Appendix 0

DGM QC Plan Addendum

DGM QC Plan Addendum
MRS-16 Munitions and Explosives of Concern Removal
Former Fort Ord, California

Total Environmental Restoration Contract
Contract No. DACW05-96-D-0011
Task Order No. 016

Submitted to:
U.S. Department of the Army
Corps of Engineers
1325 "J" Street
Sacramento, California 95814-2922

Submitted by:
Shaw Environmental, Inc.
PO Box 1698
Marina, California 93933

Revision 0

January 2007

Issued to:_____ Date:_____

Copy #:_____ ☐ Controlled ☒ Uncontrolled

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Acronyms and Abbreviations

ATS	Anomaly Tracking Sheet
DGM	Digital geophysical mapping
DID	Data Item Description
DQO	data quality objectives
EM61-MK2	Geonics EM61-MK2 time domain metal detector
GIP	Geophysical Investigation Plan
GIS	Geographic Information System
GPO	Geophysical prove-out
GPS	Global Positioning System
MEC	Munitions and Explosives of Concern
mm	millimeter
mph	Miles per hour
MR	Munitions response
MRS	Munitions Response Site
mV	Millivolt
nT	NanoTeslas
ODDS	Ordnance Detection and Discrimination Study
PDA	personnel data assistant
QA	Quality assurance
QC	Quality control
QCP	Quality Control Plan
RTK	Real Time Kinematic
SSWP	Site Specific Work Plan
USACE	U.S. Army Corps of Engineers
UXO	Unexploded Ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist

1.0 Introduction

This digital geophysical mapping (DGM) Quality Control Plan (QCP) details the quality requirements to be employed to perform DGM for munitions response (MR) covered under the Site-Specific Work Plan (SSWP) (Shaw, 2006). This addendum to the SSWP was developed to augment the Quality Control (QC) program which is described in SSWP QCP and defined by Data Item Description (DID) MR-005-11. This addendum will be referred to as the DGM QCP, to distinguish it from the SSWP QCP and SSWP Geophysical Investigation Plan (GIP) it supports.

The QC program will be administered by the Unexploded Ordnance Quality Control Specialist (UXOQCS) and the QC Geophysicist. All work will be conducted in accordance with the SSWP and established Total Environmental Restoration Contract technical and administrative procedures. Referenced QC forms are included in Appendix F of the SSWP.

QC activities applicable to non-DGM and intrusive activities are not repeated here.

2.0 Quality Control Personnel Organization and Responsibilities

The overall project organization and reporting structure is presented in Technical Management Plan of the SSWP. QC personnel, organization, qualifications, and responsibilities relevant to DGM are addressed in more detail in this section.

2.1 Unexploded Ordnance Quality Control Specialist

The UXOQCS is responsible for planning and executing QC oversight of project operations, and ensuring compliance with specified QC requirements as detailed in the SSWP QCP.

2.2 Project Geophysicist

The Project Geophysicist has overall responsibility for design, implementation, and management of all geophysical investigations required for the work effort. This individual shall be the project geophysicist-of-record.

2.3 Quality Control Geophysicist

The QC Geophysicist is responsible for overall geophysical survey quality control. He has a degree in geophysics and a minimum of five years of directly related geophysical experience. The Quality Control Geophysicist (QC Geophysicist) has authority to enforce the procedures detailed in this plan, including authority to stop work.

The QC Geophysicist is responsible for planning and executing QC oversight of geophysical activities and ensuring compliance with geophysical QC requirements. Specifically, the QC Geophysicist is responsible for the following:

- Reviewing and approving the qualifications of geophysical staff;
- Planning and insuring the acceptable performance and completion of all geophysical QC activities;
- Reviewing the geophysical QC and DGM data, target lists, and dig results as specified in the SSWP GIP;
- Establishing the known and blind seed item and location control program;
- Identifying quality problems and verifying that appropriate corrective actions are implemented for geophysical activities;
- Ensuring that the requisite geophysical QC records, including submittals, are generated and retained as prescribed.

