SUMMARY REPORT

FOLLOW-ON MUNITIONS AND EXPLOSIVES OF CONCERN (MEC) EVALUATION

AREA C– PROPELLANT BURN PIT AREA

Lockheed Martin Corporation
Former Beaumont Site No. 1
Beaumont, California

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Prepared by:

Tetra Tech

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Bothell, WA 98011

March 2010

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LOCKHEED MARTIN

March 16, 2010

Mr. Daniel Zogaib
Southern California Cleanup Operations
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, CA 90630

Subject: Submittal of MEC Area C report (*Summary Report Follow-up Munitions and Explosives of Concern (MEC) Evaluation, Area C - Propellant Burn Pit Area, Lockheed Martin Corporation, Former Beaumont Site 1, Beaumont, California*)

Dear Mr. Zogaib:

Please find enclosed one copy and two compact disks of the *Summary Remedial Investigation Report, Lockheed Martin Corporation, Beaumont Site 1, Beaumont, California* for your approval or comment.

If you have any questions regarding this submittal or the status of site activities, please contact me at 408.756.9595 or denise.kato@lmco.com.

Sincerely,

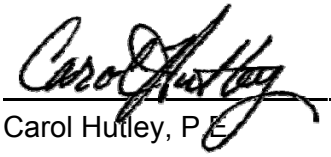
Denise Kato
Remediation Analyst Senior Staff

Enclosure

Copy with Enc:
Jim Austreng, DTSC (hard copy)
Gene Matsushita, LMC (hard copy & electronic copy)
Ian Lo, CDM (electronic copy)
Tom Villeneuve, Tetra Tech, Inc. (hard copy & electronic copy)

This report documents the Follow-On Munitions and Explosives of Concern (MEC) Evaluation in the Operational Area C Burn Pit Area at Beaumont Site 1. It contains a description of the procedures implemented and the areas where the MEC evaluation was conducted. The report also contains a summary of the results of the MEC evaluation and conclusions regarding the potential need for further assessment or mitigation actions. By their signatures, the undersigned certify this report has been reviewed and accurately reflects the work performed in accordance with the work plan and industry standards.

APPROVALS:



3/16/2010

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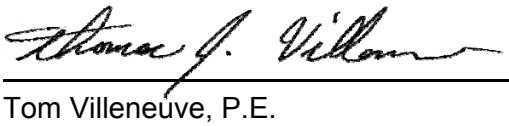

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EXECUTIVE SUMMARY

Lockheed Martin Corporation's (LMC's) former Beaumont Site 1 (the Site) is located in Riverside County south of the City of Beaumont, California, approximately 70 miles east of the City of Los Angeles, California. In 2003, the majority of the Site was sold to the State of California for use in wildlife management. A portion (565 acres) referred to as the conservation easement was retained by LMC. The approximately 17 acre propellant Burn Pit Area (BPA) in Operational Area C (Area C), which is the subject of this Follow-On Munitions and Explosives of Concern (MEC) Evaluation Summary Report (Summary Report), is located within this conservation easement.

The BPA was inspected in 1986 as part of a historical investigation to research the historical industrial activity at the site and to identify appropriate activities/investigations to determine the nature and extent of any environmental impacts noted during the historical investigation (Radian, 1986a). The 1986 inspection revealed the presence of a number of former burn pits reportedly used to dispose of wastes such as off-specification rocket propellant and various other rocket fuel additives. As a follow up to the inspection process, ground penetrating radar was later used, along with historical maps and aerial photography to locate 20 potential historical burn pits (Radian, 1986b). Based upon the outcome of that historical inspection the BPA was the subject of a removal action conducted in 1993. The top two feet of soil was removed (in phases) and any known (identified from GPR or historical maps) or newly discovered pit areas were excavated to remove residual burn pit debris/material. Chemical testing was conducted at the bottom of four of the twenty-one burn pits excavated to confirm that there was no residual contamination (Radian, 1993).

In 2005, record rainfall in the vicinity of the Site caused heavy flows in the ephemeral creeks at the Site. As a result, several creek crossings along the site roadways were damaged. During repair of one creek crossing in Operational Area D (the former Lockheed Propulsion Company [LPC] Ballistics Test Range), two small clusters of 20mm link ammunition were found. Personnel from the Riverside County Sheriff's Office Hazardous Devices Team (HDT) responded to the Site, examined the munitions and performed disposal. The officers dispatched were uncertain whether or not the 20mm rounds were live (contained an explosive charge), so the cartridges were disposed of explosively (detonated) on the Site. As a result of the discovery of these discarded cartridges, LMC initiated an evaluation of other potential residual ordnance-related hazards at the Site, along with removal actions in appropriate areas. The munitions and explosives of concern (MEC) evaluation and removal activities were conducted in three phases: two during 2005 and a third in 2006. The evaluation areas included ranges where test projectiles were fired, areas where explosive testing was conducted, and other areas where ammunition or explosives residue might be present. The areas evaluated or subjected to removal actions did not include the BPA because the area had reportedly been cleaned via excavation and removal of all burn pit debris and closed in 1993. During the removal activities, surface soils containing native plant seeds were removed, stockpiled and later re-spread during

the clean up to expedite re-vegetation with native species. According to the BPA Removal Action Report (Radian 1993), these soils were visually inspected for signs of burn pit debris or other obvious contamination prior to being re-spread.

During a recent drilling project in the BPA, several potential MEC-related items were found. The items were reported to the HDT, who responded to the Site to examine and remove the items. The HDT determined that the items were likely spent cartridge actuated devices (CADs). One item also appeared to be an empty, non-ferrous 30mm casing. The items were found on the ground surface near the eastern boundary of the BPA. While this area was reportedly cleaned and closed, it appears that some inert munitions waste may remain. As a precautionary measure, LMC decided it would be prudent to evaluate the BPA to determine if there is potential for MEC to be present, and if any further action would be warranted. Due to unanticipated conditions in the BPA (see following sections), the goal of determining the potential for MEC to be present could not be met. Data were obtained from several areas of the site that will provide a basis for the design of follow-on work to meet the intended goal. This Summary Report documents the methods and procedures used in the evaluation and findings of the evaluation. Conclusions and recommendations regarding follow-on activities are provided in this Summary Report.

The evaluation in the BPA was designed using 5-foot wide transects spaced approximately 20 feet on center to achieve about 25% coverage of the entire area. Hand-held, Vallon VHM-3, all-metals detectors (Vallons) were used to sweep areas within the transect boundaries and locate subsurface metallic anomalies. The Vallons were selected for their capability to effectively detect targets containing both ferrous and non-ferrous metals. This was important since some of the experimental munitions tested at Beaumont Site 1 were composed of non-ferrous materials. In addition, the items which prompted the Area C evaluation were primarily non-ferrous. Anomalies detected during the evaluation were prosecuted to a depth no greater than 2 feet below ground surface (bgs) since reportedly all burn pit material below this depth had been removed and the items recently found were present at the ground surface. Figure ES-1 shows the BPA and planned evaluation transects.

Initially all subsurface anomalies detected were to be excavated, identified and located using a differential global positioning system (DGPS); however, early findings indicated that there was a very large amount of non-MEC metallic debris in the BPA. More than 33,000 small metallic anomalies are estimated to be present in the area consisting primarily of metal flakes (possibly residue from deteriorated barrels), tin foil, wire, bottle caps, and other non-specific scrap.

X:\GIS\Lockheed 23521-020\1T\ransects 10-16-09.mxd

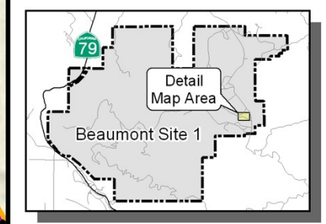
0 50 100 Feet

Adapted from:

April 2007 aerial photograph.

