# SUMMARY REPORT

## MUNITIONS AND EXPLOSIVES OF CONCERN (MEC) EVALUATION

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

LOCKHEED MARTIN
*We never forget who we're working for™*


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**December 2005**

**Final Revision February 2007**

This Report documents the Munitions and Explosives of Concern (MEC) Evaluation at Beaumont Site 1. It contains a description of the procedures implemented and the areas where MEC evaluation was conducted, along with a description of how those areas were developed for evaluation. The report also contains a summary of the results of the MEC evaluation and conclusions regarding the potential need for supplemental 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.

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# FOREWORD

This Summary Report documents the activities performed during the Phase I Munitions and Explosives of Concern (MEC) Evaluation. A number of the ordnance-related terms are included in the text of this report. The terms typically used to classify various types of ordnance based on the construction, use and condition of that ordnance vary greatly among the different military services. In this document, the terms MEC, munitions components (MC) and unexploded ordnance (UXO) are used extensively. As the definition of MEC implies, this term encompasses a broad range of different types of ordnance in various conditions including high explosive (HE) and target practice (TP) ordnance that is fuzed or unfuzed, armed or unarmed, fired or unfired, as well as bulk explosives and soil containing enough explosive residue to represent an explosive hazard. UXO is a subset of MEC including ordnance items that have been prepared (fuzed, armed, etc.) and fired, but have failed to function (detonate, burn, etc.) in the intended manner. The term UXO is used in this report primarily to refer to the qualified private-sector technicians who perform ordnance-related services. These individuals are commonly referred to in this industry as UXO technicians. For simplicity and clarity, MEC is used in the report to refer to both UXO and unfired TP ammunition found at the Site.

The term MC is used in this report to refer to any ordnance related items that are non-explosive either by design or because they have been fired and functioned as intended destroying and energetic materials contained by the item.

# EXECUTIVE SUMMARY

In late 2003, approximately 94% of former Beaumont Site 1 facility (the Site) near Beaumont, California was sold to the State of California. The portion of the Site sold is being managed by the California Department of Fish and Game (CDFG). CDFG proposes to use the property as a wildlife conservation area and allows limited use of the property for public recreation.

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, since this work was focused on propulsion systems and weapons delivery systems, most munitions used on site were reportedly practice rounds that did not contain high explosives. In 1970, LMC began offering their test services to outside parties. LMC leased property to Aerojet Corporation and allowed General Dynamics to conduct testing on several occasions. There are indications that some of these tests involved live 30mm ammunition, rocket propelled projectiles and explosive shaped charges.

Record rainfall in 2005 caused heavy flows in the ephemeral creeks at the Site. As a result, several creek crossings on site were damaged. During repair of a stream 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 responded to the site and examined the munitions. The officers dispatched were uncertain whether or not the ammunition was live (contained an explosive charge), so it was explosively disposed of on site. As a result of the discovery of these apparently discarded munitions, LMC expressed concern regarding other potential ordnance -related hazards on site.

As a result of the discovery of these apparently discarded munitions, Tetra Tech, Inc. (Tetra Tech) was tasked by LMC to provide rapid response to assess and, if necessary, mitigate immediate ordnance-related hazards potentially present on site. To facilitate this process, a preliminary list of areas of concern (AOCs) was prepared to focus the assessment in areas most likely to contain MEC hazards. The rapid response and preliminary assessment were designated as the Phase I Munitions and Explosives of Concern (MEC) Evaluation. Based on the results of the Phase I evaluation and a review of historical information available, Tetra Tech was asked to identify areas where

follow-on work (more detailed inspection/evaluation) was warranted and to plan and conduct that work. The follow on work was designated as the Phase II MEC Evaluation. Both phases of the MEC evaluation are documented in this report.

During the Phase I MEC Evaluation, relevant portions of five operational areas on site (A, B, D, G & I) were swept for surface MEC and related items. In addition, limited shallow subsurface evaluation was conducted in selected areas to evaluate the potential for buried MEC to be present. Areas were selected for evaluation based upon available historical information.

Just over 20 acres of land were evaluated during the Phase I MEC Evaluation. Twenty-five MEC items including 20mm target practice (TP) rounds and primer/igniters were found. In addition, 79 various munitions components were found including 20mm TP projectiles, 30mm TP projectiles, 40mm TP projectiles, primers/igniters and fragmentation (frag) from munitions. This count includes the 11 items initially found by CDFG personnel. The MEC items were all located in Operational Area D, while munitions components were found in areas B, D, G and I. In addition, UXO field personnel identified several areas not designated as test sites where numerous subsurface metallic contacts were present that may be buried MEC or related items.

Supplemental historical information was received during the Phase I MEC Evaluation from a former LMC employee who worked in Operational Area A. The employee indicated that live ordnance was used in this area and housekeeping procedures may not have been as extensive as necessary to ensure removal of all test related MEC and waste.

Following the Phase I MEC Evaluation, all of the data available including historical data, MEC data from Phase I and the new anecdotal information regarding Area A was used to create an initial conceptual site model (CSM) for the site. The CSM describes the MEC-related operations that are thought to have taken place in each area and the types and general distribution of MEC or related materials expected to be present based on the characteristics of those operations. In addition, the CSM shows the transport mechanisms that may have resulted in re-distribution of MEC over time and the new locations where MEC may now be found. During preparation of the CSM the preliminary list of AOCs was adjusted to reflect the data gathered during Phase I. AOCs were added, removed or modified as appropriate to provide as accurate a depiction of site MEC characteristics as possible at the time.

The initial CSM was used to develop a plan for the Phase II MEC Evaluation. The second phase of evaluation was intended to verify or refute the various assumptions in the CSM and thus provide a more detailed and accurate depiction of the MEC characteristics of the Site. Approximately 82 acres of land were evaluated in seven operational areas during the Phase II MEC Evaluation. Four MEC items were found including three 30mm high explosive (HE) projectiles and one 20mm TP round. In addition, 616 munitions components were found including 20mm TP projectiles, 30mm TP projectiles, 40mm TP projectiles and frag. Table ES-1 summarizes the MEC data for each phase of the evaluation.

**Table ES-1. Summary of MEC Data**

| AREA | DISCOVERIES BY AREA | | |
|---|---|---|---|
| | MEC Phase I/Phase II | Munitions Components Phase I/Phase II | Comments |
| A | 0/3 | 0/43 | Three 30mm HE projectiles, three 30mm TP projectiles, seven pieces of 30mm scrap, 16 pieces of 30mm frag and nine pieces of non-specific frag found during Phase II. |
| B | 0/0 | 26/121 | Fired 20 & 30mm TP projectiles and associated frag found during Phases I & II. Three pieces of thick walled frag found in the possible Viper Bazooka range. This frag may be part of a former target. |
| D | 25/1 | 43/246 | Fired and unfired 20 mm TP projectiles; igniter tubes with and without energetic material; 155mm projectile base and rotating band, Sabot charge nose, a piece of a LAW rocket launcher; and frag found during Phases I & II. Possible HE frag in one AOC. |
| F | NA/0 | NA/0 | No propellant found in Phase II sweep of washout area. No documented munitions use in this area. |
| G | 0/0 | 8/155 | Fired 30 mm & 40 mm TP items and frag found during Phases I & II. Small arms remnants also found (81 of 155 munitions components) |
| H | NA/0 | NA/0 | No MEC or munitions components found in surface sweep of landfill. |
| I | 0/0 | 2/51 | Frag located during the Phase I sweep. Four 27.5mm base plate pieces (fired) and thick walled frag found during Phase II. |
| Total | 25/4 | 79/616 | |

Following completion of the Phase II work, the CSM was updated to reflect the most current data available. The updated CSM will serve as the basis for decisions concerning no further action, further characterization or cleanup.

