

Appendix B

Field Work Variances

FIELD WORK VARIANCE

Project Name/Number	Fort Ord / 846075	CTO/WAD	CTO 16 / WAD 06
Applicable Document:	Draft Final Work Plan, MRS-16		Date: 12/27/06
Munitions and Explosives of Concern Removal, Former Fort Ord, California, August 2006, Revision 1			

Problem Description:
 Digital Geophysical Mapping (DGM) is to be performed at MRS-16 with the intent to identify anomalies for subsequent excavation by UXO Team. Current plan for field work is to conduct Schonstedt-assisted surface removal over the entire site prior to DGM. Approximately 13.5 acres of the site (See Figure 1) contains significant metallic debris on the surface. If there is significant debris in the subsurface, this may preclude identification of distinct anomalies by DGM. Current Work Plan text reads as follows: *In areas where anomaly density is high as shown by the initial DGM, mag and dig or dig and sift operations may be conducted to locate and remove subsurface anomalies prior to the second DGM survey.*

Recommended solution:
 This FWV proposes to perform a magnetometer assisted subsurface removal in selected grids prior to DGM. Production rate and cost data will be collected to evaluate whether the magnetometer assisted subsurface removal improves cost efficiency compared with grids where only surface removal is conducted prior to DGM.

Impact on present and completed work:
 Should have minor impact on MRS 16 cost and schedule. Results may indicate most cost effective solution for similar future sites.

Requested by: Kevin Siemann

Recommended revisions to the plan: Conduct magnetometer assisted surface and subsurface removal in 23 grids (See Attachment 1) within the approximately 13.5 acres prior to DGM implementation. Subsurface removal may allow for better mapping of distinct anomalies during initial DGM phase.

Technical Scope
 A new approach is going to be used in the MMRP clean-up effort at Ft Ord's MRS-16. The goal is to use a surface sweep to perform an initial clearance then to apply a dynamic and iterative DGM and reacquisition protocol to remove all detected subsurface anomalies equivalent to, or greater than that characteristic of the smallest MEC. The iterative approach is designed to focus on the most contaminated areas with a footprint reduction between each phase. It is assumed that at least 2 or 3 phases of DGM surveys will be required to achieve clean-up standards. The basis behind this approach is that past operations demonstrated the high costs associated with analog clearance to depth and noted that there was a limited reduction in the total number of anomalies that passed through to DGM activities. Due to the size of MRS-16, it was determined that this range is an ideal site to evaluate the cost effectiveness of such a repeat DGM process.

At the initiation of the project, a comparative analysis is to be performed in the most contaminated 13.5 acres of the site. The grids in this area have been divided roughly in half. Half the grids are to be initially analog cleared to depth while the other half is to be surface cleared. Once completed, both sets of grids will be subjected to the iterative DGM approach. Production time, including all man hours associated with analog and DGM operations will be tracked by grid and grid type (analog to depth vs. surface sweep). Sweeps and analog clearance operations will focus on grid-types and not work on multiple grid types during the same day to aid in tracking costs. DGM data will be collected in grid blocks where all grids within a block are of a unique grid type. Thus, as data is processed, targets picked and reacquired, the activities and times involved are automatically accounted for by grid type (and as a function of initial data acquisition). Following completion of the 13.5-acre clean-up data regarding all labor efforts associated with the analog clearance, surface sweep, DGM activities and digital reacquisitions will be compiled by grid and a cost comparison performed.

Personnel
 Current field personnel will conduct work addressed in this FWV.



Shaw Environmental, Inc.

