



**US Army Corps
of Engineers®**
Omaha District

Final Five-Year Review Plan

Former Lowry Bombing and Gunnery Range Arapahoe County, Colorado

**Revision 0
April 2011**



7604 Technology Way
Denver, CO 80237

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**FINAL
FIVE-YEAR REVIEW PLAN**

**FORMER LOWRY BOMBING AND GUNNERY RANGE
ARAPAHOE COUNTY, COLORADO**

REVISION 0

Prepared for:

**U.S. ARMY CORPS OF ENGINEERS
Omaha District
Omaha, Nebraska**

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Prepared by:

***Shaw Environmental, Inc.*
A Shaw Group Company
7604 Technology Way, Ste 300
Denver, Colorado 80237**

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Acronym and Abbreviation List

| | |
|----------------|---|
| AGGR | Air-to-Ground Gunnery Range |
| AOC | area of concern |
| AOI | area of interest |
| ASR | Archives Search Report |
| BT1 | Bombing Target 1 |
| BT2 | Bombing Target 2 |
| BT3 | Bombing Target 3 |
| BT4 | Bombing Target 4 |
| BT5 | Bombing Target 5 |
| BT6 | Bombing Target 6 |
| BT7 | Bombing Target 7 |
| CA | Consent Agreement |
| CAIS | Chemical Agent Identification Set |
| CDPHE | Colorado Department of Public Health and Environment |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR | Code of Federal Regulations |
| DEM | Digital Elevation Model |
| DGM | digital geophysical mapping |
| DID | Data Item Description |
| DMM | discarded military munitions |
| DoD | Department of Defense |
| DoJ | Department of Justice |
| EE/CA | Engineering Evaluation/Cost Analysis |
| EOD | explosive ordnance disposal |
| EM | electromagnetic |
| EP | Engineer Pamphlet |
| ESS | Explosives Safety Submission |
| FLBGR | Former Lowry Bombing and Gunnery Range |
| Foster Wheeler | Foster Wheeler Environmental Corporation |
| FUDS | Formerly Used Defense Site |
| FUDSMIS | Formerly Used Defense Sites Management Information System |
| GIS | geographic information system |
| Golder | Golder Associates, Inc. |
| GPS | global positioning system |
| HE | high-explosive |
| Helimag | helicopter mounted magnetometer survey |
| HFA | Human Factors Applications, Inc. |
| HSI | hyperspectral imaging |
| HTRW | hazardous, toxic, and radioactive waste |
| IC | Institutional Control |
| ICAP | Integrated Corrective Action Plan |
| J/D | Jeep/Demolition |
| LiDAR | Light Detecting and Ranging |
| MC | munitions constituent |
| MD | munitions debris |
| MEC | munitions and explosives of concern |
| mm | millimeter |
| MM | Military Munitions |

| | |
|------------|--|
| MMR | Military Munitions Response |
| MMRP | Military Munitions Response Program |
| MPPEH | munitions potentially presenting an explosive hazard |
| MRS | munitions response site |
| MTADS | Multi-sensor Towed Array Detection System |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| NRL | Naval Research Laboratory |
| NTCRA | Non-Time Critical Removal Action |
| OE | ordnance and explosives |
| ortho | high-resolution color orthophotography |
| PCC | Plains Conservation Center |
| PCOC | potential contaminants of concern |
| PIG | K941 M1 toxic gas set ferrous shipping container |
| Plan | Five-Year Review Plan |
| QC | quality control |
| RAB | Restoration Advisory Board |
| RCWM | Recovered Chemical Warfare Materiel |
| RI/FS | Remedial Investigation/Feasibility Study |
| SAR | synthetic aperture radar |
| SARA | Superfund Amendments and Reauthorization Act of 1986 |
| Shaw | Shaw Environmental, Inc. |
| SKY | Sky Research, Inc. |
| SLB | Colorado State Land Board |
| Southshore | Southshore at Aurora |
| SSFR | site specific final report |
| SUXOS | Senior Unexploded Ordnance Supervisor |
| TCRA | Time-Critical Removal Action |
| TDEM | time domain electromagnetic |
| TERC | Total Environmental Restoration Contract |
| TEU | Technical Escort Unit |
| U.S. | United States |
| USAESCH | U.S. Army Engineering and Support Center, Huntsville |
| USACE | United States Army Corps of Engineers |
| USC | United States Code |
| USEPA | United States Environmental Protection Agency |
| U.S. Home | U.S. Home Corporation |
| UXB | UXB International, Inc. |
| UXO | unexploded ordnance |
| UXOSO | Unexploded Ordnance Safety Officer |
| VSR | Visual Surface Reconnaissance |
| WAA | Wide Area Assessment |