LEGEND

- MD Finds
- Well Location
- Transects - Mowed and Cleared (20-ft offsets)
- Transect - Surveyed and Intrusively Investigated
- Burn Pit Perimeter Fence
- Former Burn Pit Location



Beaumont Site 1

Figure ES-1

Burn Pit Area Evaluation Summary

TETRA TECH

Some investigated areas contained so much metallic debris that no individual anomalies could be identified for excavation. In addition, there are 48 well heads, numerous buried pipes wrapped with metallic tracer wire and several dozen Stephens' Kangaroo Rat (SKR) burrows in the area, all of which interfered with execution of the MEC evaluation as planned. The field procedures were modified to include excavation of only those anomalies producing a selected bar graph readout displayed on the Vallon LED screen to minimize the effects of the excess debris and focus the evaluation on potential MEC items.. These readouts, called elements, have no numerical units. The element scale is numbered from 1 to 14 and the values displayed are proportional to the strength of the response signal generated in subsurface metal anomalies by the pulses transmitted by the Vallon. The element values can be used to estimate the relative size of near surface anomalies and to generally screen for anomalies above a certain approximate size, provided that the instrument is operated at a consistent sensitivity as it was for this project. The field team was instructed to intrusively investigate only those anomalies producing a readout value greater than the value produced by the smallest item (equivalent to a 20mm projectile buried at 10 inches) in the instrument test strip on site. In empirical tests on the instrument test strip, this was found to be a value of "9". In practice, the actual munitions debris (MD) recovered created readouts between 10 and 12. In addition, GPS coordinates were recorded only for MD recovered. Following the modifications, it became clear that even the amended procedure would require the excavation of several thousand anomalies and would not effectively deal with the areas containing clusters of very small anomalies. The field team was instructed to use the remaining planned evaluation time to collect data from a number of different locations throughout the BPA to provide a representative overview of the area. This data was used to evaluate whether additional work is needed and to identify an effective path forward. The locations of areas evaluated are shown on Figure ES-1.

During the evaluation, approximately 25% (about 4 of 16.75 acres) of the BPA was surface swept and approximately six percent (about 1 acre) of the BPA was intrusively evaluated including a perimeter transect just outside of the area boundary. A total of 1,997 anomalies, approximately six percent of an estimated 33,000 anomalies in the BPA were identified and 911 were intrusively investigated. Nineteen of the items excavated were identified as MD including 3 pieces of projectile fragmentation (frag), 6 small pieces of unidentified frag and 10 empty, non-ferrous 30mm casings. All MD was found at depths ≤ 12 inches bgs, with 16 of the 19 items being ≤ 6 inches bgs. No MEC was found during the evaluation. The results of the MEC Evaluation are shown on Figure ES-1 and summarized in Table ES-1.

There is no apparent definitive indication of the source of the projectile or other unidentified frag, but three reasonable possibilities exist. The first is that waste explosive ordnance was burned in the BPA pits as a method of disposal. Some of the munitions would have detonated, creating both the projectile and unidentifiable fragments. If explosive ordnance was disposed of in the burn pits, some unexploded ordinance may remain. The second possibility is that frag from various experimental activities was collected and burned in the burn pits as a method of decontamination. This type of disposal would make it unlikely that any explosive ordnance is

present in the BPA. The third possibility is that testing activities occurred in the area that is now identified as the BPA. This possibility could also result in some unexploded ordinance being present in the area, although there is no indication in any of the records that these kinds of activities were conducted in the BPA. Further, interviews with former employees conducted during previous MEC evaluation projects also did not reveal any evidence of MEC-related testing in the BPA.

The nature and condition of the MD and the depth of the debris, in conjunction with information in the BPA Removal Action Report (Radian 1993) suggests that the most likely explanation is that the MD items found are residuals of historical burning activities of either explosive ordnance or munitions debris and not the result of munitions testing; however, verification that no explosive ordnance remains within the BPA will require the collection of additional data to fully support this conclusion.

Based upon the type, location and depth of MD items that have been found to date, and the physical conditions and constraints present in the BPA, a phased follow-up evaluation described below (or equivalent) is recommended .to confirm the conceptual site model (CSM) developed for the BPA as a disposal area for waste propellant and related materials, and to alleviate concerns regarding potential MEC hazards.

The phased evaluation recommended includes an instrument-aided surface sweep and initial mapping of the entire BPA and a buffer zone in order to gather the information needed to better understand the distribution of metallic debris in the BPA and to develop a tailored investigation pattern/approach for the area. The mapping would be followed by intrusive investigation in selected areas to verify the absence of MEC, seen thus far. Sampling would be biased toward areas with more potential to contain MEC and the size and distribution of subsurface anomalies. All large anomalies, which might represent the larger caliber ordnance tested at Site 1, would be investigated. In addition, 5-10% of the anomalies in the proper size range for 20mm and 30mm munitions would be investigated. If no MEC is found, the area would be recommended for no further field actions and institutional controls (if necessary) would be considered in the Remedial Action Plan currently being prepared for Site 1. If MEC is found, DTSC would be engaged in discussion of the appropriate follow-on actions.

Table ES-1. Summary of Area C MEC Evaluation Results						
Transect No.	Length (ft)	Length Dug (ft)	Area Dug (acres)	No. of Targets Identified	No. of Targets Dug	No. of MD Found
1	819.3	819.3	0.094	56	56	0
2	888.2	888.2	0.102	106	52	0
3	918.4	918.4	0.105	212	93	0
4	948.5	948.5	0.109	212	126	1
5	978.7	400.0	0.046	56	46	2
20	1048.1	946.2	0.109	383	140	3
25	927.4	731.9	0.084	261	138	0
33	571.5	201.7	0.023	102	49	8
37	588.4	588.4	0.068	92	40	2
Perimeter Segment 1	898.0	898.0	0.103	181	63	0
Perimeter Segment 2	530.3	530.3	0.061	159	61	3
Perimeter Segment P5-P6	245.6	245.6	0.028	79	24	0
Perimeter Segment P8-P11	286.8	286.8	0.039	34	7	0
Perimeter Segment P14-P15	274.7	274.7	0.032	64	16	0
Totals	*9923.9*	*8678*	*1.003*	*1997*	*911*	*19*

Notes:
MD – Munitions debris.
ft – feet.

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ABBREVIATIONS AND ACRONYMS

bgs	below ground surface
BPA	Burn Pit Area
CAD	cartridge actuated device
CSM	conceptual site model
DGPS	Differential Global Positioning System
EMI	electro-magnetic induction
ESQ	environmental safety and quality
frag	fragmentation
GCRC	Grand Central Rocket Company
HDT	Hazardous Devices Team
HE	high explosives
HMX	cyclotetramethylene tetranitramine
ITS	instrument test strip
LAC	Lockheed Aircraft Corporation
LMC	Lockheed Martin Corporation
LPC	Lockheed Propulsion Company
µg/kg	micrograms per kilogram
MD	munitions debris
MEC	munitions and explosives of concern
MSL	mean sea level
QA	quality assurance
QC	quality control
SKR	Stephens' Kangaroo Rat
Tetra Tech	Tetra Tech, Incorporated
Site 1	Former Lockheed Beaumont Site No. 1
UXO	unexploded ordnance

1.0 INTRODUCTION

This report documents the Supplemental Munitions and Explosives of Concern (MEC) Evaluation conducted in Operational Area C at the former Lockheed Martin Corporation (LMC) Beaumont Site No. 1 property (the Site) near Beaumont, California. During the active industrial life of the Site from 1960 until 1974, LMC used the facility for solid propellant mixing, testing, and incineration, as well as ballistics testing. The company utilized explosives in their work; however, most munitions used on site were reportedly practice rounds that did not contain high explosives (HE). Aerojet Corporation and General Dynamics Corporation also conducted munitions-related testing at the Site. Reportedly, Aerojet used only practice ammunition, while General Dynamics is said to have used HE shaped charges, explosives, and 2.75-inch rocket motors in their work. Operational Area C was reportedly used for the disposal of hazardous waste materials, primarily waste rocket propellant, via burning in open pits. For this reason the Area C is also known as the former Burn Pit Area (BPA).

In 1986, Radian Corporation reviewed the operating history of the Site to evaluate the potential for residual hazards associated with historical operations at the site. The report prepared to document this review (the Historical Report) concluded there were some areas of the Site that required evaluation and action for potential by-products (chemicals and compounds) associated with historical munitions testing. One of these areas was the BPA, where Radian recommended geophysical evaluation to determine the extent of the burn pits, sampling of the burned propellant, and possibly follow-on treatment or removal actions (Radian, 1986a). Ground penetrating radar was later used, along with historical maps and aerial photography, to locate the potential burn pits (Radian, 1986b). The Historical Report also recommended evaluation of groundwater beneath the BPA. No recommendations for further action were made regarding potential residual materials from munitions or explosives that may have been used in historical operations.