Field Work Variance No. TII-016
Page 2 of 2

Clarification Minor Change Major Change

Affects Budget Yes No X

Affects Schedule Yes X No

Signature [Signature] Date 12/12/06
Technical Reviewer

Shaw Approvals:

Signature [Signature] Date 12-12-06 Signature [Signature] Date 12/12/06
SUXOS Project Manager

Signature [Signature] Date 12-12-06
UXOQCS

USACE Approval: If Major Change:

Signature [Signature] Date 12/27/06 Signature [Signature] Date 12/27/06
OE Safety Specialist USACE COR or TM

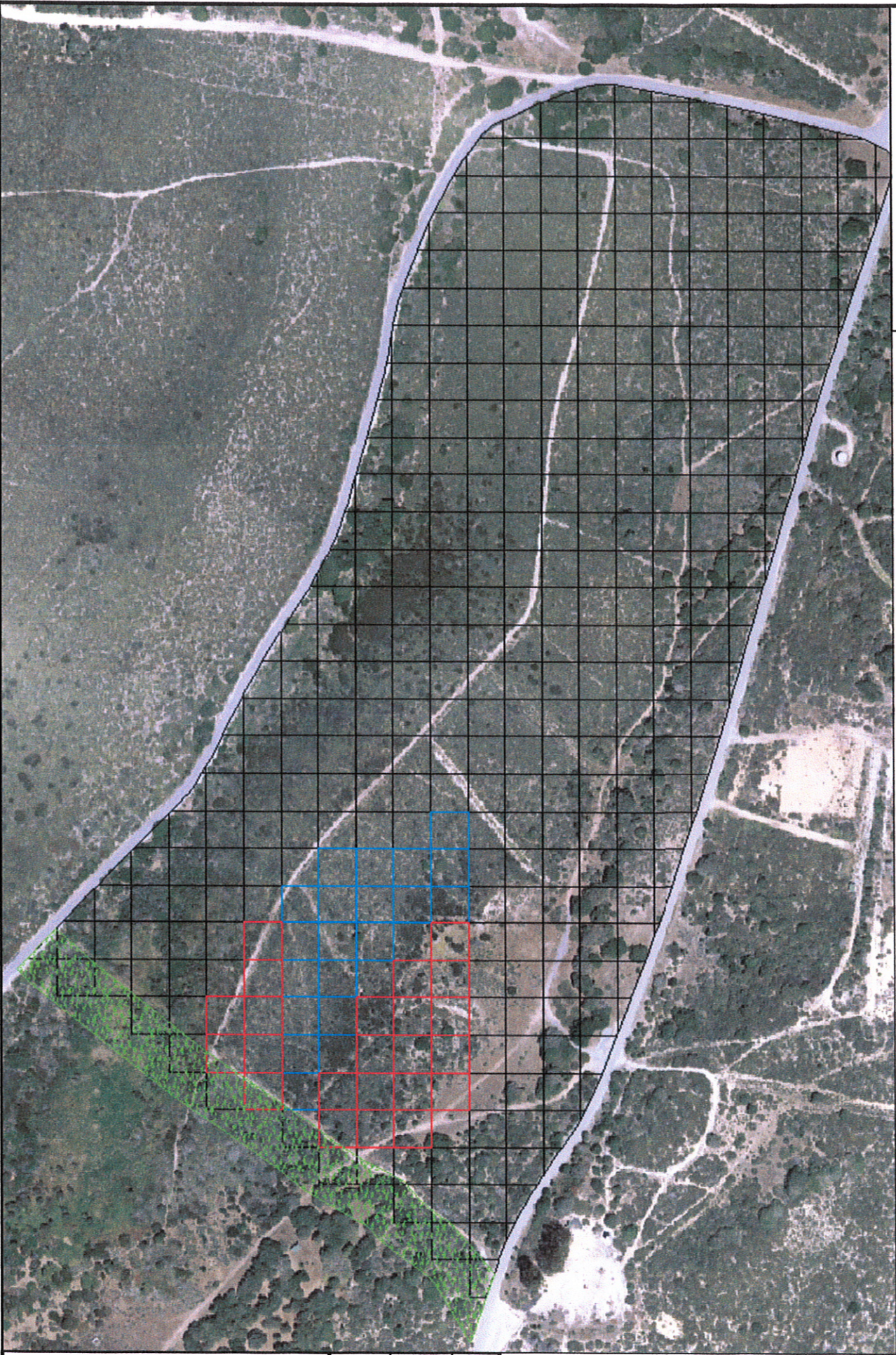
Attachment 1

DGM GRIDS

C3A2H1
C3A2H2
C3A2H3
C3A2H4
C3A2H5
C3A2H6
C3A2G2
C3A2G3
C3A2G4
C3A2G5
C3A2G6
C3A2G7
C3A2F4
C3A2F5
C3A2F6
C3A2F7
C3A2E5
C3A2E6
C3A2E7
C3A2D6
C3A2D7
C3A2D8