1.0 Introduction

1.1 General Information

This Five-Year Review Plan (from here forward referred to as the Plan) was prepared by Shaw Environmental, Inc. (Shaw) on behalf of the United States (U.S.) Army Corps of Engineers (USACE) – Omaha District under Delivery Order No. 51 of the Total Environmental Restoration Contract (TERC) No. DACA45-96-D-0007. This Plan provides the approach, methods, and procedures for conducting the 2011 Five-Year Review of the military munitions response (MMR) actions being conducted at the Former Lowry Bombing and Gunnery Range (FLBGR), located in Arapahoe County, Colorado. A Five-Year Review is being conducted to evaluate the implementation and performance of the ongoing MMR actions in order to determine if the remedy continues to minimize explosive safety risks and continues to be protective of human health, safety, and the environment, in relation to the current and anticipated future land use. The initial Five-Year Review will document the status of each of the FLBGR munitions response sites (MRSs) and areas of interest (AOIs), and address MMR activities performed by the USACE – Omaha District during the period between January 2006 and December 2010.

The contents and general order of presentation of this Plan are based on the requirements of the USACE Data Item Description (DID) OE-110.01 *Recurring Review Plan* (USACE, 2002), and Engineer Pamphlet (EP) 75-1-4 *Recurring Reviews on Ordnance and Explosives (OE) Response Actions* (USACE, 2003). This Plan includes descriptions of the FLBGR location and history; schedule and frequency of Five-Year Reviews; documents to be reviewed; community and stakeholder involvement activities; methodologies to be used to evaluate existing site conditions, including the site inspection; and rationale for terminating the Five-Year Reviews. Specifically, this Plan is organized as follows:

- Section 1.0, Introduction;
- Section 2.0, Site Description;
- Section 3.0, Schedule for Five-Year Reviews;
- Section 4.0, Review of Existing Documentation;
- Section 5.0, Community and Stakeholder Involvement;
- Section 6.0, Site Inspection;
- Section 7.0, Five-Year Review Report; and
- Section 8.0, Termination of Five-Year Reviews.

1.2 Authority

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), United States Code (USC) Title 42 Part 9601 et seq. (42 USC 9601 et seq.) and the National Oil

and Hazardous Substances Pollution Contingency Plan (NCP), Code of Federal Regulations (CFR) Title 40 Part 300 et seq. (40 CFR 300 et seq.), require Five-Year Reviews of CERCLA remedial actions. Additionally, the 1998 FLBGR Settlement Agreement between the U.S. Department of Justice (DoJ) and the Colorado Department of Public Health and Environment (CDPHE) calls for the USACE to periodically review changes in land use in relation to possible risk and munitions and explosives of concern (MEC) hazard, and provide recommendations for the appropriate response, if required.

1.3 Site Location

The FLBGR, formerly known as Buckley Field, is located in Arapahoe County, Colorado, about 20 miles southeast of Denver, adjacent to the city of Aurora (**Figure 1-1**). The range encompasses approximately 92 square miles, or nearly 60,000 acres, and contains a total of 12 designated MRSs, as well as three other AOIs. The FLBGR is generally bordered by County Road 50 (County Line Road) to the south, Gun Club Road and the city of Aurora to the west, Jewell and Yale Avenues to the north, and Brick Center Road to the east. The location of the FLBGR, and associated MRSs and AOIs, are shown on **Figure 1-2**.

1.4 Response Actions

Beginning in 1942, the FLBGR site was used for military operations that included bombing practice (with practice and high-explosive [HE] bombs), gunnery and small arms training, explosive ordnance disposal (EOD) training/operations, and chemical warfare training. Between 1960 and 1980, the extent of the range was either sold or transferred to non-Federal parties. Initial range clearances were conducted and certificates of clearance were issued between 1948 and 1972.

The Department of Defense (DoD) established the Military Munitions Response Program (MMRP) under the Defense Environmental Restoration Program to address DoD sites suspected of containing MEC, discarded military munitions (DMM) and munitions constituents (MC) munitions. Under the MMRP, the USACE conducts environmental response activities at Formerly Used Defense Sites (FUDS) for the Army. The USACE is the DoD's Executive Agent for the FUDS program. MMR actions at FUDS are conducted in accordance with the process outlined in the NCP as authorized by CERCLA as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA).