In 1993, LMC conducted a removal action reportedly excavating and removing all contaminated soils and other materials associated with historical burning in Area C. The removal included separate excavation and stockpiling of the soil from depths of zero to one foot and from depths of one to two feet. Segregation of the top one foot of the soil was intended to preserve native seed in the soils to aid in re-vegetation after the removal action was complete. The removal of the one to two foot soil layer was intended to reveal the top of any previously unidentified burn pits. Reportedly the top two feet of the soil layer was observed continuously during removal for signs of contamination (discoloration or disturbance). The BPA Removal Action Report states that the site was restored to near previous grade following the burn pit excavation, but does not specify if any fill material was imported to the site either from other areas of Beaumont Site 1 or from off-site sources. A complete description of the removal action is presented in the BPA Removal Action Report (Radian, 1993). The BPA Removal Action Report is presented in Appendix A of this report for reference.

In 2003, the majority of the Site was sold to the State of California to be used for wildlife management. A portion of the Site (565 acres) referred to as the conservation easement was retained by LMC to facilitate remediation of contamination associated with historical operations. The BPA is contained within the conservation easement.

In 2005, record rainfall in the vicinity of the Site caused heavy flows in the ephemeral creeks on site. As a result, several creek crossings along the site roadways were damaged. During repair of one of these creek crossing in Operational Area D (the former Lockheed Propulsion Company [LPC] Ballistics Test Range), two small clusters of 20mm link ammunition were found. Personnel from the Riverside County Sheriff's Office Hazardous Devices Team (HDT) responded to the Site, examined the munitions and performed disposal. The officers dispatched were uncertain whether or not the 20mm rounds were live (contained an explosive charge), so the cartridges were disposed of explosively (by detonation) in place (at the location where they were found). As a result of the discovery of these discarded cartridges, LMC (LPC's successor) initiated an evaluation of other potential residual ordnance-related hazards on the Site, along with removal actions in appropriate areas. The MEC evaluation and removal activities were conducted in three phases: two during years 2005/2006 and a third in years 2006/2007. The evaluation areas included ranges where test projectiles were fired, areas where explosive testing was conducted, and other areas where ammunition or explosives residue might be present. Over 8,000 subsurface anomalies were identified during the evaluation activities and more than 5,000 of these anomalies were investigated. A total of 26 MEC items were recovered, along with 245 pieces of munitions debris. All of the MEC items recovered were located either in the former test range in Operational Area A or along Bed Springs Creek in Operational Area D. The areas evaluated or subjected to removal actions did not include the BPA because it reportedly had been cleaned via excavation and removal of all burn pit debris and closed.

During a recent drilling project in the BPA, several suspect items (potential MEC) were found. These items were reported to the HDT, who responded to the Site to examine and remove the items. Team members determined that the items were likely spent cartridge actuated devices (CADs). One item also appeared to be an empty non-ferrous 30mm casing. The items were found on the surface near the eastern boundary of the BPA. While this area was reportedly cleaned and closed it appears that some inert munitions waste may remain. As a precautionary measure, LMC decided it would be prudent to evaluate a representative portion of the BPA to determine if there is potential for MEC to be present, and if any further action would be warranted in this area. This report documents the methods and procedures used in the evaluation, as well as the findings of the evaluation.

1.1 PURPOSE AND SCOPE

The original objective of the MEC evaluation documented in this report was to assess the relative potential for MEC to be present in the BPA based upon a representative survey and sampling of the area. The activities conducted were also intended to provide data for evaluation of potential residual risk to personnel working in and around the former BPA and future

recreational users if the conservation easement is sold to the State of California. The hazard evaluation itself was not part of the current evaluation and is not discussed in this report.

The original objective for this evaluation could not be met due to unanticipated conditions in the BPA. Excessive amounts of metal debris, nearly 50 groundwater well heads and dozens of Stephens Kangaroo Rat (SKR) burrows significantly reduced productivity and prevented completion of the intended scope. The original objective was modified to include collection of representative data from all sectors of the BPA to support development of a focused follow-on methodology to deal effectively with the conditions in the BPA.

The tasks performed during the Follow-On MEC Evaluation included:

- Preparation of work plans;
- Site preparation (staking and vegetation mowing);
- Mag & Dig investigation of selected subsurface metallic anomalies; and
- Preparation of this report.

1.2 SUMMARY OF TECHNICAL APPROACH

The project was intended to provide supplemental data for use in evaluation of potential MEC issues in the former BPA in Area C. The pits in the BPA were removed in 1993. This action entailed removal and stockpiling of the upper two feet of soil to preserve native seed stock and expose the tops of any previously unidentified pits, followed by excavation of all burned material and chemical confirmation sampling of the pit bottoms. Although the site was reportedly restored to near pre-removal grade, it is not known whether any fill material was imported to the site or if the site was simply regarded. Based on this information, the technical approach for the current evaluation was designed to focus attention on the upper two feet of the soil, where there is potential for residual items or debris from the historical burn activities to be present. To obtain a representative sampling of the area, a sampling scheme was developed using a series of 5-foot wide, parallel, east-west trending transects spaced approximately 20 feet on center to achieve about 25% coverage of the area. The sampling was not weighted toward the former pit areas since the upper two feet of the soil was removed, stockpiled and re-spread across the site, providing equal potential for residual MEC items (if any) to be present in all areas of the site.

Reportedly, non-hazardous materials including burn zone residue, metal drums, barrel lids, a spent rocket motor casing, glass, scrap metal and old irrigation pipe were shipped to a Class III landfill (BKK) for disposal. Wastes classified as hazardous, including an oily drum, burned rocket propellant and burn rate modifiers, were shipped to the Laidlaw Class I landfill for disposal. No mention of MEC or munitions debris (MD) screening or detection is made in the Removal Action Report (Radian, 1993).

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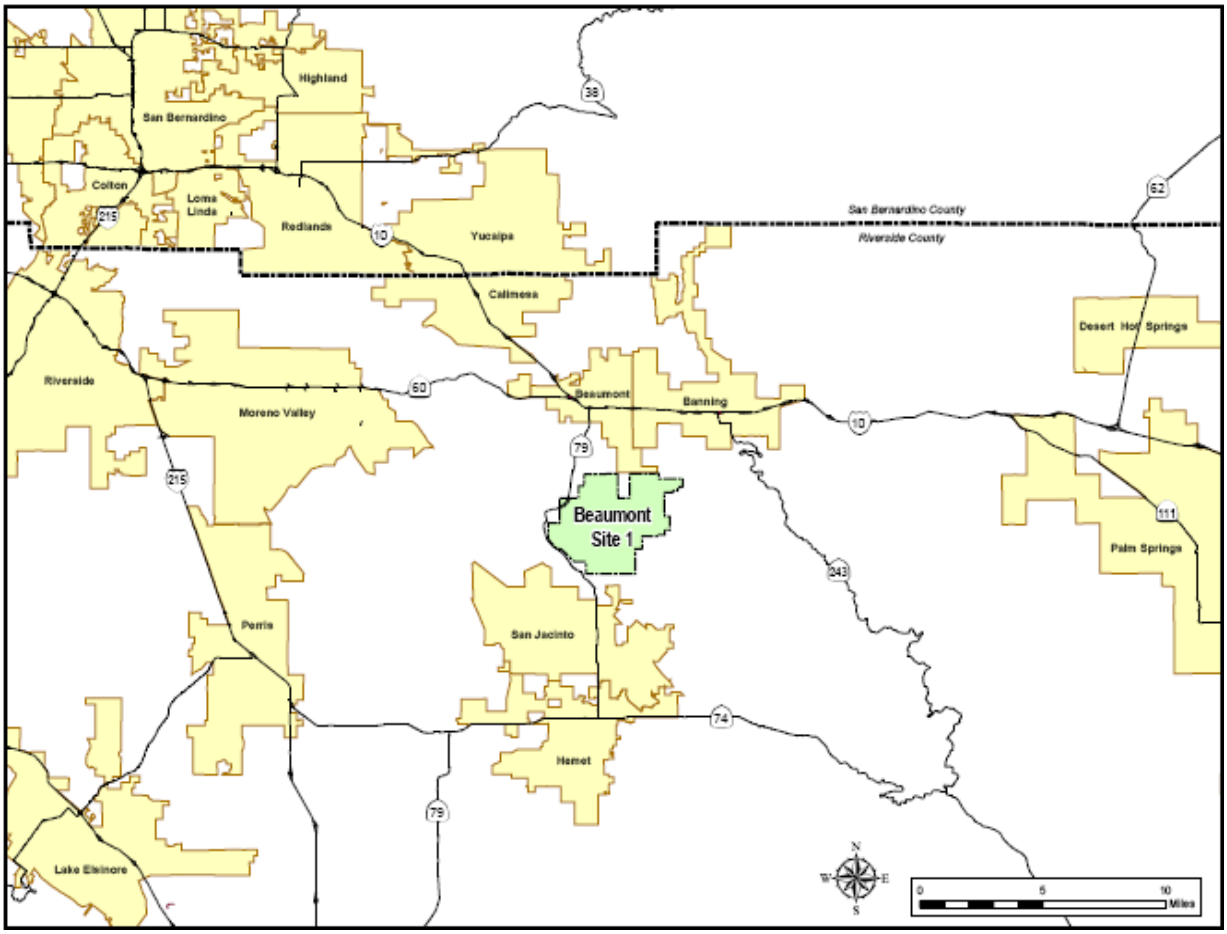
2.0 SITE DESCRIPTION