ANALOG GRIDS

C3A1G0
C3A2G1
C3A1F0
C3A1E0
C3A2F1
C3A2F2
C3A2F3
C3A2E1
C3A2E2
C3A2E3
C3A2E4
C3A2D1
C3A2D2
C3A2D3
C3A2D4
C3A2D5
C3A2I1
C3A2I2
C3A2I3
C3A2I4
C3A2I5
C3A2J2
C3A2J3



- SURFACE/DGM
- SURFACE/MAG & DIG/DGM
- FIRE BREAK



FIGURE 1
MRS 16 BOWL GRIDS
 - FT. ORD, CA -



REFERENCE/PROJECTION: NAD83 STATE PLANE CA N
 OFFICE
 DRAWN BY
 DRAWING NUMBER
 FT. ORD
 T. Smith
 12/11/2016
 PRJ_846075_Fig1BowlGrids.mxd



Shaw Environmental, Inc.

Field Work Variance No. TR-016
Page 2 of 2

Clarification Minor Change Major Change

Affects Budget Yes No

Affects Schedule Yes No

Signature [Signature] Date 12/20/06
Technical Reviewer

Shaw Approvals:

Signature [Signature] Date 12-21-06 Signature [Signature] Date 12/21/06
SUXDS Project Manager

Signature [Signature] Date 12/21/06
UXOQCS

USACE Approval: If Major Change:

Signature [Signature] Date 12/21/06 Signature [Signature] Date 12/27/06
OE Safety Specialist USACE COR or TM

FIELD WORK VARIANCE

Project Name/Number	Fort Ord / 846075	CTO/WAD	CTO 16 / WAD 06
Applicable Document:	Draft Final Work Plan, MRS-16 Munitions and Explosives of Concern Removal, Former Fort Ord, California, August 2006, Revision 1		Date: 03/07/07

Problem Description:
 Tree canopies at MRS-16 preclude Digital Geophysical Mapping because GPS signal is lost when EM-61 array enters canopy areas.

Recommended solution:
 Implement recommended revisions to the plan outlined below.

Impact on present and completed work:
 Will allow completion of areas where GPS signal loss precludes use of EM-61 towed array and man portable unit for DGM mapping.

Requested by: Marty Miele

Recommended revisions to the plan:
 In order to conduct clearance under the tree canopy at MRS 16 the following approach will be utilized. Site personnel will mark the boundary where the RTK GPS starts to falter around the tree canopy at a given site with a pin flag. This can be determined during data processing and can be verified in the field. Assurances will be made that the boundary lies within good GPS coverage. Once a given tree canopy area is marked and delineated, a geophysicist or UXO personnel will use the EM61 MK2 in real time to locate and excavate anomalies under the tree canopy. This will all be documented on the field excavation forms. The procedure for this operation is outlined below along with the general and pertinent DQOs that apply.

Procedures and Metrics for Clearance of Tree Canopy Areas at MRS 16 Using the EM61 MK2 in Real Time.

- 1.) Delineate the edge of coverage using the DGM GPS data. The marked location should be just inside (approximately 2 feet) good GPS coverage to ensure overlap of detections.
- 2.) The clearance will be conducted on a grid by grid basis (or partial grid basis).
- 3.) Straight ropes will be used for guidance of each "lane of detection". The ropes will be positioned such that the lanes will be parallel and will not exceed 2 feet between lanes (2 foot centers).
- 4.) The lanes will be numbered in increasing order from west to east (or south to north) and the orientation of the parallel lanes will be recorded.
- 5.) The EM61 MK2 operator will use the instrument in real time at the maximum frequency (10 hertz or greater) and will use the data logger to monitor anomaly magnitude.
- 6.) The operator will walk with the EM61 MK2 at a velocity less than 3 miles per hour. The operator will walk along each lane and will progress along the lanes in a sequential manner (from one parallel lane to the next).
- 7.) The operator will either center the EM61 Mk2 over the rope and maintain this position along the extent of the lane.
- 8.) The operator will monitor the data logger and each anomaly that is detected at 14 mV (Sum of 4 channels) will be flagged in the field.
- 9.) When an anomaly is located the operator will precisely locate the position by running short, orthogonal transects and place a pinflag over the anomaly peak. Once the pin is located, the operator will relocate the EM61 over the line marking the lane and resume the transect.
- 10.) After all of the flags are located in a given grid (after conducting the lane detections) each anomaly will be excavated and all pertinent information will be recorded as per the "normal excavations" from reacquisition anomalies.
- 11.) The approximate location of each anomaly will be recorded (per each numbered lane).