The FLBGR was established as a FUDS in June of 1991. In April 1998, a Settlement Agreement between the CDPHE, on behalf of the State of Colorado, and the United States of America, on behalf of the USACE, the DoD, the Department of the Army, the Department of the Navy, and the Department of the Air Force (collectively, the "United States") was signed. The 1998

FLBGR Settlement Agreement details the authority under which MM investigation and response activities are conducted at the FLBGR (CDPHE and DoJ, 1998).

In general, the following MM investigation and response activities have been conducted at the FLBGR under the FUDS program:

- 1991: Aurora Reservoir periphery clearance;
- 1994 – 1995: Archives Search Report (ASR);
- July – October 1996: Time-Critical Removal Action (TCRA) for the Jeep/Demolition Range (J/D Range);
- 1997: Archival Photo Analysis;
- 1997 – 1998: Engineering Evaluation/Cost Analysis (EE/CA);
- January 1998 – December 1999: Construction and anomaly avoidance support;
- April 1998 – January 2000: Interim Removal Action;
- June 1998: Multi-sensor Towed Array Detection System (MTADS) geophysical survey at Bombing Target 2 (BT2);
- August – September 1998: Visual Surface Reconnaissance (VSR);
- 1999 – 2000: Supplemental test grid effort;
- 1999 – 2005: Wide Area Assessment (WAA);
- January 2000 – April 2000: MEC Removal Action;
- April 2000 – Present: Non-Time Critical Removal Action (NTCRA) for numerous FLBGR MRSs/AOIs;
- March 2002 – February 2004: Recovered Chemical Warfare Materiel (RCWM) Operations at the J/D Range;
- April 2003: Surface Clearance at the Bennett Army National Guard Facility;
- 2005: Helicopter mounted magnetometer survey (Helimag); and
- 2005 – 2006: Bombing Target 5 (BT5) NTCRA.

In January 2000, Shaw (as Stone & Webster, Inc.) began MM investigation and response activities at the FLBGR, on behalf of the USACE – Omaha District. The USACE is the lead agency for implementing remedial activities at the FLBGR, and as such has overall responsibility for project management, contract administration, quality assurance, execution, and acceptance/approval of milestones. Shaw is currently the prime contractor for the project and is responsible for the technical project management and execution of the project. Sky Research, Inc. (SKY) is a specialty contractor to the USACE and is responsible for 1) performing WAA activities using airborne remote sensing technologies and 2) providing aerial and ground-based geophysical mapping, data processing, target identification, target reacquisition, and associated geophysical support services.

MMR activities conducted at the FLBGR by Shaw are part of an ongoing NTCRA being conducted in accordance with Section 104 of CERCLA and Section 300.400 of the NCP. All work conducted by Shaw relating to the NTCRA is being performed in accordance with the project methods described in the *Final Master Work Plan, Unexploded Ordnance Investigation and Clearance Activities, Former Lowry Bombing and Gunnery Range* (Shaw, 2010) and in accordance with *Explosives Safety Submission, Non-Time Critical Clearances Ordnance and Explosives Removal Action* (USACE, 1998).

The FLBGR MMR action was designed to meet the requirements set forth in the 1998 FLBGR Settlement Agreement (CDPHE and DoJ, 1998). The overarching objective of the FLBGR MMR action is to obtain a status of “response complete” for the various identified MRSs/AOIs. By definition, the designation “response complete” means that the area has been cleared of all dangerous and/or explosives material reasonably possible to detect and that no further MMR efforts are required. For MMR actions, the CDPHE utilizes a technology-based standard that requires all detectable MM be removed using the best currently available munitions detection and removal technologies. For the majority of the FLBGR MRSs/AOIs, the performance standard is unrestricted land use. However, depending upon site-specific conditions and anticipated future land use, select MRSs may require Institutional Controls (ICs) to limit access and mitigate any associated explosive risk, rather than a full MM clearance.

The principal work efforts being performed under the MMR action consist of the location, investigation, classification, removal, and disposal of MEC, munitions potentially presenting an explosive hazard (MPPEH), and munitions debris (MD) associated with historical site operations. The MMR action is being performed using a combination of digital geophysical mapping (DGM) and analog detection methods to locate ferrous and non-ferrous metallic anomalies that are then investigated with hand tools or earth moving equipment. Recovered MEC, MPPEH, and MD are subsequently identified and removed/disposed. Post-removal MC sampling and analysis is also being performed to determine if MC (specifically potential contaminants of concern [PCOCs]) associated with the former MEC, MD, and RCWM documented at the various MRSs/AOIs are present in environmental media at concentrations that may warrant additional evaluation, investigation, and/or action.