2.1 SITE LOCATION

The Site is located in Riverside County south of the City of Beaumont, California, approximately 70 miles east of the City of Los Angeles, as shown in Figure 2-1.

Figure 2-1. Former LMC Beaumont Site 1 Vicinity Map



2.2 SITE HISTORY AND OPERATIONS

Historically, the Site was used primarily for ranching. There were ranch houses and other related structures at the Site. A title search performed on this property indicated that LMC purchased the property in 1960. The property was developed and used as a remote test facility for early space and defense programs. During the active life of the LMC facility from 1960 until 1974, LMC (then known as Lockheed Aircraft Corporation) used the facility for solid propellant mixing and testing; waste propellant incineration; rocket motor washout; and ballistics testing. Based on the historical record, nine operational areas were identified for the Site. Figure 2-2 shows the location of these areas.

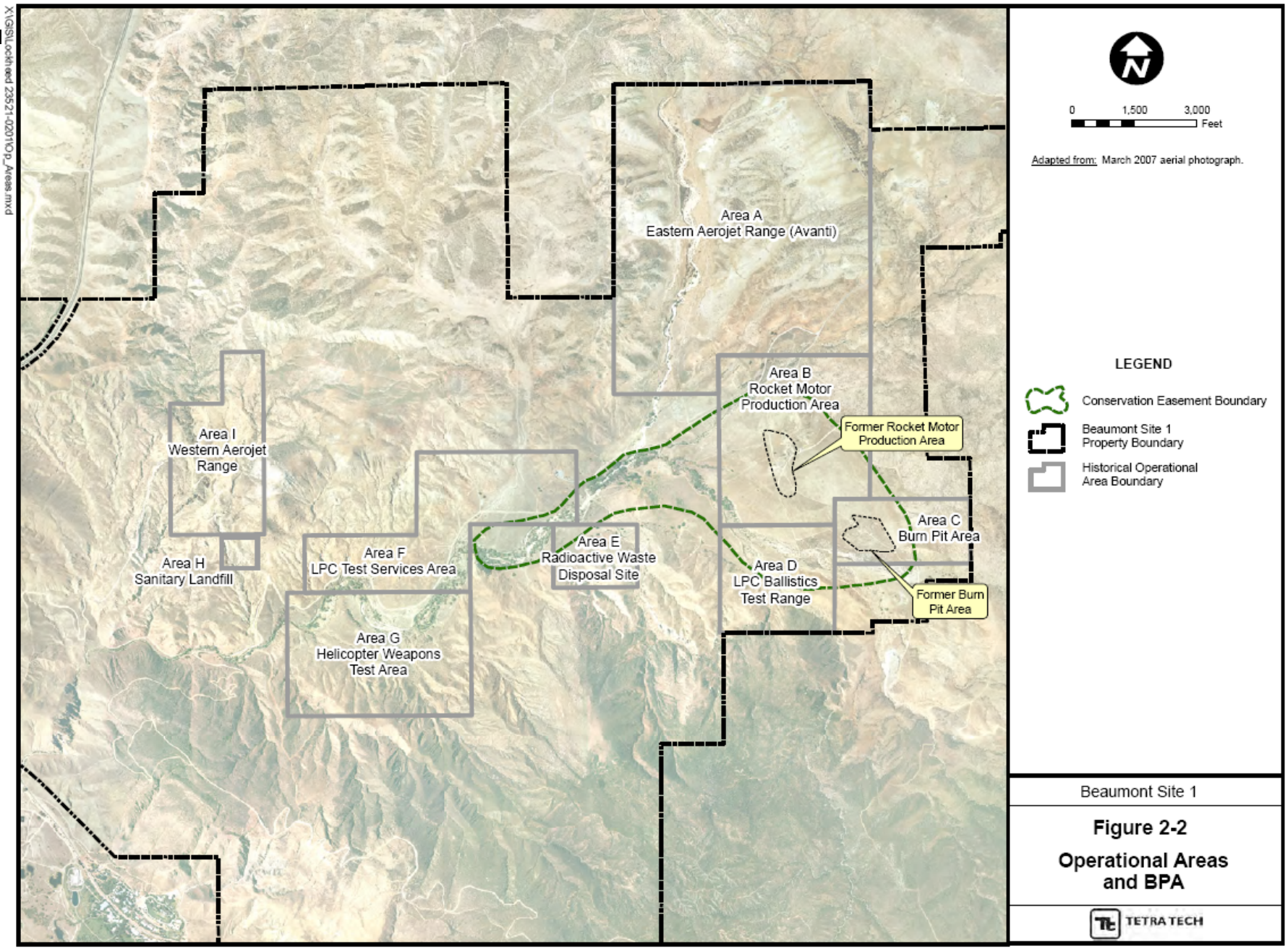
The BPA, which is the subject of this report, is located in Operational Area C (See Figure 2-2). According to available information (Radian 1986), the BPA was historically used to dispose of hazardous waste materials by open burning in pits. Materials burned included off-specification ammonium perchlorate, wet propellant from motor washout, dry propellant cast and cured in small containers for various tests, and out-of-specification propellant, along with various adhesives, resin curatives, burn rate modifiers (such as ferrocene), pyrotechnic and ignition components, packaging material, and solvents. The burn pits were reportedly excavated with a bulldozer and were generally six to eight feet wide, four to six feet deep, and 50 to 100 feet long. Waste materials were placed in the pits, covered with ammonium perchlorate oxidizer or diesel fuel, and ignited using an electric match. After use, the pits were covered over with soil. The only known MEC items reported to have been burned in the pits were a number of small kidney-shaped, aluminum cups containing cyclotetramethylene tetranitramine (HMX), which is a Class A explosive. These cups were brought on site specifically for disposal by a company identified in the Removal Action Report as McCormick Self.

Following the closure of Site 1, Operational Area C (Area C) including the BPA was utilized as grazing land for sheep and agricultural land for cultivation of barley.

2.3 PREVIOUS BPA ASSESSMENT AND CLEANUP

During preparation of the historical report for Site 1 (Radian, 1986), personnel performed several site visits to observe and document conditions at the Site and review historical operations with past employees. During a visit to the BPA, several mounds were noted near the eastern edge of this area, which were reportedly composed of soil generated during burn pit excavation. It was noted that degrading scrap metal, drums, 5-gallon containers, burned propellant, insulation, and paint cans were present on and around these mounds. This area also showed signs of cultivation (around the mounds), which the Radian personnel noted may have resulted in the dispersion of this type of debris across the site.