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Field Work Variance No. TII-017

Page 2 of 2

Affects Budget Yes No X
Affects Schedule Yes No X

Signature [Signature] Date 3/8/07
Technical Reviewer

Shaw Approvals:

Signature [Signature] Date 3-8-07
SUXOS

Signature [Signature] Date 3/8/07
Project Manager
for PCK w/ permission

Signature [Signature] Date 3-8-07
UXOQCS

USACE Approval: If Major Change:

Signature [Signature] Date 3/8/07
OE Safety Specialist

Signature [Signature] Date 3/2/07
USACE COR or TM

FIELD WORK VARIANCE

Project Name/Number Fort Ord / 846075 CTO/WAD CTO 16 / WAD 06
 Applicable Document: Draft Final Work Plan, MRS-16 Date: 04/13/07
 Munitions and Explosives of Concern Removal, Former
 Fort Ord, California, August 2006, Revision 1

Problem Description:

QA seed Ord QA29 was detected and recovered on 3/15/07. This seed was planted as a double seed with a second seed buried 6" below. The second seed, Ord QA08 is a 37mm planted horizontally that was buried below QA29. QA08 by itself is undetectable from the surface but should have been detectable with a Schonstedt from the bottom of the hole when QA29 was removed.

Recommended solution:

Discussions of problem resolution included checking bottom of each excavation hole with Schonstedt after anomaly excavation. Based upon discussions with USACE geophysicist and U.S. Army MMRP Manager, implementation of this proposed solution was determined to be unnecessary. Decision was made to continue to QC excavations with only EM-61 where EM-61 was the tool used to detect anomaly initially. After excavation and subsequent QC check with EM-61, holes can be backfilled immediately.

Impact on present and completed work:

Essentially entails following Work Plan as initially written. No impact on present and completed work.

Requested by: Marty Miele

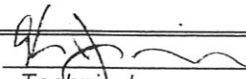
Recommended revisions to the plan:

None.

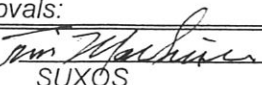
Clarification Minor Change Major Change

Affects Budget Yes No X

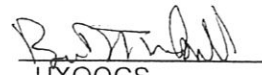
Affects Schedule Yes No X

Signature  Date 4/13/07
 Technical Reviewer

Shaw Approvals:

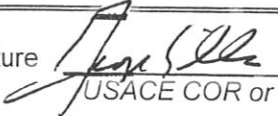
Signature  Date 4-13-07
 SUXOS

Signature  Date 4/15/07
 Project Manager

Signature  Date 4/13/07
 UXOQCS

USACE Approval: If Major Change:

Signature  Date 4/13/07
 OE Safety Specialist

Signature  Date 4/13/07
 USACE COR or TM

FIELD WORK VARIANCE

Project Name/Number	Fort Ord / 846075	CTOWAD	CTO 16 / WAD 06
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Applicable Document: Draft Final Work Plan, MRS-16
Munitions and Explosives of Concern Removal, Former
Fort Ord, California, August 2006, Revision 1

Problem Description:

Tree canopies at MRS-16 preclude Digital Geophysical Mapping because GPS signal is lost when EM-61 array enters canopy areas.

Recommended solution:

Implement recommended revisions to the plan outlined below. This FWV supersedes FWV 017.

Impact on present and completed work:

Will allow completion of areas where GPS signal loss precludes use of EM-61 towed array and man portable unit for DGM mapping.