In addition to the MMR action conducted by the USACE – Omaha District at the FLBGR, MEC/MD characterization and clearance activities were performed by commercial property developers for the following areas located within the FLBGR boundary prior to the sites being developed for residential and commercial use:

- August 2002 – June 2003: High Plains (now called Blackstone);
- October 2002 – May 2003: Beacon Point; and
- 2003 and 2005: Southshore at Aurora (Southshore).

Because the USACE – Omaha District’s plans for the FLBGR MMR action did not include addressing the three development sites within the foreseeable future, the developers (also landowners at the time) entered into Consent Agreements (CAs) with the CDPHE to expedite the MMR actions at their properties. The CAs allowed the developers to use private means to characterize the nature and extent of any MPPEH on the properties, and to complete response actions to reduce the MEC hazard potential, thereby improving the safety of the land for future use. The CAs also included provision to ensure the private MMR were consistent with the cleanup guidelines CDPHE established for the USACE MMR at the FLBGR. Under the CAs, the developers submitted Integrated Corrective Action Plans (ICAPs) and Completion Reports for the MMR actions to the CDPHE for review and approval.

In 2003, MPPEH characterization and clearance efforts were performed for the Wheatlands development site. Only a characterization was conducted in 2003 for the Grassland development site (now called Serenity Ridge). Even though the two development sites are not included in the FLBGR boundary and were not suspected of prior military use, these efforts were performed by the developers (also the landowners at the time) because the two sites are located adjacent to the FLBGR western boundary.

1.5 Objective and Scope of Five-Year Review

The purpose of the Five-Year Review at the FLBGR is to determine if the ongoing MMR actions being conducted by the USACE – Omaha District at the MRSs/AOIs can be expected to minimize explosive safety risk and be protective of human health, safety, and the environment upon completion. For MRSs/AOIs where the MMR action is ongoing or no MMR action has been performed, the Five-Year Review will also determine if conditions that could result in unacceptable risks are being controlled. The applicability of new technology for addressing previous technical impracticability determinations will also be assessed during the Five-Year Review. The Five-Year Review will also include an assessment of the maintenance and effectiveness of any implemented ICs and whether they are operating as intended. Land use controls may include legal, physical, or educational mechanisms that limit the access or use of a property, or warn of the hazard in order to protect property users and the public.

The major steps and sequence for conducting the Five-Year Review at the FLBGR are shown on **Figure 1-3**. In general, the Five-Year Review process will consist of a document review, interviews with key FLBGR stakeholders, and site inspections to gather information necessary to perform a technical assessment of each MRS/AOI. Key site-specific factors to be evaluated include changes in the physical conditions at an MRS/AOI and changes in public accessibility and land use. Community notification and involvement will also be included as part of the Five-Year Review process.

The primary objective of the Five-Year Review will be to answer the following technical assessment questions for each MRS/AOI:

1. Is the MMR action functioning as intended (meeting its objectives)?
2. Are the assumptions used at the time of the MMR action selection still valid?
3. Does any new information indicate that the previously selected MMR action no longer minimizes explosives safety risks or is no longer protective of human health, safety, and the environment, considering the best available technology?

Currently, 12 MRSs and 3 AOIs are located in the FLBGR, all of which will be evaluated during the 2011 Five-Year Review (**Figure 1-2**). These areas are in various stages of the remedial process, from ongoing MMR action through post-removal MC investigation, to MEC site closure. The following 15 FLBGR MRSs and AOIs will be included in the 2011 review:

- 20-millimeter (mm) Range Fan;
- Air-to-Ground Gunnery Range (AGGR);
- Bombing Target 1 (BT1);
- BT2;
- Bombing Target 3 (BT3);
- Bombing Target 4 (BT4);
- BT5;
- Bombing Target 6 (BT6);
- Bombing Target 7 (BT7);
- J/D Range;
- Mortar Range;
- Rocket Range;
- Circle of Bricks AOI;
- Miscellaneous Target AOI; and
- No Name AOI.

The Five-Year Review report will document the status of each of the FLBGR MRSs/AOIs, describe the activities conducted during the review period, and present the methods, findings, and conclusions of the Five-Year Review. The report will also describe any issues identified during the review and provide recommendations to address those issues. The 2011 Five-Year Review will address MMR action activities performed by the USACE – Omaha District during the period between January 2006 and December 2010.

2.0 Site Description

2.1 Site History

2.1.1 Ownership Changes and Timeline

The following discussion presents general historical information on the FLBGR. For more detailed information, refer to the range ASR (USACE – St. Louis, 1995). Buckley Field was established on an area of 65,547 acres in 1937 and was opened in 1942 as an Army Air Field. In 1946, 59,814 acres were assigned to Lowry Air Force Base as the Lowry Bombing and Gunnery Range. An additional 43 acres were later acquired to bring the total to 59,857 acres.