In 1993, LMC performed a removal action in the BPA reportedly removing and disposing of all residual burn materials. The removal footprint included a buffer area around the identified pits where the upper two feet of soil were removed in order to search for undocumented burn pits. This same scrape and inspect activity was preformed in the spaces between the documented burn pits in the central region of the BPA. While the BPA Removal Action Report (Radian, 1993) discusses the procedures implemented in detail, it does not document where on site the clean surficial cover material that was removed was stockpiled or how it may have been re-distributed about the Site after pit removal. The total volume of soil removed, stockpiled on site and subsequently re-spread over the BPA was 48,600 cubic yards. During the removal action 4,112 tons of non-hazardous material and 18.6 tons of specific waste were removed. The non-hazardous waste was transported to a Class III facility (BKK Landfill in West Covina, CA). Specific wastes were disposed of at a Class I landfill (Laidlaw Environmental Services in Westmorland, CA).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Area A
Eastern Aerojet Range (Avanti)
Area B
Rocket Motor
Production Area
Former Rocket Motor
Production Area
Area I
Western Aerojet
Range
Area H
Sanitary Landfill
Area F
LPC Test Services Area
Area E
Radioactive Waste
Disposal Site
Area C
Burn Pit Area
Area D
LPC Ballistics
Test Range
Former Burn
Pit Area
Area G
Helicopter Weapons
Test Area
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Feet
Adapted from: March 2007 aerial photograph.
LEGEND
Conservation Easement Boundary
Beaumont Site 1
Property Boundary
Historical Operational
Area Boundary
Beaumont Site 1
Figure 2-2
Operational Areas
and BPA
TETRA TECH

2.4 PHYSICAL AND ENVIRONMENTAL FEATURES

Beaumont Site 1 is located in a broad valley, known as the San Jacinto Nuevo Y Potrero. The San Jacinto Nuevo Y Potrero is an alluvial in-filled valley located along the western foothills of the San Jacinto Mountains. The valley is surrounded by gently rolling hills and rugged mountains. Elevations at Site 1 range from about 1,500 feet above mean sea level (MSL) to approximately 3,700 feet above mean sea level. Potrero Creek bisects the Site in a northeast to southwest direction.

The climate of the Site region is semi-arid. Rainfall averages from 10- 14 inches per year. The temperature generally ranges between the upper 30s and upper 90s (degrees Fahrenheit) depending on season.

Vegetation at the Site consists primarily of native stands of chaparral mixed with dense, low-growing sagebrush. There are small stands of trees including cottonwood, willow, ash and sycamore near the streambeds/arroyos. Indigenous animals include two species of rattlesnake (the Western Diamondback and the Red Rattler), cougars and the endangered SKR. In addition, this site has the potential to support four other species that are either endangered or threatened. These include the Least Bell's vireo, the southwestern willow flycatcher, the California gnatcatcher and the arroyo southwestern toad. It is not known whether these species are present on site or in the BPA; however, information gathered during a site visit by a biological resource firm indicates that the potentially suitable habitat for these species would generally be located along Potrero Creek (Chambers Group, 2003) in Operational Area A to the west of the BPA.

The BPA is located in a broad valley in the southeastern portion of Site 1. The terrain is relatively flat and the area is covered with native vegetation including brush and grass. The soils in the BPA are alluvial/floodplain soils and are typically well drained. There are no surface water features in the BPA; however, Bedsprings Creek is located just south of the BPA. The creek flows generally east to west and is an ephemeral creek. Groundwater is present at about 80- 90 feet bgs in the BPA.

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3.0 MEC EVALUATION

3.1 EVALUATION AREA AND PATTERN

The BPA is documented as an open burn disposal area for hazardous waste materials and there is no evidence that the area had any munitions-related use. However, a small amount of munitions debris has been found in the area over time. The items found have not been located near the former burn pits, but generally near the eastern boundary of the area. During the removal action in the BPA in 1993, the upper two feet of soil was temporarily removed in an effort to conserve native seed stock and to ensure that all burn pits were located for removal. This soil was stockpiled and later re-spread on site. Although ten zones were established for this activity it is not known whether soil from each area was stockpiled in a unique location, or if all of the removed surficial soil was co-mingled in a single stockpile. There was no formal inspection of the "clean soils"; however, it was reported that they were visually examined for discoloration or debris that may be associated with burning.

This information suggests that if any residual MEC is present in the BPA, no one area is more likely than another to contain that MEC. Based on this assumption, the entire BPA was included in the MEC evaluation. A series of parallel transects, running east-west across the area were evenly spaced and distributed to provide approximately 25% coverage (about 4 of 16.75 acres) of the BPA. The 5-foot wide transects were spaced at approximately 20 feet on center. This resulted in the creation of 41 transects ranging in length from about 320 feet to 1,120 feet, and covering a combined area just under four acres. One additional transect was placed outside the existing site boundary (fence) in order to evaluate the potential for kickouts related to potential undocumented MEC burns/disposals (if any). Figure 3-1 shows the investigation pattern designed for the BPA.

The vertical boundaries for the MEC evaluation were established based upon the design of the BPA removal action. Since the upper two feet of soil were retained to cap the area after the removal action and all known burn pit material was removed, the upper soil horizon from zero to two feet is theoretically the only area where MEC may potentially be present unless specific undocumented detonation pads were present in the BPA. Based on this data, the MEC evaluation was limited to the upper two feet of the soil.

3.2 EVALUATION METHODS

Evaluation in the BPA began with site preparation (mowing and staking of transect paths). Although this is not typically considered part of the formal evaluation, in the case of the BPA, this activity included a surface sweep along the survey transects prior to mowing. This sweep was conducted as a safety measure to protect personnel conducting the mowing from MEC hazards; however, since the sweep involved instrument-aided (all-metal detector) visual observation of the ground surface for MEC, it was functionally equivalent to a surface clearance.

The intrusive portion of the MEC evaluation was conducted exclusively using "Mag and Dig" techniques. This method involves the location of subsurface anomalies with a hand-held metal detector, followed by real-time hand excavation and inspection of those anomalies. The Mag and Dig procedure was conducted using Vallon electromagnetic pulse induction, all-mine/all-metal detectors (Vallons). The Vallon search head continuously emits electromagnetic pulses as the operator sweeps the head close to the ground surface. Between each magnetic pulse is a short pause. During these pauses, the electro-magnetic reaction/response created in subsurface metal objects by the Vallon pulses is detected by the search head. The detector's receiver processes the responses from the objects and converts them to an acoustic signal (i.e., an audible tone) which the operator uses to pinpoint the location of the object. The Vallons used for this project also have LCD readouts which provide a quantitative value for the reaction/response created by buried metallic objects. These values have no numeric units (are relative readings), but they provide general information regarding the probable size of near-surface buried objects. The readouts can be used to check the instrument function by comparing consecutive readings for a known object (instrument test strip) or to differentiate targets for investigation based upon a pre-selected readout value that corresponds to the readout value for an item or stimulant of interest.

Mag and Dig operations were conducted in accordance with the procedures established in the approved work plan. This entailed setting up 5-foot wide survey lanes in the BPA and then sweeping the area within those lanes using the Vallon to locate subsurface metallic anomalies. Each detected anomaly was marked with a pin flag for reference (i.e., flagged) and then immediately excavated to determine the nature of the anomaly.

After intrusive evaluation and quality control (QC) activities were complete, the excavations were back-filled with the soil previously removed. The items recovered during the investigation of the anomalies were consolidated in piles within the BPA, but were not removed for off-site disposal. The results of the Mag and Dig evaluation are presented in Section 5.1.