The QC Geophysicist will have daily access to all geophysical QC and DGM data, but may only be present on-site intermittently as needed after the completion of the initial inspections for

geophysical activities. The QC Geophysicist will report to the Project Geophysicist and liaison with and support the UXOQCS.

3.0 DGM Data Quality Objectives

3.1 MEC Detection DQO

The goals for munitions and explosives of concern (MEC) detection are based upon proper execution of the most appropriate geophysical technology as determined in the Ordnance Detection and Discrimination Study plot (ODDS) survey. The performance objective is to locate all MEC and MEC-like targets equivalent to the diameter of 37 millimeter (mm) or larger and approximately to a depth of 11 times the MEC item's diameter, which should be detectable to at least 16-in (ODDS Table 5-17). Actual site-specific detection depths may vary within the survey area based on specific circumstances as described in the SSWP GIP.

3.2 General Data Quality Objectives

The following data quality objectives (DQOs) are believed to provide sufficient metrics to quantify the quality of the data collected at the Munitions Response Site 16 Site (MRS-16). It is stressed that these DQOs are intended as objectives only, and will be used to monitor and evaluate the quality of data collected.

- ***Background Noise Based on Leveled Survey Data Set.*** A DQO for background noise will be established by the Project Geophysicist, in consultation with the U.S. Army Corps of Engineers (USACE), based on site-specific and deployment-system-specific performance demonstrated in the ODDS survey. Previous work by Parsons identified the picking threshold above background levels of 3 milllivolt (mV) in EM61 MK2 channel 3 data, and 3 nano teslas (nT) for the G858 magnetometer. As specified in the geophysical prove-out (GPO) for MRS-16 the Sum 4 data will be used (Sum of 4 EM61 MK2 channels). A picking threshold of 14 mV was established for Sum 4 data. The data from MRS-16 will be clipped such that any measurements that are well above the background noise will not be included in the calculation of statistics. The clipping value(s) will be recorded.
- ***EM61 MK2 Velocity.*** Maintain velocity less than 3 miles per hour (mph) for the towed array and single cart system. The mean speed will be documented along with the standard deviation of the mean speed.
- ***Along Track Sampling.*** Less than 0.6 feet with cumulative gaps along line less than 2 percent of line distance.
- ***Across Track Sampling.*** Less than 2.0 feet, excluding data gaps due to trees or other obstacles that preclude the survey platform from providing complete coverage. This metric is intended to control data gaps associated with inconsistent track plots that are not associated with trees or other obstructions. For the purposes of this project, the deviation should not exceed 50 percent of the line spacing (1 foot) and no single gap will exceed 4 square feet excluding those caused by an obstruction.

- ***Latency Correction.*** No visible chevron effects in the data or pseudo-color plots. The use of appropriate color scaling will be maintained throughout the project.

- ***Data Leveling.*** Consistent parameters and processing methods will be used for all channels within each dataset. Consistent processing routines will be used for all datasets throughout the project.

- ***Systematic Noise.*** Data will be representative with no systematic or sporadic system noise related to environmental factors such as debris attached to the towed array or water in cable connections. etc.

- ***Anomaly Selection.*** The anomaly selections will be accepted by the Project Geophysicist or his/her designated assistants. These individuals will verify that all anomaly selections for a given dataset are reasonable and should identify all MEC or MEC-like items in accordance with ODDS survey results and the GPO report established by Shaw.

- ***Positioning Errors.*** Cumulative navigation positioning errors are not to exceed 2.0 feet. A functionality test will be performed each morning and evening to quantify the accuracy of the positioning/navigation system.

- ***Known Location QC Items***. At least one known location item must be surveyed each day. Temporary "hubcap test" QC locations can be used for that function as needed to meet the frequency requirements. All known QC locations must be detected to within 2 feet of their known locations.

- ***Blind/Seed QC Items.*** All blind seed items must be detected to within 2.0 feet of their known locations. These items will be buried to the lesser of the depths that were reliably detected during the ODDS survey, or to the top of weathered bedrock. Blind QC items will not be smaller or buried deeper than those emplaced in the ODDS plot.