In 1947, approximately 3,625 acres were transferred from Buckley Field to the Department of the Navy and thereafter known as U.S. Naval Air Station, Buckley Field. Between 1947 and 1951, the Department of the Navy transferred a total of 27 acres to the Colorado Air National Guard. In 1960, U.S. Naval Air Station, Buckley Field was redesignated as Colorado Air National Guard, Buckley Field. In 1959, the Lowry Bombing and Gunnery Range was redesignated as the Lowry Air Force Missile Site. In 1960, this designation was changed to Lowry Missile Site No. 1. Eighteen Titan 1 missiles were maintained at four installations from 1961 to 1965 (**Figure 1-2**). All missiles were removed by April 1965. In 1969, the Department of the Navy transferred approximately 3,700 acres to the U.S. Air Force for use as the Lowry Training Annex (USACE – St. Louis, 1995).

Following the termination of the Air-to-Ground Bombing and Gunnery Mission in 1956, much of the range was leased for grazing. Between 1960 and 1980, approximately 63,600 acres of land were transferred to various other state and federal agencies and private owners (USACE – St. Louis, 1995). The last federal property transferred was the Former Titan Missile Complex 2A (a.k.a. Bennett Army National Guard facility). The Bennett Army National Guard facility was designated for base closure in 1989 and was formally excessed in 2006.

2.1.2 Military Activities

On the majority of the FLBGR, bombing and gunnery training was limited from the World War II era up through 1956. Buckley and Lowry Fields were part of the Army Air Western Technical Training Command in World War II, and armament and bombing training were conducted at both areas. The FLBGR was used during World War II for bombing practice, using both practice and HE bombs. The FLBGR included fixed and flexible gunnery targets and ranges. Rifle training was conducted at three training camps located north of Airline Road (currently East Quincy Avenue). Following World War II, the Air Force continued to use the FLBGR and added a demolition range at the west end of the FLBGR and later at the Lowry Training Annex.

Documentation of dates regarding additions or changes of targets is limited. A portion of the FLBGR was also used for support training during the Vietnam War (USACE – St. Louis, 1995).

2.1.3 Post-Military Activities

Over the years, numerous non-military developments have occurred on the FLBGR. From 1966 to 1980, the city and county of Denver constructed and operated the Lowry Landfill and sludge disposal operations near the northwest corner of the range. In 1984, portions of the Lowry Landfill were declared a Superfund site. Section 6, Township 5 South and Range 65 West, is the main area of the Superfund Site; Section 31, Township 4 South and Range 65 West, some of which is part of the Superfund Site, is currently used as the city landfill. Waste Management of Colorado constructed and operated a chemical treatment and storage facility northeast of Denver's landfill on city property. Additionally, the city and county of Denver owns the Denver Arapahoe Disposal Site located in Section 31, which is a major regional solid waste disposal site.

Recreation facilities were constructed north of the J/D Range, including a horse-racing track, the Arapahoe Park Racetrack. The Arapahoe County fairgrounds complex has also been built northeast of the J/D Range. OEA, a manufacturer of propellants for air bag inflation and explosive charges for ejection seats, constructed a large manufacturing building just east of the Lowry Training Annex (Section 5, Township 5 South and Range 64 West). In 1991, the city of Aurora constructed the Aurora Reservoir site, which includes public use areas and buildings. The reservoir is located east of the J/D Range near the western end of the FLBGR. Additionally, the city of Aurora owns a conservation area, the Plains Conservation Center (PCC), which is located on the far northwestern corner of the range. BT1 is located within the boundaries of the PCC. The PCC includes about 1,920 acres.

Several buildings/structures have been built on Colorado State Land Board (SLB) property and include cattle ranching headquarters, the Arapahoe Hunt Club, and three remote-control model airplane clubs (Mile High, Model Museum, and Cross Winds). A number of residences have been built on the eastern end of the FLBGR. One residential development area, known as the Denver East Ranchettes, is located near the southeastern boundary of the range. Additionally, Blackstone, Beacon Point, and Southshore residential subdivisions are located within the southwestern portion of the range. Commercial development on the range consists mainly of manufacturing; sand and gravel mining; and oil and gas wells.

2.2 Land Use

Prior to DoD use, which began in 1937, the area was used to graze cattle. Much of the current land usage remains cattle grazing, with some wheat farming. The city of Aurora operates the Aurora Reservoir and the related recreation area near the west end of the FLBGR. An increasing

number of residences and businesses are scattered over, and immediately adjacent to, the FLBGR.