3.3 SUMMARY OF FIELD MODIFICATIONS

Initially all detected subsurface anomalies were to be excavated, identified and located using a differential global positioning system (DGPS); however, early findings indicated that there was a very large amount of non-MEC metallic debris in the BPA. Based on these early findings, more than 33,000 metallic anomalies are estimated to be present in the BPA. These items were expected to consist primarily of metal flakes (possibly residue from deteriorated barrels), wire, bottle caps, and other non-specific, non-munitions metal scrap. Some investigated areas contained so many of these small anomalies that no distinct anomalies could be identified for excavation. In addition, there are dozens of well heads, numerous buried pipelines wrapped with metallic tracer wire, and several dozen SKR burrows in the area, all of which can, and did, interfere with execution of the MEC evaluation as planned. In order to minimize the effects of the excess debris and focus the evaluation on potential MEC items, the field procedures were modified to include excavation of only those anomalies producing a selected bar graph

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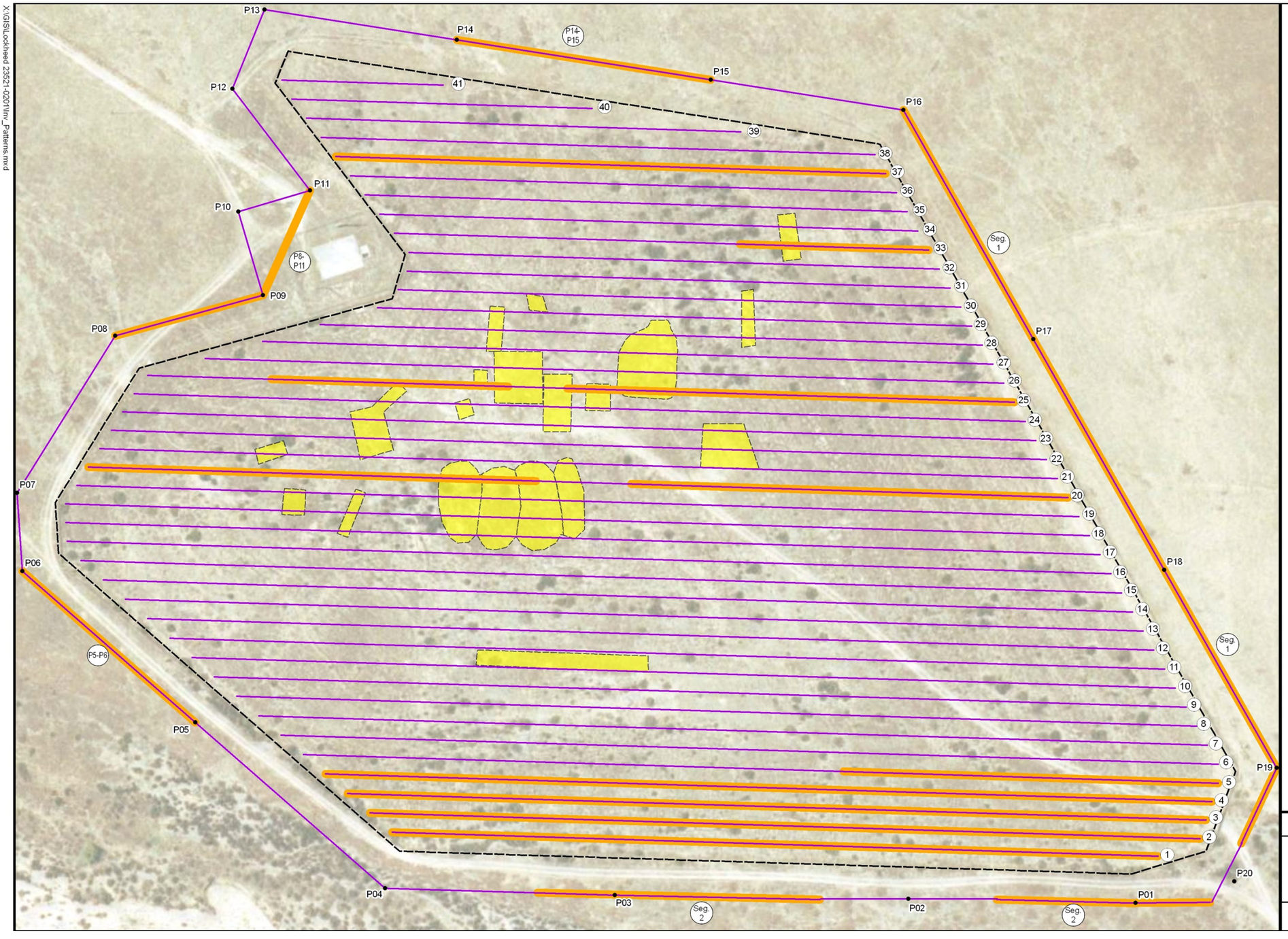

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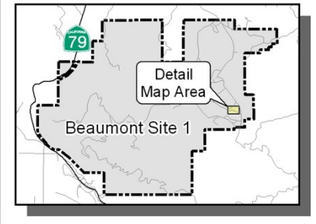
Adapted from:
April 2007 aerial photograph.

LEGEND

- Transects - Mowed and Cleared (20-ft offsets)
- Transect - Surveyed and Intrusively Investigated
- Burn Pit Perimeter Fence
- Former Burn Pit Location



Beaumont Site 1

Figure 3-1

Burn Pit Area Investigation Patterns

TETRA TECH

readout displayed on the Vallon LED screen. These readouts, called elements, have no numerical units. The element scale is numbered from 1 to 14 and the values displayed are proportional to the strength of the response signal generated in subsurface metal anomalies by the pulses transmitted by the Vallon. The element values can be used to estimate the relative size of near surface anomalies and to generally screen for anomalies above a certain approximate size, provided that the instrument is operated at a consistent sensitivity as it was for this project. The field team was instructed to intrusively investigate only those anomalies producing a readout value greater than "9" which was produced by the smallest item in the instrument test strip on site. This item was equivalent to a 20mm projectile buried at 10 inches bgs. In practice, the actual MD recovered generated readouts between 10 and 12. In addition, the field team was instructed to record DGPS coordinates only for MD items recovered.

Following the modifications, it became apparent that even the amended procedure would require the excavation of several thousand anomalies and would not effectively deal with the areas containing clusters of very small anomalies. The field team was instructed at this time to use the remaining evaluation time to collect representative data for the overall BPA by allocating segments of field time to each portion of the area (e.g., north, south, central and perimeter). This data was then evaluated to determine whether additional work is needed in the BPA and to identify an effective path forward. The results of the evaluation are discussed in Section 4 of this report. Conclusions and recommendations regarding follow-on activities are contained in Section 5.

3.4 QUALITY CONTROL

The QC program for this evaluation project consisted of process and product quality control.

3.4.1 Process Quality Control

Process QC is concerned with standardization and reproducibility of processes, as well as improving the efficiency and effectiveness of the processes. This can be considered a preventive approach to QC, as the goal is to make the processes work properly and detect any inefficiencies or problems early and improve processes before the final product is created. The quality of the work was ensured by strict adherence to the standard operating procedures in the work plan, including those regarding function testing for detection equipment, consistent performance, accurate recordkeeping and repetitive measurement of the objective measures of desired quality attributes.

3.4.2 Product Quality Control – Checks and Inspections

Product quality control was applied to Mag and Dig operations at the BPA by performing a percentage-based inspection of the areas subjected to MEC evaluation. Before the investigation excavations were backfilled, the unexploded ordnance (UXO) Environmental Safety and Quality specialist (UXO ESQ) on site re-checked 5-10% of the excavations to ensure that all metallic anomalies above two feet bgs had been removed.

3.4.3 Equipment Function Checks and Calibration

Equipment function testing and calibration were the major elements in the process QC for this project. Effective identification of MEC relies heavily on properly functioning and properly operated detection equipment. All MEC detection equipment was function tested twice daily (morning and evening) utilizing the instrument test strip (ITS) created for this project. The test strip contained a number of surrogate munitions items similar in size to those that might potentially be present in Area C based on the historical munitions use at Site 1. A full description of the ITS is presented in the approved work plan for this evaluation (Tetra Tech, 2008). Instrument responses to the surrogate items buried in the ITS were compared to previous readings to ensure that the readings were consistent and the instruments were functioning properly. The DGPS equipment was function tested by deploying the instrument over a known monument and comparing the readings to the known coordinates.

3.5 SAFETY

The Follow-on MEC Evaluation activities in the BPA were performed in accordance with the Environmental Health and Safety Plan approved for the initial MEC evaluations at Site 1 (Tetra Tech, 2005a). This plan was prepared for a large scale MEC evaluation at Beaumont Site 1 and was amended, as necessary, for this project to accommodate specific conditions.

One safety issue was noted during the field operations. A green-colored, granular material was noted at one excavation site. The UXO ESQ halted operations at that location and instructed the field team to backfill the hole. The material was later examined by scientists who thought the material was bentonite that was used as backfill during previous drilling activities in Area C. A composite soil sample containing this material was collected and tested for site contaminants of concern. Perchlorate was detected in the sample at a concentration of 1,000 µg/kg. The residential regional screening level for perchlorate in soil is 55,000 µg/kg (USEPA, 2009).

