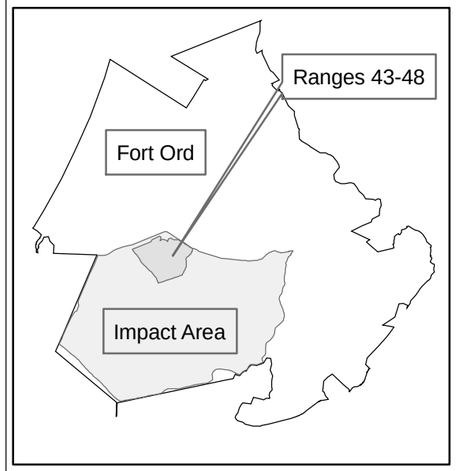
Legend

- QA_dig list_Final2 Events

QA_Anomalies

STATUS

- E Aluminum Foil
- (Empty
- # MD-E
- NA
- X Nail/Bolt
- RRD



0 15 30 60
Feet

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Ranges 43-48 QA AAR
Former Fort Ord

B2J6B8 B2J6B9 B2J6B0 B2J7B1 B2J7B2

B2J6A8 B2J6A9 B2J6A0 B2J7A1 B2J7A2

QA-QAB2J6A9-0002
QA-QAB2J6A9-0001
QA-QAB2J6A9-0004
QA-QAB2J6A9-0003
QA-QAB2J6A9-0005
QA-QAB2J6A9-0006
QA-QAB2J6A9-0007
QA-QAB2J6A0-0001
QA-QAB2J7A1-0001
QA-QAB2J7A1-0002
QA-QAB2J6A0-0002
QA-QAB2J7A1-0003

B2I6J8 B2I6J9 B2I6J0 B2I7J1 B2I7J2

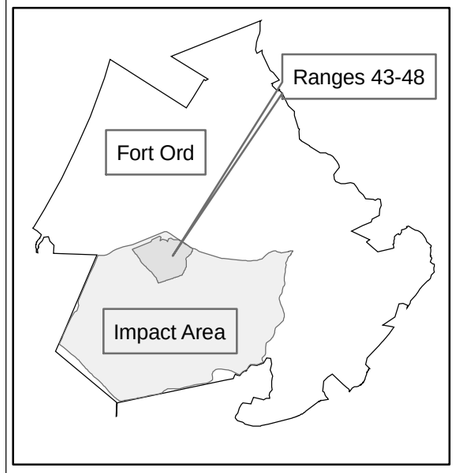
Legend

- QA_dig list_Final2 Events

QA_Anomalies

STATUS

- E Aluminum Foil
- (Empty
- # MD-E
- NA
- X Nail/Bolt
- RRD



0 15 30 60 Feet

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Ranges 43-48 QA AAR
Former Fort Ord

B2J0A2 B2J0A3 B2J0A4 B2J0A5

B2I0J3-QA-0003

B2I0J3-QA-0002

B2I0J2 B2I0J3 B2I0J4 B2I0J5

B2I0J4-QA-0001 B2I0J4-QA-0001

B2I0J3-QA-0001

B2I0I2 B2I0I3 B2I0I4 B2I0I5

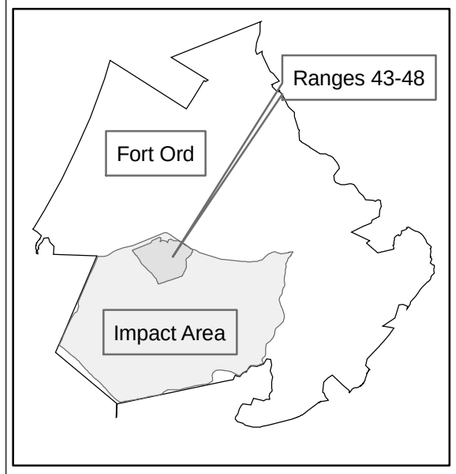
Legend

- QA_dig list_Final2 Events

QA_Anomalies

STATUS

- E Aluminum Foil
- (Empty
- # MD-E
- NA
- X Nail/Bolt
- RRD



0 10 20 40
Feet

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Ranges 43-48 QA AAR
Former Fort Ord