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# ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AEDA | Ammunition, explosives and other dangerous articles |
| AOC | area of concern |
| AP | armor piercing |
| CPR | Cardiopulmonary Resuscitation |
| CSM | conceptual site model |
| DGPS | Differential Global Positioning System |
| EHSP | Environmental Health and Safety Plan |
| EOD | explosive ordnance disposal |
| frag | fragmentation |
| GPS | Global Positioning System |
| HE | high explosives |
| HMX | High Melting eXplosive (cyclo-1, 3, 5, 7-tetramethylene-2, 4, 6, 8-tetranitramine) |
| LAW | Light Anti-tank Weapons or Light Anti-armor Weapon |
| LGPC | Lakewood Geophysical Processing Center |
| LMC | Lockheed Martin Corporation |
| LPC | Lockheed Propulsion Company |
| MC | munitions constituents |
| MEC | munitions and explosives of concern |
| PM | Project Manager |
| PPE | personal protective equipment |
| QA | quality assurance |
| QC | quality control |
| SKR | Stephens' Kangaroo Rat |
| SOP | Standard Operating Procedure |
| SRAM | short range attack missile |
| SUXOS | Senior UXO Supervisor |
| Tetra Tech | Tetra Tech, Incorporated |
| The Site | Former Lockheed Beaumont Site No. 1 |
| TPLZ | terraced projectile landing zone |
| TP | target practice |
| UXO | unexploded ordnance |
| UXOQC | UXO Quality Control Specialist |
| UXOSO | UXO Safety Officer |

# 1.0 INTRODUCTION

Lockheed Martin Corporation (LMC) purchased the Beaumont Site No. 1 property (the Site) near Beaumont, CA in 1960. 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, since the LMC work was focused on propulsion systems and weapons delivery systems, most munitions used on site were reportedly practice rounds that did not contain high explosives. In 1970, LMC began offering their test services to outside parties. Between 1970 and 1974, LMC leased property to Aerojet, which conducted ballistics testing at two locations on site. In 1983 and 1984, after the Site was vacated by LMC, General Dynamics tested two weapons systems at the Site. These systems included a Viper bazooka and a Phalanx gun.

In 1986, the operating history of the Site was reviewed in order 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 chemical contaminants. No recommendations for further action were made regarding munitions or explosives that may have been used in historical operations (Radian, 1986).

In late 2003, approximately 94% of former Beaumont Site No. 1 test facility (the Site) near Beaumont, California was sold to the State of California. The portion of the Site sold to the State is managed by the California Department of Fish and Game (CDFG). CDFG intends to use the property as a wildlife conservation area and to allow use of the property for public recreation. The remaining site acreage became a Conservation Easement owned by LMC until chemical contamination has been cleaned up.

Record rainfall in 2005 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 a stream crossing in Operational Area D (the former Lockheed Propulsion Company [LPC] Ballistics Test Range), two small clusters of 20mm link ammunition were found. The Riverside County Sheriff's Office responded to the site, examined the munitions and performed disposal. The officers dispatched were uncertain whether or not the 20mm rounds were live (contained a high explosive charge), so the rounds were disposed of in place explosively.

As a result of the discovery of these apparently discarded munitions, Tetra Tech, Inc. (Tetra Tech) was tasked by LMC to provide rapid response to identify and mitigate immediate ordnance-related hazards potentially present on site. The rapid response and preliminary assessment were designated as the Phase I Munitions and Explosives of Concern (MEC) Evaluation. Based on the results of the Phase I evaluation and a review of historical information available, Tetra Tech was asked to identify areas where follow-on work (more detailed inspection/evaluation) was warranted and to plan and conduct that work. The follow on work was designated as the Phase II MEC Evaluation. Both phases of the MEC evaluation are documented in this report.

## 1.1 PURPOSE AND OBJECTIVES

The purpose of the Phase I MEC Evaluation was to find and mitigate immediate MEC-related hazards on site and to gather preliminary data with which to evaluate the need for further assessment of mitigation at the Site. Specific objectives for the Phase I MEC Evaluation were:

- To address the immediate hazard posed by the potential presence of 20mm ammunition in Area D;
- To determine if immediate MEC hazards were present in other potential areas of concern (AOCs) at the site;
- To help ensure the safety of personnel working on site by providing MEC awareness/safety training; and,
- To prepare a preliminary conceptual site model (CSM) and evaluate the need for further characterization at the site.

The purpose of the Phase II MEC Evaluation was to sample or characterize each of the AOCs identified at the site and to validate and/or update the CSM. The specific objectives for the evaluation were to:

- Collect MEC data in each AOC of sufficient quantity and quality to support evaluation of the validity of the conceptual site model (CSM) developed during the previous Phase I MEC Evaluation conducted at the Site.
- Evaluate the CSM and make adjustments to address discrepancies found during the evaluation
- Identify AOCs where additional actions may be needed including assessment, institutional controls and/or clearance, as well as areas where no further action is indicated

## 1.2 SCOPE OF WORK – PHASE I MEC EVALUATION

The Phase I MEC Evaluation was a limited scope, rapid response action intended to identify and mitigate immediate MEC hazards. The tasks executed for this evaluation included:

- Site Specific Work Plans - An abbreviated internal work plan and health and safety plan were prepared to direct and support the Phase I MEC Evaluation. These plans contained the basic information necessary to conduct the proposed activities in a safe and productive manner.
- Mobilization and Site Preparation - This task included all preliminary work needed to set up for the evaluation activities including mobilization of staff and equipment, site-specific training for Tetra Tech unexploded ordnance (UXO) staff performing activities at the site and identification and prioritization of work areas for MEC activities.
- MEC Awareness Training -This training included a discussion of general UXO safety considerations, MEC identification guidance, and procedures to follow upon discovery of MEC. Training was conducted on site and some of the inert MEC-related items found during the Phase I MEC Evaluation were used as training aids.
- Evaluation for Immediate MEC Hazards - Initial AOCs were identified and those determined to have the highest potential to contain immediate MEC hazards were evaluated via detector-aided MEC surface sweeps and limited subsurface investigation. Several identified AOCs were not evaluated since there was no apparent potential for immediate MEC hazards.
- Summary Report - Tetra Tech prepared this Summary Report to document the activities performed during the Phase I and II MEC Evaluations. The report summarizes the site history and the results of the evaluation activities performed. The Phase I activities provided data to support development of the initial CSM used to design the Phase II MEC Evaluation strategy.

## 1.3 SCOPE OF WORK – PHASE II MEC EVALUATION

The Phase II MEC Evaluation built upon the Phase I evaluation. The scope of work was expanded to include all identified AOCs (not just those with potential for immediate hazards) and more advanced technologies were employed as appropriate to collect data that would support a more detailed evaluation of the various AOCs. The tasks executed for the Phase II MEC Evaluation included:

- Site Specific Work Plans - The abbreviated internal plans prepared for Phase I were expanded to include all activities and hazards related to the Phase II work. The field work began prior to approval of the plans by the California Department of Toxic Substances Control (DTSC) because of the potential hazard at the site; however, the basic procedures and safety provisions were approved internal to Tetra Tech prior to the beginning the field program.
- Historical Research - Tetra Tech performed historical research to identify former Beaumont employees and other individuals in the community who may have information regarding the historical activities at the Site. Throughout the Phase II MEC Evaluation these individuals were contacted and consulted with respect to:
    - The types of MEC-related activities that occurred at the Site
    - Locations where MEC activities took place
    - The types and quantities of MEC used
    - The types of scrap generated
    - Locations where scrap or residual MEC may be found
- Mobilization and Site Preparation - The personnel and equipment utilized on site for the Phase I MEC Evaluation were augmented so that the more complex and detailed Phase II scope could be performed in a safe and efficient manner.
- Geophysical Mapping - Geophysical mapping was conducted as necessary to support MEC evaluation in the various AOCs. This technology was applied in AOCs where it was anticipated that MEC would be found in deeper soils rather than on or near the ground surface. Mapping included data collection, processing and interpretation by experienced geophysicists.
- MEC Evaluation – All identified AOCs were evaluated during the Phase II evaluation. Evaluation included surface sweeps, mag and dig intrusive investigation and/or intrusive investigation guided by geophysical mapping data in accordance with the work plans.
- Data Analysis – Field data from both phases of the MEC evaluation were analyzed along with available historical data (both old and new) to obtain a more complete understanding of the MEC characteristics of the Site. The data were used to characterize the different AOCs and refine the CSM.