4.0 SUMMARY OF FINDINGS

4.1 RESULTS OF MAG, FLAG AND DIG MEC EVALUATION

All areas within the BPA that were evaluated contained large amounts of metallic debris, although the portions of the perimeter transect prosecuted contained less debris than the interior areas. The debris included small metal flakes presumably from disintegrating drums, tin foil, bottle caps, wire and other non-specific, non-munitions metal debris. Some areas identified for investigation contained so much debris that individual anomalies could not be identified for evaluation. On the basis of the data obtained during the evaluation, it is estimated that there may be more than 33,000 small metallic anomalies present in the BPA. In addition, there are 46 monitoring wells and associated piping in the area. The well head casings are steel and some of the piping was found to be wrapped with metallic tracer wire. Both the well heads and the tracer wire interfere with detection of metallic anomalies near these structures. Due to the presence of metallic debris, well heads and wire-wrapped piping, not all areas that were planned for evaluation were completed during this effort. The presence of SKR burrows at some locations also prevented investigation in some of these areas.

Prior to initiation of the intrusive investigation in the BPA, approximately 25% of the area was surface swept to identify/remove potential MEC hazards in preparation for the mowing of the transects. This effort covered just under 4 acres and resulted in the discovery of one MD item on the ground surface in the eastern central portion of the BPA. This item was an empty, non-ferrous, 30mm shell casing. During the intrusive investigation, about six percent of the BPA (about 1 acre) was evaluated, including portions of the perimeter transect located just outside of the BPA boundary fence. A total of 1,997 anomalies were identified. Of those anomalies, 911 were excavated based on the original and modified selection criteria applied during the evaluation (See Section 3.3). Nineteen anomalies were MD including 3 pieces of projectile fragmentation (frag); 6 small pieces of unidentified frag; and, 10 empty, non-ferrous 30mm casings. All MD was found at depths ≤ 12 inches bgs, with 16 of the MD items being fund at depths ≤ 6 inches bgs. No MEC was found during the evaluation.

Eight of the 30mm shell casings were found near the previously identified location of a lone burn pit located in the northeastern corner of the BPA (See Figure 4-1). One shell casing was found in the eastern central portion of the BPA and the final casing was found in the southeastern corner of the area. There were no historical burns pits near the locations where these last two shell casings were found. Two pieces of frag identified as projectile frag were found on two adjacent transects near the southern edge of the BPA, about 300 feet apart. There were no historical burn pits in or near this area. The third piece of projectile frag was found near the eastern central portion of the site on Transect 20. A second piece of unidentified frag was found about 100 feet west along this same transect. Both pieces of frag were located near a former burn pit. Two pieces of unidentified frag were found on Transect 25, approximately 100 feet north of Transect 20. These items were also located near a former burn pit. The final three

pieces of unidentified frag were found on the perimeter transect near the southeast corner of the BPA. There are no historical burn pits in or near this area.

Figure 4-1 shows the areas of the BPA that were evaluated, along with the locations of the MD items found. The results of the MEC evaluation are summarized in Tables 4-1 and 4-2. Daily Reports and Quality Control Reports for the MEC evaluation are included in Appendix B and photographs showing items of interest from the evaluation are presented in the photo log in Appendix C.

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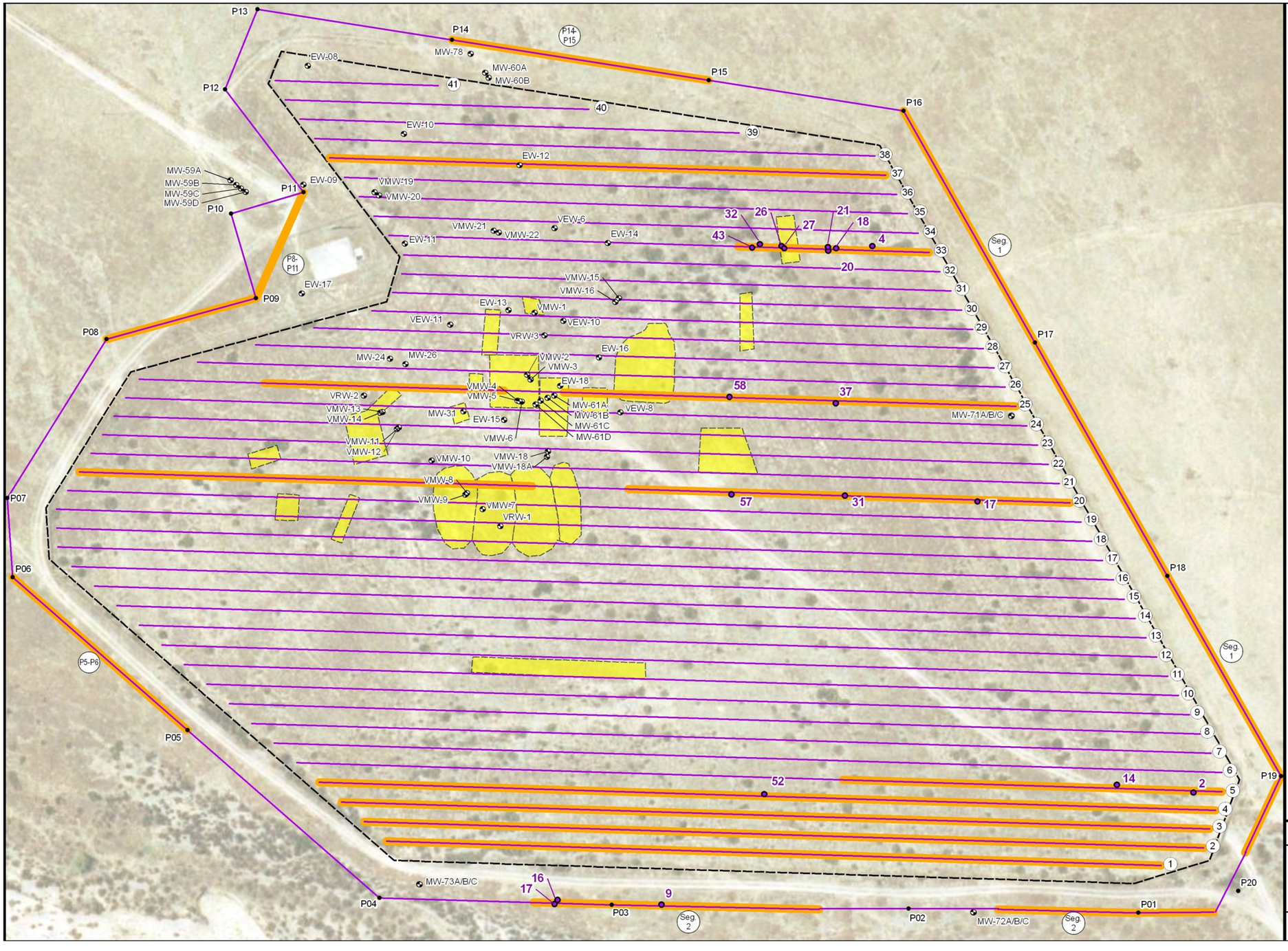

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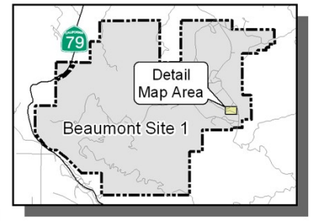
Adapted from:
April 2007 aerial photograph.

LEGEND

- MD Finds
- Well Location
- Transects - Mowed and Cleared (20-ft offsets)
- Transect - Surveyed and Intrusively Investigated
- Burn Pit Perimeter Fence
- Former Burn Pit Location



Beaumont Site 1

Figure 4-1
Burn Pit Area Evaluation Summary

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Table 4-1. Summary of Area C MEC Evaluation Results

Transect No.	Length (ft)	Length Dug(ft)	Area Dug (acres)	No. of Targets Identified	No. of Targets Dug	No. of MD Found
1	819.3	819.3	0.094	56	56	0
2	888.2	888.2	0.102	106	52	0
3	918.4	918.4	0.105	212	93	0
4	948.5	948.5	0.109	212	126	1
5	978.7	400.0	0.046	56	46	2
20	1048.1	946.2	0.108	383	140	3
25	927.4	731.9	0.084	261	138	0
33	571.5	201.7	0.023	102	49	8
37	588.4	588.4	0.068	92	40	2
Perimeter Segment 1	898.0	898.0	0.103	181	63	0
Perimeter Segment 2	530.3	530.3	0.061	159	61	3
Perimeter Segment P5-P6	245.6	245.6	0.028	79	24	0
Perimeter Segment P8-P11	286.8	286.8	0.039	34	7	0
Perimeter Segment P14-P15	274.7	274.7	0.032	64	16	0
Totals	*9923.9*	*8678*	*1.002*	*1997*	*911*	*19*

Notes:
MD- Munitions debris.
ft – feet.