B2I8A3 B2I8A4 B2I8A5 B2I8A6 B2I8A7

B2H8J3 B2H8J4 B2H8J5 B2H8J6 B2H8J7

QA-B2H8J6-QA-0003
QA-B2H8J6-QA-0001
QA-B2H8J5-QA-0001
QA-B2H8J4-QA-0001
QA-B2H8J5-QA-0002
QA-B2H8J5-QA-0003
QA-B2H8J4-QA-0003
QA-B2H8J4-QA-0004
QA-B2H8J6-QA-0002
B2H8J6-QA-0001

B2H8I3 B2H8I4 B2H8I5 B2H8I6 B2H8I7

Legend

- QA_dig list_Final2 Events

QA_Anomalies

STATUS

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- (Empty
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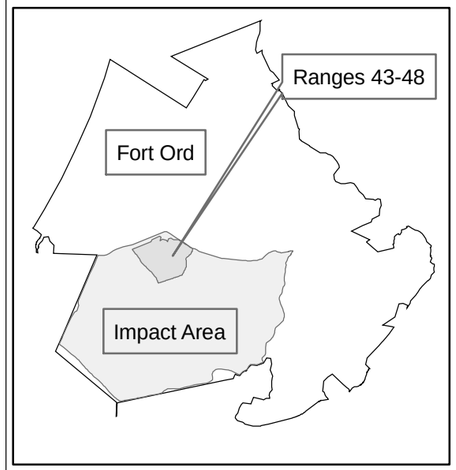
- RRD



0 15 30 60
Feet

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Ranges 43-48 QA AAR
Former Fort Ord

C2A8B2 C2A8B3 C2A8B4 C2A8A4-QA-0002
C2A8A2 C2A8A3 C2A8A4
QA-C2A8A3-QA-0002
QA-C2A8A3-QA-0001
QA-B2J8J3-QA-0005
QA-B2J8J3-QA-0001
B2J8J2 B2J8J3 B2J8J4
QA-B2J8J3-QA-0002
QA-B2J8J3-QA-0004
QA-B2J8J3-QA-0003
B2J8I2 B2J8I3 B2J8I4

Legend

- QA_dig list_Final2 Events

QA_Anomalies

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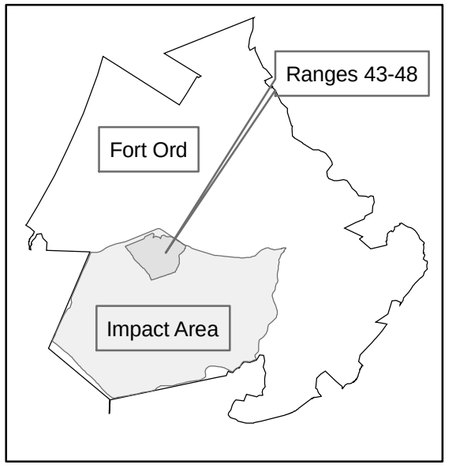
- # MD-E
- NA
- X Nail/Bolt
- RRD