- ***Reacquisition.*** Reacquisition of target anomalies must be successful to within 2.0 feet of their interpreted location. Additionally, 95 percent of all anomalies must lie within a 3.0 foot radius of their original surface location as marked on the dig sheet.

All final geophysical maps and data will be in 1983 North American Datum, California State Plane coordinates, Zone 4, US survey feet, and will be coincident with the location of the geophysical survey data.

4.0 Quality Control Testing

Geophysical QC testing will be performed to ensure proper execution of all components of the work performed to detect, locate, and reacquire targets according to the performance standards as defined in the SSWP GIP. The following four-phase process will be executed to ensure quality work:

- ***Phase 1***: Establishment of a blind seed program.
- ***Phase 2***: QC of initial MEC detection, location and mapping
- ***Phase 3***: Analog safety QC surveys to validate safe removal of all MEC
- ***Phase 4***: USACE quality assurance (QA) operations

The main phases of QC testing are described in the SSWP QCP. Phase 1 and Phase 2 QC testing procedures for DGM are described below.

4.1 Blind Seeding

A blind seed program will be established by the QC Geophysicist. The QC geophysicist will plant a blind seed item for approximately every two acres. The items will consist of 2.36 inch rockets, 60 mm mortars, 37 mm projectiles, and other possible items that were used at the Fort Ord facility. The items will be buried at various depths and orientations as determined by the QC geophysicist. The items will be buried using a combination of the known maximum detection depth for each item (given the orientation) as determined in the ODDs study, and the CEHNC approximation for detection depth (11 times diameter of item).

The QC geophysicist will choose the locations of each seed item and will record: the type of MEC item; item depth; item orientation; item survey location [using (real time kinematic) RTK GPS], and any other pertinent information. Items will be located within a detectable area positioned near trees and other features as well as in open areas. Inert ordnance will be used for seed items. The items will be painted blue and will have an associated serial number which will also be recorded by the QC geophysicist.

The QC geophysicist will furnish weekly reports to the government QA geophysicist. The weekly reports will include information regarding weekly summaries of the QC data review. The report will be in bullet format and will also include production rates and all other pertinent information related to the DGM and QC process.

4.2 QC of DGM Definable Features of Work

The following basic definable features of work are anticipated for DGM for this removal action.

- Instrument Standardization
- Geophysical Survey
- Data Processing
- Target Selection and Dig List Development
- Reacquisition
- Intrusive Target Verification and Feedback
- DGM Submittal and Records Management

These work elements are described in the SSWP GIP. QC for these work elements are overseen and approved by the QC Geophysicist. All submittals are approved by the Project Geophysicist.

4.2.1 Instrument Standardization QC

Instrument standardization procedures will be performed as indicated in the SSWP GIP. QC documentation forms are located in Appendix F of the SSWP. QC tests (which are fully described in the SSWP GIP), frequency, and metrics are as follows:

- ***Equipment Warm-Up:*** Conducted each time the instrument is powered up.
- ***Record Sensor Position*:** Conducted at the beginning of the survey when using single EM 61 MK2 system. It will also be recorded and after any changes in form factor.
- ***Static Background Test*:** The test is performed twice daily, prior to collecting data and after completion of data collection, for a minimum of 3-minutes each time. Static background readings for the EM61 MK2 should remain within 2 mV) of background in channel 3. Static background readings for the G858G should remain within 1 nT of background.
- ***Static Spike Test*:** The test is performed twice daily, prior to collecting data and after completion of data collection. Readings for the EM61 MK2 response to the standard test item should not exceed 100 mV and will be preferably in the 30 to 40 mV range. For a G858G, the test item is placed on the ground centered below the sensor. At least one minute of data is recorded. Readings for the response of the standard test item should be within 20 percent after subtraction of the sensor baseline response.
- ***Personnel Test.*** The test is performed twice daily, prior to collecting data and after completion of data collection. In general, readings should remain within 2 mV (channel 3) of background.
- ***Cable Shake Test.*** The cable shake test is performed for each sensor at the beginning and end of each day. The data collected should be free from spikes greater than 2 mV (channel 3) or variations. The test will be performed by 2 people with one shaking the cable and the other monitoring the data on a computer screen. If spikes are generated

that exceed the DQO data will not be collected until the issue is resolved and the spikes eliminated (e.g., reconnect cables, replace cables, replace sensor, etc) and the DQO is met.