- Summary Report - Tetra Tech prepared this Summary Report to document the activities performed and the findings of the Phase I and II MEC Evaluations. The report documents the activities performed, summarizes the results and provides an updated CSM.

## 1.4 SUMMARY OF TECHNICAL APPROACH

The Phase I MEC Evaluation was a rapid response that called for a simple technical approach. A small field team was employed and was equipped with light-weight, handheld instrumentation that allowed the team to safely and quickly access those AOCs most likely to potentially contain immediate hazards. No specific investigation patterns such as transects or grids within AOCs were pre-selected and the team was not asked to count the number of scrap items or subsurface anomalies noted in any of the areas. Team members recorded the general physical and MEC characteristics of the areas and the types of MEC items or related scrap found. The location of MEC items was ascertained using a handheld Garmin global positioning system (GPS) unit.

Providing general guidance on search areas and patterns rather than specifying exact geographic locations excluded the need for cumbersome, advanced location equipment and staking. Limiting the amount and type of data collected during Phase I allowed the team to focus on immediate hazards while still obtaining sufficient data to support the design of the Phase II MEC Evaluation.

During the Phase II MEC Evaluation, the technical approach was modified to reflect the significantly different purpose of this evaluation. During this phase of the work, the focus was on more detailed evaluation of AOCs and the collection of sufficient data to validate or update the CSM. Therefore, a much more detailed approach was needed. The conceptual site model prepared during the Phase I evaluation was used as a roadmap for the Phase II evaluation. The model was consulted to specifically determine the most likely areas where residual MEC or associated waste might be found. Advanced location and detection equipment was utilized to minimize labor and maximize data. The use of highly advanced geophysical equipment allowed collection of 2-dimensional (2-D) data used to evaluate the size, configuration and depth of subsurface metallic items. This data supported selection and investigation of those subsurface targets most likely to be MEC or MEC related in each AOC. Coupling the geophysical instrument with a differential global positioning system (DGPS) ensured that the work was traceable and repeatable. The simpler technical approach applied during the Phase I MEC Evaluation was applied in areas that were inaccessible to field staff using the more advanced equipment (due to equipment size or rough terrain) and at sites where the exact locations for MEC use was less well defined. .