In 1999, the E-470 corridor, which borders the western edge of the range, opened. Toll highway E-470 provides a direct route from the Denver International Airport to the southern side of Denver. Highway E-470 also provides convenient access to all of eastern Denver. The opening of this corridor has spurred the attention of land developers interested in residential and commercial development of the range. Based on this current activity and future land use plans of the city of Aurora and Arapahoe County, a significant portion of the range is anticipated to be developed and used for residential and commercial development, community parks, recreation areas, public facilities, and open space in the near future.

2.3 Investigations and Response Actions

2.3.1 Initial Site Clearances (1948 through 1972)

According to the records review conducted during the ASR, several areas within the FLBGR were cleared and received Certificates of Clearance. The first area to be cleared was the northwest corner of the FLBGR. The Certificate of Clearance, issued on 16 November 1948 by the 9800th Technical Service Unit for 1,920 acres, stated that the 1,920-acre area had been visually inspected and was clear of all dangerous and/or explosive materials (USACE – St. Louis, 1995). The BT1 site was included in this Certificate of Clearance.

In 1959, Sections 12, 13, and 24, Township 5 South and Range 65 West, were also cleared of “all dangerous and/or explosive materials reasonably possible to detect.” The Certificate of Clearance recommended that use of Sections 12 and 13 should be limited to non-intrusive activities since heavy vegetation in the sections may have prevented all of the subsurface munitions from being detected (USACE – St. Louis, 1995). The western portion of the current Rocket Range MRS is located in Sections 12 and 13.

A portion of the FLBGR, then known as the Lowry Missile Site No. 1 and covering 54,446 acres, was cleared of surface MEC in 1963. The Certification of Clearance was issued in June 1963 and did not include any restrictions on future land use for the 54,446 acres (USACE – St. Louis, 1995).

The last clearance reported by the ASR records review occurred during the summer of 1972 at the old EOD Range (currently designated as the J/D Range). The clearance area was deemed suitable for any purpose that did not require development deeper than 12 inches below the ground surface (USACE – St. Louis, 1995).

2.3.2 Aurora Reservoir Periphery Clearance (1991)

In 1991 while constructing the Aurora Reservoir, the city of Aurora encountered a “bomb dump” (USACE – St. Louis, 1995). Prior to opening the Aurora Reservoir Park and Recreation Area, the city of Aurora contracted UXB, International, Inc. (UXB) to perform a clearance of the periphery of the reservoir to 18 inches below ground surface. The clearance included portions of the 20mm Range Fan. At the time of the clearance, the surface elevation of the reservoir was 5,920 feet above mean sea level (EarthTech, 1998b).

2.3.3 Archives Search Report (1994 and 1995)

In 1994 and 1995, an ASR was prepared by the USACE – St. Louis District for the FLBGR. The purpose of the ASR was to compile information obtained through historical research at various archives and records-holding facilities, interviews with persons associated with the range, air photo interpretation, and site inspections. All efforts were directed toward determining the possible use, disposal, and locations of MEC at the FLBGR. The findings from the ASR effort are documented in the *Archives Search Report Findings – Buckley Field* (USACE – St. Louis, 1995). Current MRSs and AOIs identified as targets during the ASR includes: AGGR, BT1, BT2, BT3, BT4, BT5, BT6, J/D Range, and Rocket Range.

2.3.4 Time-Critical Removal Action (1996)

In July 1996, Human Factors Applications, Inc. (HFA) mobilized to perform a TCRA in the J/D Range on behalf of the U.S. Army Engineering and Support Center – USACE Huntsville (USAESCH). The TCRA consisted of a surface clearance for 175-acres and fencing of the main area of concern (AOC). The results of the TCRA are presented in the *Final Removal Report, Time Critical Removal Action, Former Buckley Bombing Range* (HFA, 1997).

2.3.5 Archival Photo Analysis (1997)

In 1997, an Archival Photo Analysis was conducted for the FLBGR by the USACE – St. Louis District. During the analysis, historical aerial photographs were used to identify potential AOIs. The Archival Photo Analysis included information that had not been available for the ASR. Ground truthing of the potential AOIs was not conducted as part of the Archival Photo Analysis. The findings from the Archival Photo Analysis are documented in the *Archival Photo Analysis, Buckley Field* (USACE-St. Louis, 1997).

2.3.6 Engineering Evaluation/Cost Analysis (1997 and 1998)

In 1997 and 1998, an EE/CA was conducted at the FLBGR on behalf of the USAESCH. The EE/CA was performed to assess the risk and presence of MPPEH, and to evaluate alternatives to reduce the potential risk of public exposure to MEC. For the EE/CA investigation, the range was divided into four zones based on public access, land use, and future development potential. Each EE/CA zone was subdivided into sectors (Earth Tech, 1998a-d).