- ***Two-Line Repeat (Replicate) Data.*** Replicate data will be collected for each data set using a standard test item. The amplitudes of the standard test items should be within 20 percent. This test is also used for lag corrections.
- ***Azimuthal Test (magnetics only).*** This test is performed once for each system deployment.
- ***Octant Test (magnetics only).*** This test is performed once for each system deployment although typically the actual heading corrections applied to any given set of data will need to be optimized during data processing.
- ***Height Optimization (magnetics only)***. This test is performed once for each system deployment.

Standardization for geophysical mapping is ensured through adherence to standard procedures and full documentation. The following logs are used to maximize standardization, repeatability, and control of mapping activities:

- ***Sensor QC Verification Log*** (Form G-1)
- ***Navigation QC Function Log*** (Form G-2)
- ***Survey Rework Log*** (Form G-3)
- ***Dig Sheet*** (Form G-4)
- ***Data Processing Log*** (Form G-5)
- ***Crew Deployment Log*** (Form G-6)
- ***Field Activity Log*** (Form G-7)
- ***Anomaly Tracking Sheet*** (Form G-8)
- ***False Negative Report Form***. (Form G-9)

Additional function tests may be performed as the operator or QA geophysicist deems necessary. The data from each sensor will be compared with the data collected on previous days. If there is a significant change in results, the instrument will be rechecked. If the difference in data cannot be accounted for, the instrument will be taken out of service until repaired. In the event that a significant change is made to the system deployment, a GPO survey will be required prior to approving the system for full-scale mapping.

4.2.2 Geophysical Survey QC

Several survey modes can be used to collect geophysical data for the detection, location, and characterization of MEC including full surveys, grid surveys, transects, and meandering paths. For the removal at MRS-16, a full survey will be executed to acquire accurate, high-fidelity EM61 MK2 data. Full coverage will be achieved by deploying the towed array system to collect

data in sub-parallel survey lines or swaths with single EM61 MK2 sensors being deployed to fill data gaps and to access areas that were inaccessible to the towed array. All data traverses will be brought into the geographic information systems (GIS) for verification of full coverage.

Quality control procedures for Full Coverage Survey Mode at MRS-16 include the following:

- Review of the site features that may affect the survey and selection of the most appropriate system form factor for certain specific areas within MRS-16.
- Confirm that location control has been established and documented.
- Set up a replicate data line location and collect the pre-survey data line.
- Collect pre- and post-survey replicate data line to check that the equipment is functioning within survey specifications and to use for time-slew or lag calculations.
- Complete and maintain field logs to document the conditions of the data collections.
- Review all traverse data and overlay on the survey grid layout as QC and to identify any missed areas.

4.2.3 Data Processing QC

Data processing methods and procedures are described in the SSWP GIP.

4.2.3.1 Data Pre-Processing and QC Review of Data Sets

The data interpretation process begins by verifying the validity of the collected data sets. This will be accomplished by reviewing the associated QC data, insuring that the sensor and navigation equipment are functioning properly, that the data are accurately positioned along the predetermined survey lines, that they match the site dimensions, and properly fit within the predefined survey site. All validation results will be noted in the Data Processing Log (Form G-5) and briefly summarized in the weekly bullet reports to the government QA personnel.

4.2.3.2 Review of Field QC Data

Vendor-supplied software will be used to make initial review of the data. This step validates that the data collected fall within prescribed recording ranges, and that no data outliers or null-values are present. Data statistics will be developed to measure compliance with the DQOs.