0 12.5 25 50
Feet

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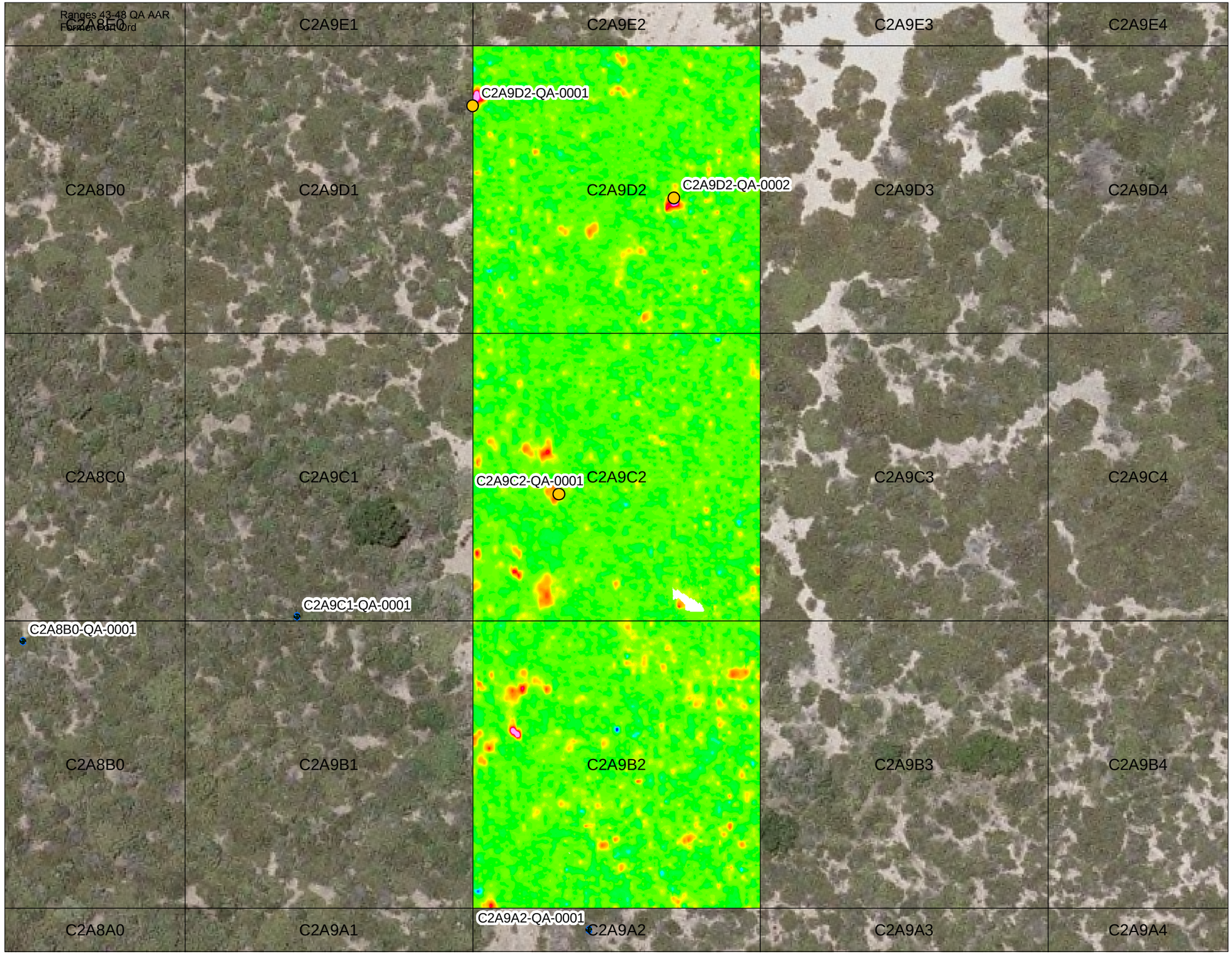


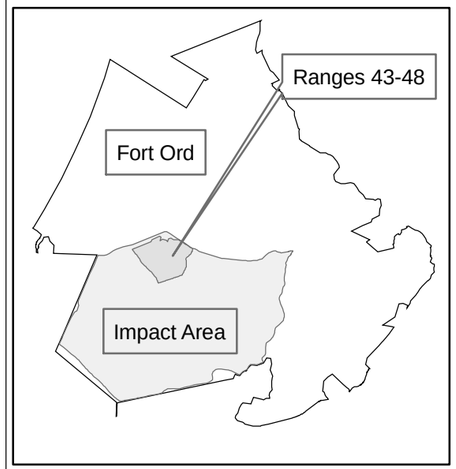
Legend

- QA_dig list_Final2 Events

QA_Anomalies

STATUS

- E Aluminum Foil
- (Empty
- # MD-E
- NA
- X Nail/Bolt
- RRD



0 20 40 80 Feet

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