Field investigations were conducted during the EE/CA to characterize the nature and extent of MEC and MD in the sectors. Test grids were randomly selected for sampling to achieve a 95 percent confidence level that a sector was fully characterized for the risk assessment (Earth Tech, 1997). First, a surface obstacle clearance was performed for the test grids to remove metallic debris and MEC that would interfere with the geophysical activities. Geophysical mapping was then performed at the test grids to detect MEC that may be buried underground. Anomalies were randomly selected from the geophysical data, and subsurface sampling was conducted. The EE/CA activities and results are further described in the *Draft Master Engineering Evaluation/Cost Analysis, Former Buckley Field (Lowry Bombing and Gunnery Range)*, and the EE/CA addenda for Zones 1 through 3¹ (Earth Tech, 1998a-d).

Current MRSs and AOIs investigated during the EE/CA include: 20mm Range Fan, AGGR, BT1, BT2, BT3, BT4, BT5, BT7, J/D Range, Mortar Range, Rocket Range, Circle of Bricks AOI, Miscellaneous Target AOI, and No Name AOI.

2.3.7 Construction and Anomaly Avoidance Support (1998 through 1999)

From January 1998 through December 1999, UXB performed construction and anomaly avoidance support at the FLBGR. These activities are summarized in the *Removal Report – Draft, Construction Report and Anomaly Avoidance, Former Buckley Field (A.K.A. Lowry Bombing and Gunnery Range)* (UXB, 2000).

2.3.8 Interim Removal Action (1998 through 2000)

In April 1998, HFA and Montgomery Watson initiated investigation and removal activities at the FLBGR on behalf of the USAESCH. As of January 2000, a surface clearance had been completed for BT1, and subsurface clearance activities were begun for the 20mm Range Fan, BT2, and BT6. Additionally, supplemental test grids were investigated in the AGGR, BT2, BT3, BT6, BT7, Mortar Range, and Rocket Range to help delineate the boundaries of the impacted areas at those sites. HFA and Montgomery Watson's work through January 2000 is summarized in the *Interim Removal Action Report, Former Buckley Field (Lowry Bombing and Gunnery Range)* (Montgomery Watson, 2000).

2.3.9 Multi-Sensor Towed Array Detection System Geophysical Survey (1998)

In June 1998, on behalf of the USAESCH, the Naval Research Laboratory (NRL) performed a geophysical survey at BT2 using the MTADS². As a part of the survey, a surface clearance was performed at BT2, and the subsurface of one grid was investigated to verify the collected magnetometer data. The MTADS survey activities and results are presented in the *MTADS Live Site Survey, Bombing Target #2 at the Former Buckley Field* (NRL, 1999).

¹ An EE/CA was not completed for Zone 4.

² The MTADS survey at BT2 was completed before HFA initiated subsurface clearance activities at BT2.

2.3.10 Visual Surface Reconnaissance (1998)

In August and September of 1998, Golder Associates, Inc. (Golder) performed a VSR on behalf of the USACE – Omaha District, of approximately 2,000 acres of the FLBGR. The results of the VSR are presented in the *Final Report for 2,000-Acre Visual Surface Ordnance and Explosive (OE) Reconnaissance at the Former Lowry Bombing and Gunnery Range* (Golder, 1998). The VSR included the following MRSs: AGGR, BT3, BT6, BT7, Mortar Range, and Rocket Range.

2.3.11 Wide Area Assessment (1999 through 2005)

Per the requirements of the 1998 FLBGR *Settlement Agreement*, a WAA was conducted across the FLBGR beginning in 1999 and continuing through 2005 to help identify any previously undocumented AOCs across the range and to identify “presumptively clean” areas across the remainder of the FLBGR. WAA work was performed by SKY on behalf of the USACE – Omaha District (SKY, 2005).

The following data was collected across the range during the WAA.

- Synthetic aperture radar (SAR) – used to detect clusters of metallic items lying on the ground surface, potentially indicative of MD;
- Compact Airborne Spectrographic Imager II hyperspectral imaging (HSI) – used to discriminate vegetation-related anomalies, roads, and other structures in the SAR data;
- Supplemental high-resolution color orthophotography (ortho) – used to perform quality control (QC) of the SAR/HSI data; and
- Light Detecting and Ranging (LiDAR) – used to perform QC of the SAR/HSI data, to develop a high-resolution Digital Elevation Model (DEM), and to correct distortions in the ortho.