- ***Review of Sensor QC Data.*** Sensor QC test results (equipment warm-up, sensor position, static background and spike tests, cable shake test, personnel test) will be reviewed to ensure proper sensor function. Background, spike, reproducibility (precent change in spike data) and position test data will be recorded in a spreadsheet and monitored for long-term shifts that might indicate developing sensor issues. This step validates that the data collected fall within prescribed recording ranges, background noise and signal-to-noise-ratios fall within acceptable ranges, and that standard responses to known items are consistent with known values. Minimum,

maximum, mean, and standard deviations of the pre- and post-survey Sensor QC tests will be calculated and reported into the Sensor QC Verification Log (Form G-1). Standard values and ranges will be determined, in consultation with USACE, based on the GPO results.

- ***Review of Navigation QC Data.*** Vendor-supplied software will be used to make initial review of the navigation QC and to ensure that the RTK GPS is functioning properly. Navigation offset distances will be calculated based on the test results and compared to the DQO objectives. The QC location and blind seed item locations will be reviewed. Navigation QC data parameters will be entered into the Navigation QC Function Log (Form G-2).

4.2.3.3 Initial Data Review and Preprocessing

The DGM data will be initially reviewed by a qualified geophysicist for accuracy, completeness, and data fidelity and to verify that the data are complete and fall within the prescribed survey area. This process is overseen and approved by the QC Geophysicist. The data review QC steps will include the following:

- ***Coverage Assessment.*** To verify that complete coverage has been achieved during survey activities, all navigation traverses will be reviewed and documented during the data processing and analysis steps. The areas surveyed and areas missed will be calculated and documented on the Navigation QC Function Log (Form G-2). If missed surveyable areas are present, Survey Rework Form (Form G-3) will be completed and provided to the Site Geophysicist.

- ***Review of Data Processing Performed.*** The QC geophysicists will verify the data editing and processing steps performed as appropriate.

- ***Site Feature Check.*** The QC geophysicist will to examine the data with respect to site cultural or natural features (wells, trees, utilities, etc.) observed on site or mapped in the GIS.

- ***Analysis of Data Sampling.*** Data sampling statistics will be calculated and entered on the Navigation QC Function Log (Form G-2). These statistics include: along-track and across-track data spacing, area surveyed, and area of data gaps. Along-track sampling error will be less than 0.6 feet and the velocity should not be greater than 3 mph. Across-track sampling error will be 2 feet or less excluding data gaps due to trees or other obstacles that preclude the survey platform from providing complete coverage. In areas where the towed array cannot be deployed the single, man-portable EM61 will be used to fill gaps. This metric is intended to control data gaps associated with inconsistent track plots that are not associated with trees or other obstructions. For the purposes of this project, minor occurrences will be accepted if they do not exceed 50 percent of the line spacing and individual gaps do not exceed 4 square feet.

- ***Analysis of Replicate Data.*** The pre-and post-survey replicate data lines will be reviewed for each data set. Data sampling statistics will be calculated in Geosoft and

entered on the Navigation QC Function Log (Form G-2). The amplitudes of the responses over standard test items should be within 20 percent, the location accuracy should be within 2.0 feet, and the latency calculation should correlate with the Navigation Function Test results.

4.2.3.4 Data Processing

The DGM data will be processed by a qualified geophysicist for accuracy, completeness, and data fidelity and to verify that the data are complete and fall within the prescribed survey area. This process is overseen and approved by the QC Geophysicist. The data review QC steps will include review of the Data Processing Logs (Form G-5), confirmation that the appropriate data processing steps were performed, review of any exceptions and corrections, confirmation that the data files conform to specifications, and confirmation that resultant geophysical maps are reasonable and that all cultural and site features were appropriately mapped and annotated.

4.2.4 Target Selection and Dig List Development QC

Target selection and dig list development is described in the SSWP GIP. Targets are detected via a two-step process: (1) initial automated detection based on threshold analyses using Geosoft UX-Detect software, and (2) operator-aided detection, revision, and review by a qualified geophysicist. A target threshold of 14 mV in the sum channel will used based on Shaw's test surveys at the ODDS plots. The steps of the target detection process are documented in the Data Processing Log (Form G-5) to facilitate replication of the target analysis results during QC. The target selection and dig lists will be reviewed by the QC geophysicist and approved by the Project Geophysicist for posting. The QC review will ensure the following:

- Target selections are reasonable and consistent with the selection criteria developed in the GPO report;
- Non-target exceptions and anomalies (cultural features, corner hubs, saturated response areas, unsurveyable areas, etc.) are documented;
- The Dig Sheet (Form G-4) contains all fields and information specified in the SSWP GIP;
- The appropriate permanent and semi-permanent location control and seed items have been detected in the appropriate locations. A QC failure will result if a seed item is not detected or is not detected within 2 feet of its known location during the geophysical mapping and evaluation.