Requested by: Marty Miele

Recommended revisions to the plan:

In order to conduct clearance under the tree canopy at MRS 16 the following approach will be utilized. Site personnel will mark the boundary where the RTK GPS starts to falter around the tree canopy. This can be done by using field PDAs loaded with a gridded map of the entire site geophysical coverage or a shape file approximation of the coverage. The PDAs, connected to the RTK GPS, will allow the GPS operator to observe his location on the PDA map. The GPS operator will then walk a minimum of 5 feet within the known geophysical coverage and record his path around the outside of the tree canopy (within the DGM). Pin flags will be inserted at the appropriate intervals outline the boundary for coverage under tree canopy for the field teams. Once a given tree canopy area is marked and delineated trained UXO personnel will use the EM61 MK2 in real time to locate and excavate anomalies under the tree canopy. This will all be documented on the field excavation forms. The procedure for this operation is outlined below along with the general and pertinent DQOs that apply.

Procedures and Metrics for Clearance of Tree Canopy Areas at MRS 16 Using the EM61 MK2 in Real Time.

- 1.) Delineate the edge and mark the boundary of area to be surveyed as per above. The marked location should be just inside (approximately 5 feet) good DGM GPS coverage to ensure overlap of coverage.
- 2.) The clearance will be conducted on a grid by grid basis (or partial grid basis).
- 3.) Straight ropes will be used for guidance of each "lane of detection". The ropes will be positioned such that the lanes will be parallel and will not exceed 3 feet between lanes (3 foot centers).
- 4.) The EM61 MK2 operator will use the instrument in real time at the maximum frequency (10 hertz or greater) and will use the data logger to monitor anomaly magnitude. Complete coverage beneath the trees will be conducted (excluding any surface objects or tree trunks which preclude coverage). The operator will walk along each lane and will progress along the lanes in a sequential manner (from one parallel lane to the next).
- 5.) The operator will monitor the data logger and each anomaly that is detected at 14 mV (Sum of 4 channels) or 4 mV (Channel 3) will be flagged in the field.
- 6.) When an anomaly is located the operator will precisely locate the position by running short, orthogonal transects and place a pinflag over the anomaly peak. Once the pin is located, the operator will relocate the EM61 over the line marking the lane and resume the transect.
- 7.) After all of the flags are located in a given grid (after conducting the lane detections) each anomaly will be excavated and all pertinent information for MEC will be recorded as per the "normal excavations" from reacquisition anomalies. Local coordinates that will later be converted to California Coordinates may be used to record MEC item locations. Number of digs and MD pounds will be recorded per grid.



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Field Work Variance No. TII-020
Page 2 of 2

Clarification Minor Change Major Change

Affects Budget Yes No X
Affects Schedule Yes No X

Signature [Signature] Date 5/7/07
Technical Reviewer

Shaw Approvals:

Signature [Signature] Date 5/7/07 Signature [Signature] Date 5/7/07
SUXOS Project Manager
Signature [Signature] Date 5/7/07
UXOQCS

USACE Approval: If Major Change:

Signature [Signature] Date 5/8/07 Signature [Signature] Date 5/9/07
OE Safety Specialist USACE COR or TM

FIELD WORK VARIANCE

Project Name/Number Fort Ord / 846075 CTO/WAD CTO 16 / WAD 06
 Applicable Document: Draft Final Work Plan, MRS-16 Date: 05/18/07
 Munitions and Explosives of Concern Removal, Former
 Fort Ord, California, August 2006, Revision 1

Problem Description:

A "noisy area" exists along the northern boundary of MRS-16. This area is subject to electromagnetic external noise (both high and low frequency), the cause of which is unknown. A list of all grids affected by this phenomenon is attached to this FWV. Approximately half of the grids listed are just partial areas within those grids. The processing geophysicist will make a judgement (background removal) regarding how to process the "partial grids" before the field implementation of this solution (as referenced below).

Recommended solution:

Several processing techniques have been tested to resolve the situation described above and a white paper (available upon request) outlines the tests that were implemented. As a result of the testing it was concluded (with concurrence from government QA) that the problem is best handled during reacquisition in the field. However, a different background removal or leveling technique for the data within the noisy area will be implemented to remove the low frequency electromagnetic noise.