# 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, California.

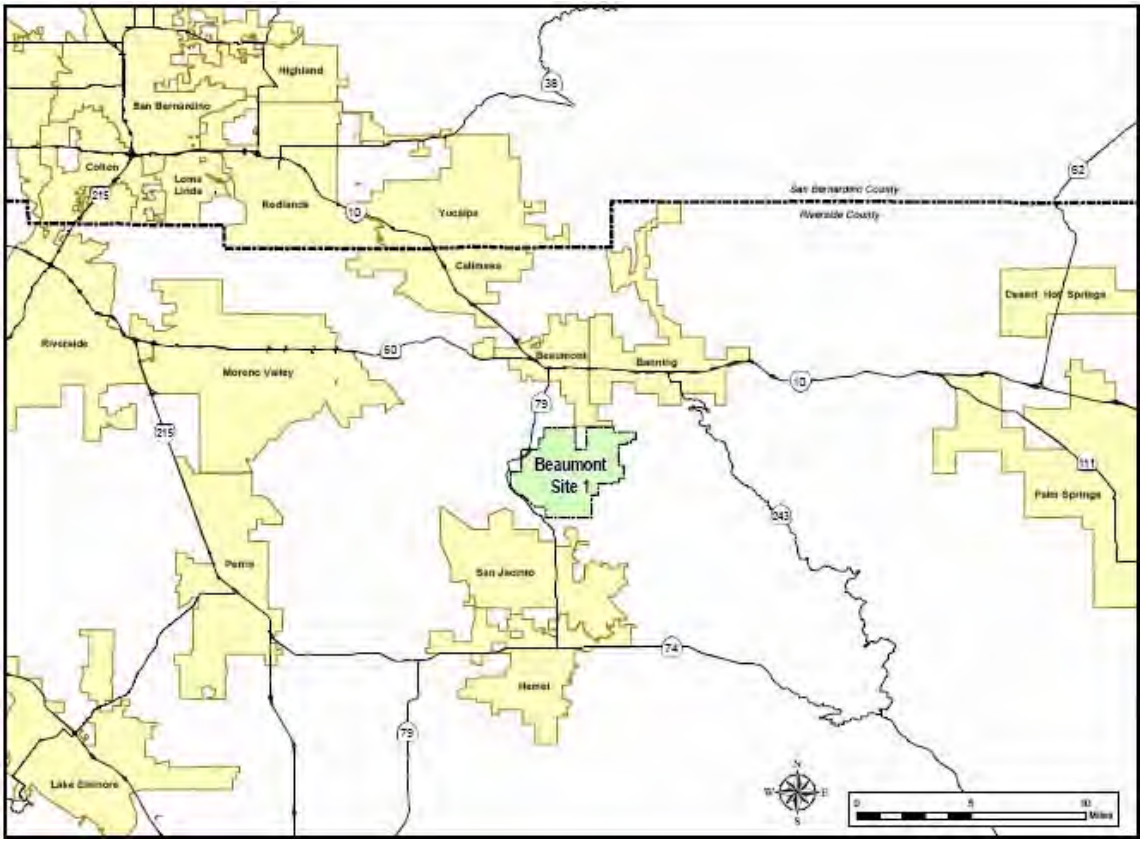



**Figure 2-1. Former LMC Beaumont Site 1 Vicinity Map**

## 2.2 SITE HISTORY AND OPERATIONS

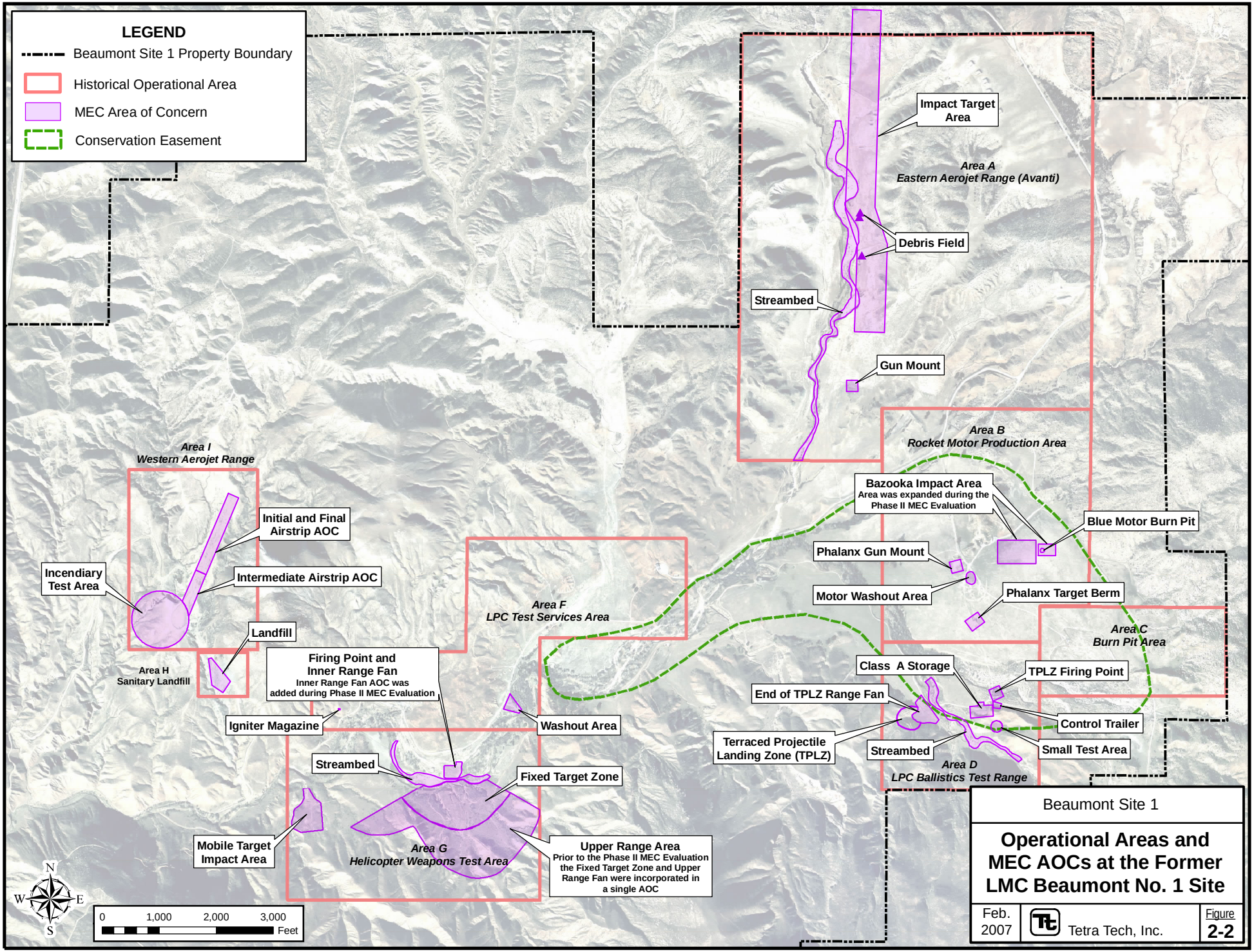
Historically, the Site was used primarily for ranching. There were ranch houses and other related structures at the site. A title search performed on this property indicated that LMC purchased the property in 1960. This facility was used as a remote test area for early space and defense programs. During 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, testing and incineration (waste propellant); rocket motor washout; and, ballistics testing. Based on the historical record, nine operational areas were identified for the Site

Table 2-1 summarizes the known operational areas and Figure 2-2 shows the location of the areas. Each historical operational area is represented on the figure by a rectangle that encompasses the various AOCs in that area; however, not all of the acreage within each operational area was utilized for operations.

**Table 2-1. Historical Operational Areas at Beaumont Site 1**

| Area Designation | Name | Operational Use |
|---|---|---|
| A | Eastern Aerojet Range | R & D experimentation with long-range 30mm weapons system was conducted in this area. A 27.5mm Bushmaster was also test fired. Reportedly no live ammo used; however, a former employee states that live HE 30mm armor piercing (AP) rounds were tested at this site. Revetments are present that once provided protective storage for classified Avanti rocket motors. Flat areas of this range were reportedly mechanically cultivated and planted in barley after the LMC facility closed. |
| B | Rocket Motor Production Area | Solid rocket propellant was mixed in this area by LMC. There was a rocket motor washout facility in Area B and four SRAM rocket motors are known to have been destroyed in this area. General Dynamics also conducted limited testing here using a Viper Bazooka and Phalanx Gatling Guns. The bazooka testing involved explosives and shaped charges. Reportedly only frag remained after the test. The Gatling guns used 20mm and 30mm practice ammunition. Four SRAM rocket motors were also destroyed in this area. |
| C | Burn Pit Area | Industrial solvents, Class A explosives, solid rocket fuel and its components, and other waste materials were disposed of in this area via open burning in strip pits. Top two feet of the soil in the burn pit area was removed to expose pits for testing, excavation and disposal. |
| D | LPC Ballistics Test Range | Ballistics testing with Navy 5"/38 and Army 37mm, 40mm and 155mm was conducted in this area. Reportedly, no live rounds were used. A .50 caliber gun was used to stress test rocket casings and LMC performed one test here using an incendiary bomb. Three magazines were used for the storage of class 1.1 explosives (Class A). |
| E | Low-level Radioactive Waste Disposal Site | A reportedly one time burial of low-level radioactive waste took place in this area. The waste was later removed under the direction of the State of California. |
| F | LPC Test Services Area | This area was used to conduct load tests, pressure vessel testing and X-ray of various propellant systems or components (large rocket propulsion systems); one igniter magazine was sited in this area. There was also a rocket motor washout facility here. |
| G | Helicopter Weapons Test Area | High speed helicopter weapons systems were tested in this area. Stationary and helicopter mounted guns were used to fire 7.62 NATO rounds into the cliffs (creek bank) opposite the firing point and at targets suspended between two towers across the creek. Additional testing on the propellant portion of 30mm shaped charges and 40mm grenades. All rounds were reportedly practice or dummy rounds. |
| H | Sanitary landfill | Anecdotal information indicates that practice rounds or related scrap may be present in the landfill. The landfill was permitted and has a soil cap. |
| I | Western Aerojet Range | This area was potentially used by Aerojet; supervisors did not remember any testing here, but a former LMC employee indicates there may have been testing. LMC reportedly performed one test here using an incendiary bomb. |

X:\GIS\LOCKHEED UXO\RPT\FIG 2-2 MEC.MXD




Beaumont Site 1

# Operational Areas and MEC AOCs at the Former LMC Beaumont No. 1 Site

Feb. 2007

Tetra Tech, Inc.

Figure 2-2

In 1970, LMC began offering their test services to outside parties for programs unrelated to rocket motors. LMC also leased property to outside firms for ballistics related testing. Aerojet Corporation leased two operational areas (Areas A and I) at the Site where the company conducted ballistics testing. During their lease period, Aerojet worked with 27.5 mm projectiles containing bursting charges and lost or misplaced at least two of these rounds (Radian, 1986). They also worked with 30mm rounds for a long-range weapons system. A former LMC employee reported that some of these rounds contained a charge of some type that exploded upon impact with a target. The resulting small-scale explosion improved the ability of range employees to photograph the impact. The same employee stated that Aerojet also used 30mm high explosive (HE) armor piercing (AP) ammunition on site. In 1983 and 1984, General Dynamics also performed test activities at the Site. General Dynamics is known to have tested a Viper bazooka in Area B. This test involved the use of a 2.7 inch rocket motor, explosives and shaped charges. According to General Dynamics only shrapnel remained after the testing. They also tested 20mm and 30mm Phalanx Gatling guns.

In late 2002, Tetra Tech employees performed a site walk at former operational areas at the Site to identify areas potentially requiring investigation. The employees were searching for visible indicators of contamination such as stained or disturbed soils, storage drums/containers, or stressed vegetation. No MEC items were found during the site walk.

In 2005, an unusually heavy rainy season resulted in higher then usual creek flows at the Site. As a result, several creek crossings along the site roadways were damaged. During repair of a stream crossing in the Area D, two small clusters of 20mm link ammunition were found. The CDFG notified LMC of the find and LMC immediately contacted the Riverside County Sheriff's Office. The Sheriff's Office responded to the site, examined the munitions and performed explosive disposal. The officers dispatched were uncertain whether or not the 20mm rounds were live (contained a high explosive charge); however, they stated that at least one round appeared to have blue paint on the tip. This is generally an indicator for practice ammunition that does not contain high explosives. This type of ammunition can still be hazardous as it contains propellant and a primer.