4.2.5 Target Location Reacquisition QC

Dig Sheet (Form G-4) targets must be reacquired prior to excavation. For electro magnetic data, target anomalies peak locations are reacquired in the field. Reacquisition, which is described in the SSWP GIP, consists of locating the position of the target based on the coordinates in the dig

list and the refining of the location by finding the location of the target peak response using the EM61-MK2. This reduces measurement errors and provides a QC ground check for the dig locations.

An Anomaly Tracking Sheet (ATS) will be used to record discrepancies between the dig sheet location and the actual reacquired location, and to note any anomalies that could not be reacquired. The reacquisition location will be measured and logged. The reacquisition coordinates will be used as the official dig location for location QC assessment.

The QC Geophysicist will review the reacquisition data on the ATS (Form G-6) and approve prior to releasing the Dig Sheet (Form G-4) for intrusive investigation. Per DID MR-005-05 (USACE, 2003), 95 percent of all anomalies must lie within a 1-meter radius of their original surface location as marked on the dig sheet.

4.2.6 Intrusive Target Verification and Feedback Process

The feedback of ground-truth excavation data via the ATS (Form G-8) and the Dig Sheets (Form G-4) is one of the most important ways to ensure effective geophysical mapping. After anomaly locations have been reacquired, the following procedures will be used for the intrusive verification and reporting of the selected target anomalies. The Senior Unexploded Ordnance Supervisor will assign a Unexploded Ordnance (UXO) team to excavate and identify the anomaly and record the required information on a personal data assistant (PDA)-based Excavation Log Sheet per Attachment C of DID MR-005-05 (USACE, 2003). Excavation data collected during each intrusive activity will be captured to document dig results and recovery data on any MEC items encountered. These data will be electronically entered into a ground-truth database and the MEC item database.

Excavation results for each MEC removal grid will be reported to USACE within three working days of grid completion. The QC Geophysicist will review the excavation results with respect to the anomaly selection criteria, QC dig results, actual MEC encountered, and any DQO performance criteria failures and provide a weekly progress report with recommendations to the USACE.

4.2.6.1 Intrusive Excavation (Dig) Clearance

After the UXO team has completed the excavation, the geophysical reacquisition team will return to the excavation location and record the post-excavation anomaly peak values to QC test that the source of the anomaly has been removed or appropriately identified as an approved exception (such as an immovable cultural feature). Every excavation within a given grid will be QC tested. The same geophysical instrumentation used to obtain geophysical data and generate geophysical maps will be used for the geophysical QC testing. Data will be obtained in real-time

and the sensor data will be noted and recorded on a PDA-based QC form. If the sensor data are determined to be within the background range, as determined by the Site Geophysicist, or an approved clearance exception is identified, the QC test is completed and the excavation can be backfilled. If the sensor data are determined to be above background range and no approved clearance exception is identified, the excavation will continue down to the clearance depth.

4.2.6.2 False Positives

False positives are reacquired anomalies that result in no detectable metallic material during excavations. False positives will be kept to a minimum as per the work plan (DGM processing). If any false positives are encountered a written response explaining the reason for the excessive false positive rate, and a Corrective Action Plan, if appropriate, will be submitted within 10 days.