Impact on present and completed work:

Will allow completion of anomaly investigation within the "noisy area."

Requested by: Marty Miele

Recommended revisions to the plan:

As referenced in the white paper, anomalies reacquired from 0 to 8 mV yielded no source. Therefore, any anomaly that is reacquired at 8 mV or less will not be excavated. Ten percent of the anomalies that are reacquired from 8 to 10 mV will be excavated. Although none of the anomalies in this range yielded sources during the field testing, they will be considered QC excavations. All anomalies with reacquisition values above 10 mV will be excavated. This approach will minimize cost and schedule impacts on anomalies caused by external noise. Because of the external noise in these areas, excavations will be conducted beneath the flag only and the 3 foot radius surrounding the hole will not be checked for anomalies between 10 and 14mV. Excavations will cease at 2 feet.

Clarification Minor Change Major Change

Affects Budget Yes No X

Affects Schedule Yes No X

Signature [Signature] Date 5/18/07
 Technical Reviewer

Shaw Approval:

Signature [Signature] Date 5/18/07
 SUXOS

Signature [Signature] Date 5/18/07
 Project Manager
 P. PCK



Shaw Shaw Environmental, Inc.

Field Work Variance No.

TII-021

Page 2

of

2

Signature

[Handwritten Signature]

Date

5/18/07

UXOQCS

USACE Approval: If Major Change:

Signature

[Handwritten Signature]

Date

5/21/07

Signature

[Handwritten Signature]

Date

5/22/07

OE Safety Specialist

USACE COR or TM

Grid	Note:	Grid	Note:
C3B2A3	Partial	C3A3G5	Trees
C3B2B3		C3A3C6	Partial
C3B2A4		C3A3D6	
C3B2B4		C3A3E6	
C3B2C4		C3A3F6	Trees
C3A2J5	Partial	C3A3G6	Trees
C3B2A5		C3A3B7	Partial
C3B2B5		C3A3C7	
C3B2C5		C3A3D7	
C3B2D5		C3A3E7	
C3B2E5		C3A3F7	Trees
C3A2J6		C3A3B8	Partial
C3B2B6		C3A3C8	
C3B2C6		C3A3D8	
C3B2D6		C3A3E8	Trees, Partial
C3A2J7	Partial	C3A3B9	
C3B2A7		C3A3C9	
C3B2B7		C3A3D9	
C3B2C7	Trees	C3A3E9	Trees, Partial
C3A2J8		C3A3B0	
C3B2A8		C3A3C0	
C3B2B8	Trees	C3A3D0	
C3A2I9	Partial	C3A3E0	Partial
C3A2J9		C3A4B1	
C3B2B9		C3A4C1	
C3A2H0	Partial	C3A4D1	
C3A2I0		C3A4A2	Partial
C3A2J0		C3A4B2	
C3A3G1	Partial	C3A4C2	
C3A3H1	Partial	C3A4D2	Partial
C3A3I1		C3A4A3	Partial
C3A3J1		C3A4B3	
C3A3F2	Partial	C3A4C3	
C3A3G2	Partial	C3A4D3	Trees, Partial
C3A3H2		C3A4A4	
C3A3I2		C3A4B4	
C3A3E3	Partial	C3A4C4	
C3A3F3		C3A4A5	
C3A3G3		C3A4B5	
C3A3H3		C3A4C5	
C3A3I3		C3A4A6	
C3A3D4	Partial	C3A4B6	
C3A3E4		C3A4C6	Partial
C3A3F4			
C3A3G4	Trees		
C3A3H4			
C3A3C5	Partial		
C3A3D5			
C3A3E5			
C3A3F5			

93 Total

FIELD WORK VARIANCE

Project Name/Number	Fort Ord / 846075	CTO/WAD	CTO 16 / WAD 06
Applicable Document:	Final Work Plan, MRS-16	Date:	03/06/08
Munitions and Explosives of Concern Removal, Former Fort Ord, California, August 2006, Revision 1			

Problem Description:

MRS-16 MEC Removal work was not completed due to insufficient funding prior to completion of all work. Additional funding has been secured to complete work.