## 2.3 PHYSICAL AND ENVIRONMENTAL FEATURES

The Site is located within the western foothills of the San Jacinto Mountains. The site is located in a broad valley, known as the San Jacinto Nuevo Y Potrero, surrounded by gently rolling hills and rugged mountains. Elevations at the site range from about 1,500

feet above mean sea level (MSL) to approximately 3,700 feet MSL. Potrero Creek bisects the site in a northeast to southwest direction.

The climate of the Site region is semiarid. Rainfall averages from 14 to 20 inches per year. The temperature generally ranges between the upper 30s and upper 90s depending on season.

The San Jacinto Nuevo Y Potrero at the Site is an alluvial in filled valley located along the western foothills of the San Jacinto Mountains. These mountains are an elevated structural block composed of igneous and metamorphic rock. Tertiary sediment deposits consisting of sandstone, sand, gravel and shales form subdued hills characterizing the northeastern portion of the Site. The San Jacinto fault and associated branch faults are located adjacent to the southern boundary of the site.

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 Stephens' Kangaroo Rat (SKR). In addition, this site has the potential to support four other species that are either endangered or threatened. These include 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; however, information gathered during a site visit by a biological resource firm indicates that the potentially suitable habitat for these species would generally be found along Potrero Creek (Chambers Group, 2003). Training and mitigation measures for protection of endangered species is discussed in Section 4.1.

# 3.0 CONCEPTUAL SITE MODEL

## 3.1 IDENTIFICATION OF AREAS OF CONCERN

The first step in development of the CSM for the Site was identification of AOCs. Preliminary AOCs were developed for use in the Phase I MEC Evaluation based primarily on information presented in the Historical Report. The data in this report was supplemented with information obtained in an interview with a former LMC employee. The operational areas on site were evaluated individually to determine whether or not the historical activities in those areas may have resulted in the presence of residual MEC hazards. In addition, the physical characteristics of the areas were examined in conjunction with historical maps and aerial photography to identify the most likely locations for those MEC activities. Following the Phase I MEC Evaluation, the preliminary AOCs were modified slightly to reflect the results of the evaluation and were then used to develop an initial CSM. The AOCs for the initial CSM are discussed in the following sections. Table 3-1 presents a summary of the information available for each AOC following the Phase I evaluation.

### 3.1.1 Operational Area A – Eastern Aerojet Range

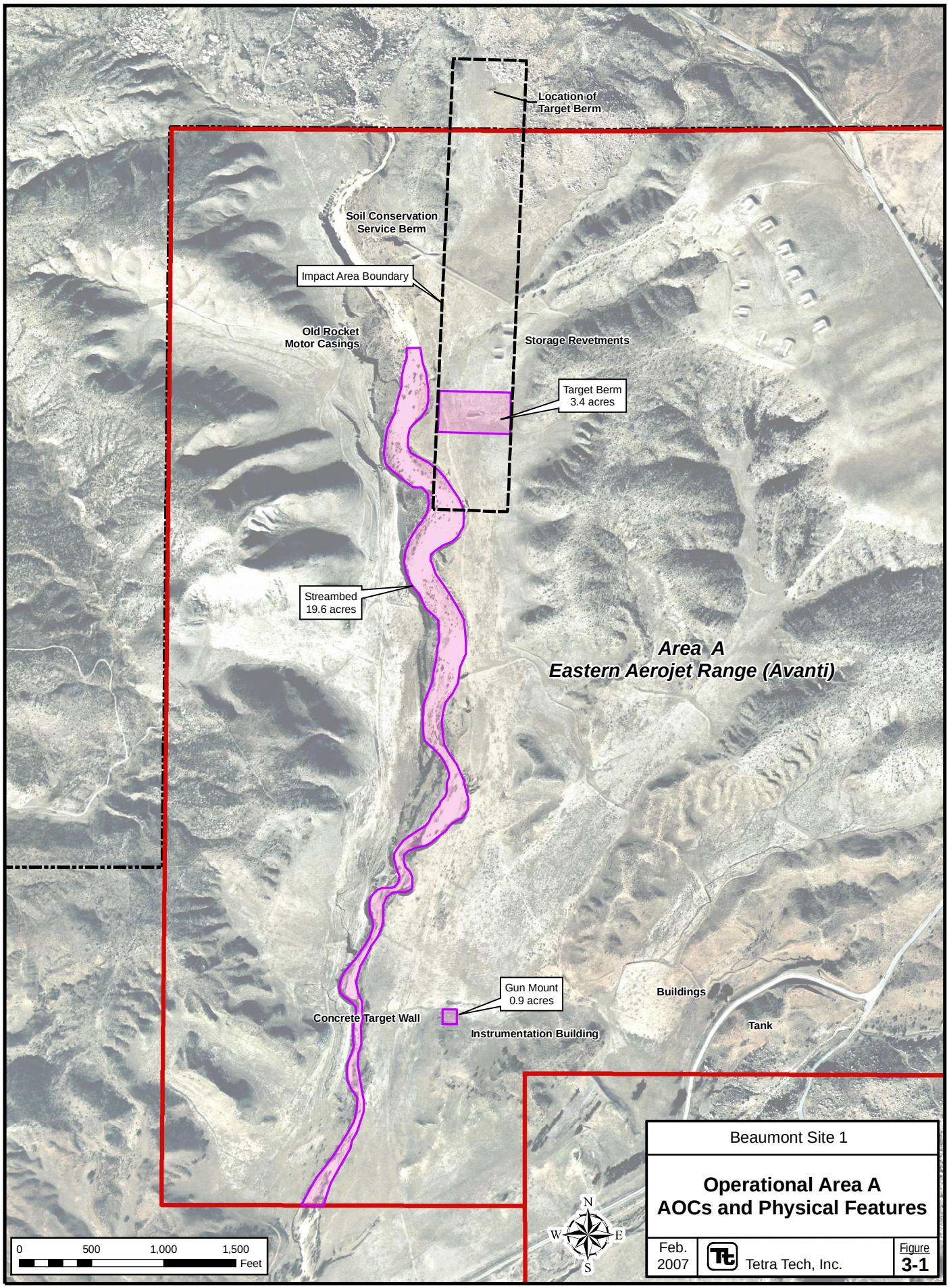
This 926 acre area is located in the northeastern portion of the property near the main gate to the facility (Figure 2-2). Geographical features include a large central flat area bounded on two sides by rolling hills and on the third by a large seasonal creek. There is an earthen berm near the north end of the flat area that is identified in the Historical Report as a target berm. Steel plate targets were supposedly set up in front of this berm to capture ammunition passing through the target during testing. Camera equipment was set up near the target to collect photographs of the ammunition at impact which were used to study the ballistics of the various munitions tested. The report indicates that the firing point for the test range was located next to a small knoll near the southern boundary of Area A. A truck mounted 30mm gun was positioned on a concrete pad and firing was controlled from a small concrete instrumentation building positioned behind a concrete barrier just south of the gun mount. Pertinent physical features of Area A are shown on Figure 3-1.