4.2.6.3 False Negatives

A false negative is defined as a target not detected or listed on the Dig Sheet. (Form G-4) False negatives are difficult to identify, as they are undetected targets. These targets can be identified during reacquisition where new anomalous signatures are identified in the field. Additionally, false negatives can be identified during execution or other site activities such as MEC removals and other excavation activities. False negatives will also be assessed via the use of known location and blind QC targets. In any of these cases, the following procedures will be performed:

- A False Negative Report Form (Form G-9) will be completed by the Site Geophysicist and submitted to the QC Manager with copies provided to the Project Manager.
- The QC Manager will forward this information to the UXOQCS, who will investigate and provide a memo report describing the activities associated with the discovery. This report will also provide recommendations for further action. Technical information for this memo will be provided from the QC Geophysicist and Site Geophysicist.

4.2.7 Geophysical Data Management QC

Data management and procedures for all phases of work are described in the SSWP.

On-site DGM field data and logs are maintained by the Site Geophysicist. On-site records will be periodically audited by the UXOQCS or the QC Geophysicist for compliance with data completeness, back-up/archive status, and organization as specified by the SSWP GIP.

Off-site DGM processed data, mapping data, target lists and tracking information, interim deliverables, and QC documentation are maintained and tracked on the project internet-based sharepoint/file transfer protocol site. These records will be tracked and periodically audited for completeness and content by the QC Geophysicist as specified by the SSWP GIP.

Geographic information system data and maps are managed by the GIS Manager in accordance with the SSWP requirements.

5.0 Corrective Measures

The objectives of the geophysical investigations are to accurately locate and record the location of anomalies (potential MEC). In the event of a DQO failure, Shaw's Project Geophysicist and QC Geophysicist will perform a root-cause analysis to identify the reason for the failure, to identify how much data has been affected, and whether corrective actions can be taken to correct, mitigate, or eliminate the cause of the failure. This will include examining the ability to meet the metric for any DQO where the data was collected. The root-cause analysis will be submitted to the USACE QA Geophysicist.

In the event that a particular geophysical method, instrument, or procedure is not generating meaningful results or advancing the project goals, Shaw will convene a review team consisting of the Shaw's Project Manager, Project Geophysicist, and QC Geophysicist and appropriate USACE personnel by the next working day to investigate the cause and recommend corrective action.

Basic corrective measures will be implemented as part of day-to-day activities (i.e., replacing faulty equipment). USACE will receive written notification of all actions taken. If an instrument or process cannot be corrected to meet a DQO, Shaw will cease using that instrument or process and make recommendations to USACE. These recommendations may include modifications to the GIP. Shaw will implement the amended plan upon approval from USACE.

Specific corrective measures are dependent on the type of geophysical equipment used during an operation. However, the following are the basic corrective measures Shaw will employ for DGM:

- Replace sensors if they fail to meet calibration requirements;
- Replace navigation equipment if daily check of location accuracy is not met;
- Re-survey grids when data quality specifications are not met;
- Re-excavate targets if Site Geophysicist determines that the excavated targets are not associated with the initial target anomaly.

6.0 Reporting

6.1 Interim Reporting and Submittals

All digital data will be provided in formats compatible with the USACE requested format. Interim data will include the following:

- Draft and final geophysical data for all data sets with appropriate headers to identify survey and processing specifics and column identifiers;
- All raw, interim, and processed XYZ and grid files, with associated README files
- Grid data and QC reports for all MEC removal grids;
- Draft and final anomaly lists for all MEC removal grids;
- Dig lists and relocation coordinates for all MEC removal grids;
- Anomaly excavation reports for all MEC removal grids;
- QA dig lists and excavation reports for all MEC removal grids.

The QC Geophysicist will review interim submittals for completeness and accuracy, as well as compliance with the file formats, file headers, coordinate systems, and associated file documentation specified in the SSWP GIP. All interim deliverables will be approved by the Project Geophysicist.

7.0 Supplemental References

Shaw Environmental (Shaw), 2006. *Work Plan, MRS-16 Munitions and Explosives of Concern Removal, Former Fort Ord, California*

U.S. Army Corps of Engineers (USACE), 2003. *Ordnance and Explosives Digital Geophysical mapping Guidance – Operational Procedures and Quality Control Manual (DGM QC Guidance), Draft Document*. Prepared by NAEVA Geophysics, Inc. December 2003.