Recommended solution:

Intent of work is to remove fencing from the site. This work does not include the saturated area in the western portion of the site. Complete work inside and at fenceline as detailed below:

- 1) Complete reacquisition and excavation of anomalies resulting from Digital Geophysical Mapping (DGM) performed previously.
- 2) Investigate latrine and trash pit delineated during previous work at the site.
- 3) Conduct EM61 real time work in areas where DGM is not feasible to include areas with significant tree cover and site fenceline once fence is removed.
- 4) Conduct "mag and dig" operations using Schonstedt GA52-C/x magnetometers in areas where EM61 real time work is not feasible due to terrain conditions and proximity to obstructions (tree trunks, stones, mounds, etc.).
- 5) Remove fence around the site at an appropriate time. Current intent is to leave fencing in place until removal of fencing is required to complete work at the site.

Some areas at the site have significant populations of Sand Gilia and Monterey Spineflower which preclude work at this time. These areas are currently being delineated and will be addressed in June 2008 when impact to these populations is reduced.

Impact on present and completed work:

Will allow completion of MEC Removal work inside and along MRS-16 fenceline.

Requested by: Kevin Siemann

Recommended revisions to the plan:

A total of 1445 DGM anomalies will be reacquired and subsequently excavated if reacquisition is successful. Two reacquisition teams consisting of one local field laborer and one geophysicist each will reacquire the anomalies. Production goals for reacquisition are 100 reacquired anomalies per day per team. Subsequent to the reacquisition phase of the project, two excavation/EM61 real time teams will excavate anomalies and perform EM61 real time operations. Production goals for excavation are 75 excavated anomalies per day per team. This goal is based on the assumption that the majority of reacquired anomalies will require only one dig. Excavation/EM61 real time teams will consist of the following personnel on each team: one geophysicist, one UXO Tech III, and one UXO Tech I or II. Production goals for EM61 real time is completion of one grid (area) per day per team.

Data collection for DGM anomaly excavation and EM61 real time work will be different as defined below.

For DGM targets that are reacquired and dug, all standard data fields will be collected for every dig. This will include item length, diameter, metal type (ferrous vs. non-ferrous) as well as estimated thickness from each dig (measurements are visual estimates). For the previous DGM grids, dimensions and weight were collected only for suspected MEC. This change was requested by the USACE geophysicist, as discussed in a team conference call 2/14/08.

For Real Time EM61 grids/areas, a record will be entered into PDAs that will record the following items by grid:

Grid
Team

Number of Digs
Total lbs of Munitions Debris
Total lbs of Other Debris
Grid Op Complete (Y/N)
Date

Additionally, for EM61 real time grids/areas, an "item" record will be created *only* for MEC or QA Seed items that are found. This will include all of the standard data fields, including coordinates (or offsets), length, diameter and weight.

Every excavation, either resulting from DGM or EM61 real time work, will be QC'd following excavation using the EM61. If QC check results in an EM61 reading below 14 mV, excavation will be considered complete. If QC check results in an EM61 reading at or above 14 mV, subsequent excavation will occur. This process will continue until QC check of excavation results in an EM61 reading below 14 mV.

Subsequent to completion of subsurface work at the site, a final QC visual inspection of the site will be performed prior to demobilization.

Specific individual grids and actions required are included on the attached spreadsheet.

Clarification Minor Change Major Change

Affects Budget Yes X No
Affects Schedule Yes X No

Signature [Signature] Date 3/6/08
Technical Reviewer

Shaw Approvals:

Signature [Signature] Date 3/6/08
SUXOS
Signature _____ Date _____
UXOQCS

Signature [Signature] Date _____
Project Manager
Peter Kelsall
Digitally signed by Peter Kelsall
DN: CN = Peter Kelsall, C = US, O = Shaw E&I
Date: 2008.03.06 13:20:32 -07'00'

USACE Approval: If Major Change:

Signature [Signature] Date 3/6/08 Signature [Signature] Date 3/6/08
OE Safety Specialist USACE COR or TM