Table 4-2. Summary of MD Items Found

Transect No.	Target No.	Northing	Easting	Depth (In)	Description
4	52	2256655.07	6355564.12	8	projectile frag ~ 4" x 1"
5	2	2256649.25	6356017.26	3	projectile frag ~ 2" x 1"
5	14	2256657.49	6355936.11	6	empty 30mm shell casing
33	4	2257226.75	6355677.66	8	empty 30mm shell casing
33	18	2257232.75	6355637.99	6	empty 30mm shell casing
33	20	2257230.38	6355629.48	6	empty 30mm shell casing
33	21	2257234.16	6355629.26	6	empty 30mm shell casing
33	26	2257241.33	6355578.98	4	empty 30mm shell casing
33	27	2257239.10	6355582.01	4	empty 30mm shell casing
33	32	2257242.40	6355554.90	2	empty 30mm shell casing
33	43	2257233.47	6355549.28	2	empty 30mm shell casing
20	17	2256954.53	6355788.49	3	empty 30mm shell casing
20	31	2256955.60	6355649.20	6	projectile fragment
20	57	2256958.03	6355531.84	12	unidentified fragment
25	37	2257060.91	6355638.86	6	unidentified fragment
25	58	2257067.71	6355526.59	4	unidentified fragment
Perimeter Segment 2	9	2256533.38	6355453.97	4	unidentified fragment
Perimeter Segment 2	16	2256540.69	6355343.82	10	unidentified fragment
Perimeter Segment 2	17	2256536.31	6355340.93	6	unidentified fragment

Notes:
In – Inches.
mm – millimeter.

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5.0 CONCLUSIONS AND RECOMMENDATIONS

The nature and condition of the MD and the depth of the items found during this evaluation, in conjunction with information in the BPA Removal Action Report, suggest that the MD items found are residuals of historical burning activities and not the result of planned detonations in a disposal, target, or range area. All items found were located in the upper 12 inches of soil. This layer of native soil was excavated and stockpiled within the BPA during the removal action and then replaced on site to encourage re-growth of native plant species. Based on the description of the procedures supplied during the removal action, it appears that this "top soil" was visibly, but not physically screened for all debris. The focus of the removal action and associated visual inspections was the residual burn debris and materials that might chemically contaminate the underlying soil and groundwater. In this circumstance, miscellaneous metal debris in the soil outside of the burn pit areas would not have been considered a significant contributing factor (i.e., would not have required removal based on the goals of the removal action).

Although the small number of MD items that have been found are not hazardous and appear more likely to be associated with occasional miscellaneous disposal or poor housekeeping, than with planned large-scale detonation of munitions, more data is needed to support this assumption and validate the CSM of the BPA as a disposal area for hazardous waste materials via open burning. There are several possible paths forward to obtaining this necessary data. Complicating the selection of an appropriate, cost-effective path forward is the presence of very large amounts of metallic debris in the area, as well as dozens of monitoring well heads, wire wrapped underground piping and SKR burrows. A second complication is that the historical activities in the BPA (farming and the removal action) would have resulted in a re-distribution of the metallic debris in the shallow soil and would have obscured any potential kickout patterns typically associated with the detonation of munitions. The methods used to remove, stockpile, and re-spread the top soil are likely to have resulted in significant mixing of this soil zone, and the spreading of any localized debris (such as a pile of waste 30mm casings) across the site.

A statistically based random sampling approach would (assuming typical specifications for required confidence levels and percentages of the area to be demonstrated free of MEC) require evaluation (intrusive investigation) of 3 or more acres spread randomly about the BPA. This area would be expected to contain up to 6,000 targets, in addition to well heads and piping. Areas containing clusters of very small anomalies would require special processing to ensure a comprehensive visual evaluation of the soils to eliminate the possibility of MEC items being present. Since the anticipated future use of this area will be generally limited to the surface, this level of effort does not appear to be warranted, especially considering the fact that the transect preparation work already completed resulted in a surface sweep of approximately 25% of the BPA and did not reveal any MEC. Only a single piece of MD was found during the surface sweeps.

Based upon the type, location and depth of MD items that have been found to date, and the physical conditions and constraints present in the BPA, it is recommended that the following

actions (or equivalent) be conducted to confirm the CSM developed for this area and alleviate concerns regarding potential MEC hazards during future site use.

5.1 BIASED PHASED SAMPLING RECOMMENDATION

The phased evaluation recommended includes an instrument-aided surface sweep and initial mapping of the entire BPA and a buffer zone in order to gather the information needed to better understand the distribution of metallic debris in the BPA and to develop a tailored investigation pattern/approach for the area. The mapping would be followed by intrusive investigation in selected areas to verify the absence of MEC, seen thus far. Sampling would be biased toward areas with more potential to contain MEC and the size and distribution of subsurface anomalies. All large anomalies which might represent the larger caliber ordnance tested at the Site would be investigated. In addition, 5 percent of the anomalies in the proper size range for 20mm and 30mm munitions would be investigated. If no MEC is found, the area would be recommended for no further field actions and institutional controls (if necessary) would be considered in the MEC Remedial Action Plan for the Site. If MEC is found, DTSC would be engaged in discussion of the appropriate follow-on actions.

Specific tasks would include:

1. Follow-up interviews (if possible) with the two former LMC employees previously interviewed who may have knowledge of which parties may have used the BPA and what types MEC items may have been burned in that area;
2. Surface clearance of the BPA and a limited surrounding buffer zone to identify/remove any potential MEC hazards at the ground surface in preparation for mowing and geophysical mapping. The surface clearance will be conducted by walking transects across the entire site while sweeping the ground surface with all metals detectors.
3. Mowing/vegetation reduction in the BPA and buffer zone to prepare for geophysical mapping;
4. Installation of an instrument test strip containing appropriate munitions simulants (or expansion of the existing instrument test strip)
5. 100% of the BPA and buffer zone will be geophysical mapped to obtain a more complete and clear understanding of the density, distribution and estimated depth of subsurface metallic anomalies and features (well piping, etc.) in the BPA;
6. Excavation of all large subsurface anomalies that may represent any of the larger test munitions known to have been used at the Site (5-inch, 105mm or 155mm projectiles) based upon the instrument readings recorded during geophysical mapping and comparative readings for like stimulant items buried in the instrument test strip established for the follow-on action.
7. Excavation of 5 percent of the subsurface anomalies that may represent the smaller test munitions known to have been used at Beaumont Site 1 (20mm and 30mm projectiles)

based upon the instrument readings recorded during geophysical mapping and comparative readings for like stimulant items buried in the instrument test strip established for the follow-on action. The exact percentage of anomalies investigated would be a function of the total number of anomalies found during mapping.

8. Seeding of one surrogate ordnance item per acre of land evaluated in the BPA and buffer zones to provide quality control for the geophysical mapping program. The items will be representative of 20mm and 30mm projectiles since these munitions were used in other areas of Beaumont Site 1. In addition, the casings found in the BPA in the past have been 30mm. Seeded items assist in determining that the given area was in fact surveyed with the desired level of quality.

The location of the smaller anomalies investigated would be biased toward areas with higher densities of anomalies and areas that have a greater probability to contain MEC (areas where surface items have been found previously, areas near pits, etc.). If areas identified for evaluation contain large amounts of small debris (such as metal flakes), a five-point sampling approach similar to that previously used for the Phalanx Target Berm (TetraTech, 2005b) in Operational Area B will be applied to obtain data regarding these areas..

This phased approach would allow the final intrusive effort (Steps 6 and 7) to be more accurately scoped and specifically focused in areas most likely to contain MEC-related hazards. It would also provide a larger body of data for evaluation of risk and potential remedies, if necessary..

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REPORT BODY AND APPENDICES A-C ON ATTACHED CD

APPENDIX A BPA REMOVAL ACTION REPORT

APPENDIX B DAILY AND QUALITY CONTROL REPORTS

APPENDIX C PHOTOLOG