According to the Historical Report, Operational Area A was leased to Aerojet for a period of approximately 3 years. During this time, Aerojet conducted research and development experimentation with ammunition for a long range 30mm weapon and a

## Table 3-1. Summary of Phase I Findings and AOC Adjustments

| Area | AOC | MEC/Related Items | Phase I Adjustments | Justification for Phase II |
|---|---|---|---|---|
| A | Gun Mount | None | None | Potential for disposal by burial |
| A | Target Impact Area | None | Size increased; shape changed to reflect input from former employee | Anecdotal information on the use of live 30mm ammo |
| A | Streambed | None | None | Proximity to impact area |
| A | Debris Fields | None | New AOC added | Potential for disposal by burial |
| B | Phalanx Gun Mount | None | None | Potential for disposal by burial |
| B | Phalanx Target Berm | 20mm TP projectiles and scrap | None | Need to verify TP only |
| B | Bazooka Impact Area | None | None | HE used in testing |
| B | Blue Motor Burn Pit | Not evaluated, no immediate hazard | None | |
| B | Washout Area | Not evaluated, no immediate hazard | None | Potential ignitable propellant pieces |
| D | Terraced Projectile Landing Zone (TPLZ) Firing Point | None | None | Potential for disposal by burial |
| D | End of TPLZ Range Fan | Sabot charge nose; frag | None | Need to verify TP only |
| D | TPLZ | 155mm projectile base and rotating band; 37mm TP projectile and frag | None | Need to verify TP only |
| D | Small Test Area | frag | None | Potential for disposal by burial |
| D | Class A Storage | None | Renamed .50 cal test area based on field observations | Potential for disposal by burial |
| D | Control Trailer Area | None | New AOC; initially identified as actual Class A storage | Potential for disposal by burial |
| D | Streambed | 20mm TP rounds; 20mm TP projectiles; primer/igniters (live & expended) | None | Remove TP rounds; identify source if possible |
| F | Igniter Storage Magazine | Not evaluated, no immediate hazard | None | Potential for disposal by burial |
| F | Washout Area | Not evaluated, no immediate hazard | None | Potential ignitable propellant pieces |
| G | Firing Point | 40mm TP projectile; 30mm scrap | Size decreased & location changed based on input from former employee | Potential for disposal by burial |
| G | Range Fan | 40mm TP projectiles | Divided into three AOCs based on input from former employee | Need to verify TP only |
| G | Mobile Target Impact Area | 40mm TP projectile | None | Need to verify TP only |
| G | Streambed | None | None | Proximity to impact area |
| H | Landfill | Not evaluated, no immediate hazard | None | Need to verify no exposed MEC waste |
| I | Airstrip | Thick-walled frag; south end | Shortened to eliminate north end | ID source of frag if possible; verify no testing in this AOC |
| I | Incendiary Bomb Test Area (IBTA) | Thick-walled frag | None | ID source of thick frag |

X:\GIS\LOCKHEED UXORPT\FIG 3-1.MXD




Beaumont Site 1

**Operational Area A**
**AOCs and Physical Features**

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weapon described as a 27.5 mm Bushmaster. According to Aerojet sources interviewed for the Historical Operations Repot, no live ammunition was used in this experimentation. Simulants specifically machined and weighted to imitate ammunition were used along with dummy aluminum bullets. Supposedly, all rounds used were accounted for after the testing. In October of 2004, a former LMC employee who worked in this AOC made a visit to the Site. During that visit, the employee stated that not only was live HE, AP ammunition used in this area but insufficient cleanup was (in his opinion) conducted after the testing. Subsequent to closure of Beaumont Site 1, the flat central portion of Operational Area A was farmed for a brief period. The area was cultivated and planted with barley.

Based on a review of historical information available and information provided by the former employee, a total of four AOCs were identified for Area A. The four AOCs for Operational Area A are discussed in the following sections. These AOCs are shown on Figure 3-1.

#### 3.1.1.1 Area A Gun Mount

Gun mounts/firing points are generally considered areas of concern with respect to MEC for two primary reasons. First, it is possible that excess ammunition was left lying on the surface (abandoned) near the gun mount following test events. In addition, it is not uncommon to find buried caches of ammunition in proximity to gun mounts. Prior to the development of the current laws and regulations governing the handling and disposal of MEC, it was often more convenient to bury waste ammunition near the firing point than to load it up and transport it to an alternative site for disposal. Based upon the potential for waste 27.5mm and 30mm ammunition to be present near the Area A gun mount, an AOC was established at this location. Since both of the types of disposal that may have occurred here are a matter of convenience, disposal sites would be found as near as reasonably possible to the gun mount. Based upon this assumption a 200 x 200 foot area (0.92 acres) surrounding the gun mount was designated as the AOC. Because there was potential for MEC to be present on the surface in this AOC, it was selected for evaluation of immediate hazards during Phase I of the MEC evaluation. During the Phase I MEC Evaluation, no MEC or related items were found; however, there was abundant scrap metal present in the area. This AOC was carried over to the Phase II MEC Evaluation for more systematic evaluation of the MEC characteristics based upon the potential for disposal by burial at firing points.

#### 3.1.1.2 Area A Target Impact Area

Target/impact areas are considered areas of concern primarily because there is generally a high probability that they contain munitions or munitions components that contain explosives or other energetic materials. There is potential for residual material to be spread over a relatively broad area near a target as a result of variations in the firing line, ricochet from targets and ammunition or weapons systems imperfections that cause rounds to fall short of the target or incompletely detonate on impact with the target. In addition, once ammunition impacts the target it fragments distributing pieces of fragmentation (frag) in a generally radial pattern around the target. The distance frag travels is dependent upon the velocity of the munition when it strikes the target, the configuration/structure, the material from which it is constructed, the type and amount of filler it contains. Based upon this information, and the assumption that there was a single target berm historically used in Area A, a 300 x 500-foot area surrounding the berm was initially designated in this AOC. Since there was a high potential for live MEC in this area and the possibility that ammunition ricocheted off the target and came to rest on the surface, the Target Impact Area AOC was selected for evaluation of immediate hazards during phase I of the MEC evaluation. During Phase I, no MEC or related items were found; however, there was abundant scrap metal present in the surveyed areas and two potential debris fields were identified. The anomalies evaluated in these two potential debris fields appeared to be construction related (reinforce concrete, piping, railroad ties, etc.). This AOC was carried over to the Phase II MEC Evaluation for more systematic evaluation of the MEC characteristics based on the reported use of HE ammunition and the inherent potential hazards of HE impact areas.

#### 3.1.1.3 Area A Streambed

Streams adjacent to MEC use areas can be both transport routes and repositories for MEC and related materials. MEC may land directly in a streambed as the result of miscalculations of the firing line or ricochet from targets nearby. In general, MEC has been buried near streambeds or dumped into creeks for purposes of disposal. Erosion of embankments along a stream may over time result in the release of MEC to the stream. Once MEC related items are deposited in a streambed, flowing water can carry these items downstream re-depositing them either atop sediments or buried in those sediments at locations remote from the initial point of deposition.

Based upon this information, a 19.6 acre portion of the streambed located adjacent to the Area A Target Impact Area was identified as an AOC. The survey area begins approximately 4,600 feet north of the firing point and extends about 1,250 downstream to the south of the firing point. This streambed is dry for much of the year, but carries heavy flows during brief periods of intense rainfall at the site and during the Spring. Since there was potential for MEC to be present on the surface in the streambed, this AOC was selected for evaluation of immediate hazards during phase I of the MEC evaluation. During Phase I, no MEC or related materials were found; however, this is a large area and the Phase I evaluation did not provide 100% coverage of the streambed. This AOC was carried over to the Phase II MEC Evaluation for more systematic evaluation of the MEC characteristics based on its proximity to the Target Impact Area AOC and its potential as a transport route.

#### 3.1.1.4 Area A Debris Fields

Debris fields, particularly when they are located in or near MEC use areas such as firing points, ranges and storage areas, are likely locations for the disposal of waste/excess MEC or related materials. During the Phase I MEC Evaluation in the Area A Target Impact Area, two debris fields were identified. They were located along direct lines from the gun mount to the then suspected target berm. The areas were approximately .06 acres in size. Since these areas did not appear to represent an immediate hazard, they were not examined in detail during the Phase I work. They were established as an AOC for the Phase II MEC Evaluation.

### 3.1.2 Operational Area B - Rocket Motor Production Area

This 327 acre area is located in the eastern central portion of the property between Areas A and D (Figure 2-2). The area is flat with the exception of a berm near the southern boundary of the site and two adjacent depressions formed when the earth was mounded up to create the berm. The Historical Report states that mixing of propellants took place at a facility near the northwestern corner of Area B. The report also identified an area where propellant was washed out of rocket motors.

Subsequent to closure of Beaumont Site 1, General Dynamics conducted limited testing in this area using a Viper Bazooka and Phalanx Gatling Guns. The bazooka was supposedly fired from a site near the mixing plant toward a steel target east of the plant. The testing reportedly involved high explosives and shaped charges. According to the Historical Report, only frag remained after the test. The Phalanx Gatling guns used belted 20mm and 30mm practice ammunition. The berm previously referenced was the

target for this testing. Four SRAM rocket motors were also destroyed in this area. Pertinent physical features of Area B are shown on Figure 3-2.

Five AOCs were initially identified for Area B: the Phalanx Gun Mount; the Phalanx Target Berm; the Bazooka Impact Area; the Blue Motor Burn Pit; and, the Washout Area. The five AOCs for Operational Area B are discussed in the following sections. These AOCs are shown on Figure 3-2.

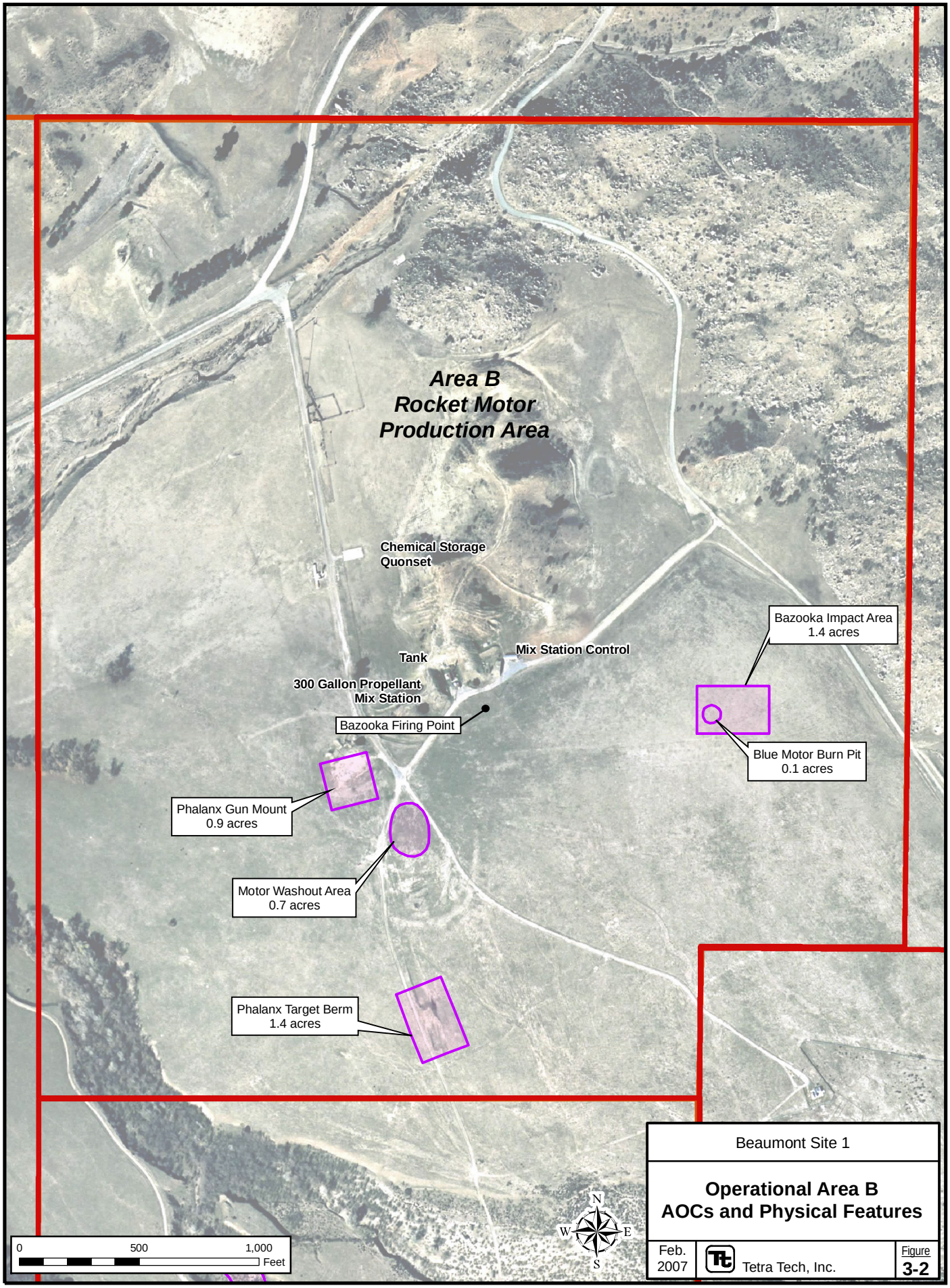
#### 3.1.2.1 Area B Phalanx Gun Mount

The MEC characteristics that identify gun mounts/firing points as potential AOCs are discussed in detail in Section 3.1.1.1. Based upon these characteristics and the possibility that waste 20mm and 30mm ammunition may be present at the Phalanx Gun Mount, an AOC was established at this location. Since both of the types of disposal that may have occurred here are a matter of convenience, disposal sites would be found as near as reasonably possible to the gun mount. Based upon this assumption a 200 x 200 foot area (0.92 acres) surrounding the gun mount was designated as an AOC. Because there was potential for MEC to be present on the surface, this AOC was selected for evaluation of immediate hazards during Phase I of the MEC evaluation. During Phase I, no MEC or related items were found: however, there was abundant scrap metal present in the surveyed area. This AOC was carried over to the Phase II MEC Evaluation for more systematic evaluation of the MEC characteristics based upon the potential for disposal by burial at firing points.

#### 3.1.2.2 Area B Phalanx Target Berm

The MEC characteristics that identify target/impact areas as potential AOCs are discussed in detail in Section 3.1.1.2. Based upon these characteristics and the possibility that 20mm and 30mm ammunition may be present, the Phalanx Target Berm was selected as an AOC. Reportedly, all ammunition used during the Phalanx gun testing was TP and the single berm still present is the only visible target area. Since there was only one known target berm and relatively little potential for rounds to ricochet off of the earthen berm, 20mm and 30mm rounds found outside the berm would likely be the result of projectiles passing through the berm and falling on the back side. These projectiles would be anticipated to have very little energy (velocity) left after passing through the berm and would be expected to fall close to the back face of the berm. In light of this, a 210 x 310-foot area (1.4 acres) surrounding the berm was designated for this AOC.

X:\GIS\LOCKHEED UXO\RPT\FIG 3-2.MXD




Beaumont Site 1

**Operational Area B**
**AOCs and Physical Features**

Feb. 2007 | Tetra Tech, Inc. | Figure 3-2

This provided a 50-foot buffer on either side of the berm; a 50-foot buffer in front of the berm and a 100-foot buffer in back of the berm. Since there was some potential for live MEC in this area (only a single source of documentation to confirm the use of TP ammunition only), the Phalanx Target Berm AOC was selected for evaluation of immediate hazards during Phase I of the MEC evaluation. During Phase I, no MEC was found. Twenty six 20mm TP projectiles were removed from the berm and abundant scrap metal was noted including wire and nails. This AOC was carried over to the Phase II MEC Evaluation for more systematic evaluation of the MEC characteristics to verify that only TP ammunition was used on the Phalanx range.

#### 3.1.2.3 Area B Bazooka Impact Area

The MEC characteristics that identify target/impact areas as potential AOCs are discussed in detail in Section 3.1.1.2. Based upon these characteristics and the reported use of live rockets and shaped charges during testing of the Viper Bazooka weapons system in this area, the Bazooka Impact Area AOC was established east of the old propellant mixing station. The Historical Report indicates that two steel targets were used in the Bazooka testing. While the targets themselves were likely modest in size, the impact of rocket propelled ammunition with a steel plate has the potential to result in a wide distribution of frag from both the ammunition and the target. In addition, little information was initially available regarding the range of the Viper Bazooka, so it was difficult to pinpoint the distance from the mixing station to the targets. The AOC for the Bazooka Impact Area was a 200-foot wide rectangle extending from 900 to 1,200 feet east of the suspected firing point for the Bazooka. The area encompassed 1.4 acres. Since there was a high potential for MEC in this area, the Bazooka Impact Area AOC was selected for evaluation of immediate hazards during phase I of the MEC evaluation. During Phase I, no MEC or related items were found. This AOC was carried forward to the Phase II MEC Evaluation for more systematic evaluation of the MEC characteristics based on the reported use of HE and the inherent potential hazards of HE impact areas.

#### 3.1.2.4 Area B Blue Motor Burn Pit

The greatest concerns at an open burn site are remnants of MEC items that were not completely destroyed and the potential for these partially destroyed munitions to be “kicked out” of the disposal area along with munitions components such as frag and propellant that may still contain explosive material. The Historical Report indicates a single disposal event involving four rocket motors took place in this area. Reportedly, the rocket motors disposed of at the site burned completely and no debris or related scrap was left behind.

Based upon this information, a small AOC (0.1 acres) was created surrounding the suspected disposal area. This AOC is located within the Bazooka Impact Area AOC and was evaluated along with that area during Phase I (See Section 3.1.2.3).

#### 3.1.2.5 Area B Washout Area

Propellant washout areas may pose an explosive hazard if the soils contain a high enough concentration of energetic material or if large pieces of propellant are present that may explode upon being disturbed. The Historical Report indicates that the slurry created by motor washout performed in Area B was collected in a lined basin. After the slurry dried, it was collected and transported to Area C for burning. The report further states "Today (1986), the area is covered with grass with no visible evidence of past operations." This area was not evaluated during the Phase I MEC Evaluation since there appeared to be no immediate hazards associated with the washout procedures; however, in the interest of being conservative, the area was established as an AOC for the Phase II evaluation to ensure that no chunks of propellant remain. This AOC is an oval shaped area encompassing approximately 0.7 acres.

### 3.1.3 Operational Area C - Burn Pit Area

Burn pits are potential AOCs if MEC items have been disposed of via open burning. During this process, items may fail to fully detonate (low order) or burn resulting in unexploded ordnance that is unstable and hazardous. In addition, items may be kicked out during burning, coming to rest hundreds of feet from the burn pit. According to the Historical Report, the burn pits in Area C were very seldom used to dispose of excess or waste MEC. The report notes a single instance when a load of aluminum igniter cups filled with HMX was burned in Area C. A number of the cups low ordered; however, the area was policed to locate and remove these items. The burn pits were generally used for open burn disposal of hazardous waste materials generated at the Site. Materials burned included industrial solvents, Class A explosives and solid rocket fuel and its components. According to the Historical Report, the materials were placed in strip pits, ammonium perchlorate or diesel fuel was added to facilitate burning, and the waste was ignited using an electric match. Following use, the pits were reportedly covered. A cleanup has been conducted in the burn pit area and it is believed that all of the residual material has been removed. The top two feet of the soil in the area was removed to expose pits for testing, excavation and disposal.

No AOCs were identified in this operational area with respect to MEC.

### 3.1.4 Operational Area D - LPC Ballistics Test Range

This 164 acre area is located near the southeastern corner of the Site (Figure 2-2). Geographical features include a relatively large, flat central area bounded on the southeast by small steep hills and on the south and southwest by a series of steep ridges running southeast to northwest. Two streambeds (one small and one large) run through the area generally from east to west. The face of the ridgeline along the southwest side of the area was terraced to serve as a backstop for a target berm used in ballistics testing. Testing was performed with a Navy 5"/38 gun and Army 37mm, 40mm and 155mm guns. The firing point was located northeast of the terraced hillside near the center of Area D. Reportedly, no live rounds were used on the ballistics test range. Just southeast of the ballistics firing point there were three Class A storage magazines situated behind a berm at the base of a hill. Behind this hill, a box canyon near the eastern boundary of the site provided a naturally sheltered area for testing incendiary bombs. A .50 caliber gun was also used in Area D to stress test rocket casings; however, the exact location of this testing is unknown. Pertinent physical features of Area D are shown on Figure 3-3.

Six AOCs were initially identified for Area D: the Terraced Projectile Landing Zone (TZLP); the TZLP Firing Point; the End of the TZLP Range Fan; the Small Test Area; the Class A Storage; and, the Streambed. The six AOCs for Area D are discussed in the following sections. These AOCs are shown on Figure 3-3.

#### 3.1.4.1 Area D Terrace Projectile Landing Zone (TPLZ)

This area is made up of two adjacent, connecting hillsides positioned behind the major target area used for ballistics testing. One hillside faces generally northeast (left hill) and the other faces generally southeast (right hill). Together the hillsides form a rounded backstop or "safety net" behind the berm used for ballistics testing. Each hillside has been terraced to create a number of narrow flat benches where ammunition ricocheting from the target berm would be captured. The hillsides would also capture ammunition passing through the berm, ammunition that may have gone over or around the berm and frag generated by impact with the berm. The MEC that may be present in this area includes 37mm, 40mm, 155mm and 5"/38 ammunition, all fired on this range at one time or another. It may be present on the surface due to ricochets or at depths up to 5 or 6 feet if large caliber ammunition passed over the target berm and impacted on the hillside. Based of the potential for MEC and related scrap to be present, this area encompassing approximately 2.7 acres was designated as an AOC. Since there is potential for MEC to be present on the ground surface, the AOC was identified for

evaluation of immediate hazards during the Phase I MEC Evaluation. During Phase I, no MEC was found. A variety of munitions components were located including a 155mm projectile base and rotating band and a 37mm TP projectile. The items found were concentrated on the lower terraces of the left hill. This AOC was also carried over to the Phase II MEC Evaluation for more systematic evaluation of the MEC characteristics in order to verify that only TP ammunition was used.

#### 3.1.4.2 Area D TPLZ Firing Point

The MEC characteristics that identify gun mounts/firing points as potential AOCs are discussed in detail in Section 3.1.1.1. Based upon these characteristics and the possibility that waste ammunition ranging from 37mm to 5"/38 may be present, an AOC was established at this location. Since both of the types of disposal that may have occurred at a firing point are a matter of convenience, disposal sites would be found as near to the gun mount as reasonably possible. Based upon this assumption a 200 x 200 foot area (0.92 acres) surrounding the gun mount was designated as an AOC. Because there was potential for MEC to be present on the surface in this AOC, it was selected for evaluation of immediate hazards during Phase I of the MEC evaluation. During Phase I, no MEC or related items were found; however, copious amounts of metal debris and small subsurface targets were noted by the field team. This AOC was carried over to the Phase II MEC Evaluation for more systematic evaluation of the MEC characteristics based upon the potential for disposal by burial at firing points.

#### 3.1.4.3 Area D End of TPLZ Range Fan

The MEC characteristics that identify target/impact areas as potential AOCs are discussed in detail in Section 3.1.1.2. This area shares those characteristics with several other areas on site. Munitions of various sizes were fired at the base of two hillsides (see Section 3.1.4.2) where earth had been piled up to create a 4 to 5-foot tall berm. At least one of the weapons tested fired using this impact area utilized rocket-assisted projectiles. The impact of these munitions with the berm may have resulted in a high degree of fragmentation and a wide distribution of the resultant frag. Based on the information available, the entire area surrounded by the backstop hills described in Section 3.1.1.2 was identified as an AOC. This area encompasses 2.9 acres. Because there was potential for MEC to be present on the ground surface, this AOC was identified for evaluation of immediate hazards in the Phase I MEC Evaluation. During Phase I, no MEC was found.