Approximately 46,000 acres of FLBGR were analyzed during the WAA. Field verifications were subsequently conducted for the areas of potential MM contamination identified during the WAA. The results of the WAA are summarized in the *Former Lowry Bombing and Gunnery Range, Wide Area Assessment, Final Report* (SKY, 2005).

2.3.12 Munitions and Explosives of Concern Removal Action (2000)

From 31 January 2000 through 27 April 2000, HFA continued investigation and removal activities at the FLBGR on behalf of the USACE – Omaha District. HFA continued the subsurface clearance activities at BT2, and investigated test grids in BT4 and BT5 to help delineate the boundaries of the impacted areas at those sites. HFA’s work through 27 April 2000 is summarized in the *Site-Specific Final Report, Ordnance and Explosives (OE) Removal Action, Former Lowry Bombing and Gunnery Range* (HFA, 2000).

2.3.13 Former Lowry Bombing and Gunnery Range Non-Time Critical Removal Action (2000 through Present)

Beginning in 2000 and continuing through the present, Shaw, on behalf of the USACE – Omaha District, began conducting conventional MM clearance activities at the FLBGR, excluding BT5, which was addressed by CH2M Hill as a separate response (**Section 2.3.15**). In general, surface hazards are being addressed by surface clearance, and subsurface hazards are being addressed by a combination of “mag-and-dig” and “map-and-dig” methodologies. However, the specific MMR action methodology for each MRS/AOI is being implemented as an iterative approach, agreed upon by USACE, CDPHE, and U.S. Environmental Protection Agency (USEPA). The MMR action approach is based on historical military use, current and future land use, geophysical anomaly density, the density of recovered MM, and the potential presence of infrastructure and cultural/ecological resources. If subsurface clearance activities cannot be performed for a MRS/AOI or are determined to be impractical, ICs and engineering controls are recommended as the preferred response alternative, with the concurrence of the land owner and regulator stakeholders.

Between 1 January 2006, and 31 December 2010, Shaw conducted conventional MMR activities at the following MRSs and AOIs:

- BT1;
- BT2;
- BT3;
- BT4;
- BT6;
- BT7;
- J/D Range;
- Mortar Range;
- Rocket Range;
- Circle of Bricks AOI;
- Miscellaneous Target AOI; and
- No Name AOI.

2.3.14 Jeep/Demolition Range Recovered Chemical Warfare Materiel Operations (2002 through 2004)

In March 2002, remnants from Chemical Agent Identification Set (CAIS) were found at the J/D Range during the performance of conventional MMR activities. Analytical data from the recovered CAIS bottles indicated no agent; however, this discovery of CAIS remnants raised concerns of finding live agent at the J/D Range. Therefore, conventional MMR activities were

stopped in March 2002, and the J/D Range was transitioned to a RCWM site in May 2002 (Shaw, 2006).

Advanced geophysical mapping and a K941 M1 toxic gas set ferrous shipping container (PIG) Discrimination Study were subsequently performed to identify potential RCWM anomalies that were “PIG-size” or greater. Details on methodology and procedures of the PIG Discrimination Study are include in the *Jeep/Demolition Range Digital Geophysical Mapping and PIG Discrimination Project, Former Lowry Bombing and Gunnery Range* (Shaw, 2005).

All of the potential RCWM anomalies identified from the PIG Discrimination Study were subsequently excavated by Parsons, and no RCWM-related items were found. The results of the RCWM removal action are documented in the *Final Removal Action Report, Former Lowry Bombing and Gunnery Range, Jeep/Demolition Range* (Parsons, 2004). In February 2004, the RCWM operations at J/D Range were completed, and the site reverted back to conventional MMR (Shaw, 2006). To date, no live agent has been found at the J/D Range.

2.3.15 Bennett Army National Guard Facility Surface Clearance (2003)

In April 2003, Shaw, on behalf of the USACE – Omaha District, performed a MEC surface clearance for the Bennett Army National Guard Facility (Bennett Site) in preparation for the property to be transferred from federal ownership. The anticipated future land use for the Bennett Site and surrounding area was public facilities, residential and commercial development, community parks, recreation area, and open space. The Bennett Site, approximately 242 acres, is located in the southeast corner of the FLBGR (**Figure 1-2**) and was the former location for the Titan Complex 2-A prior to the Colorado Army National Guard using the site for training (non-MM). The results of the surface clearance are documented in the *Final Ordnance and Explosives, Surface Clearance Report, Bennett Army National Guard Facility* (Shaw, 2003).

2.3.16 Helicopter Mounted Magnetometer Survey – Helimag (2005)

Helimag geophysical survey and anomaly identification efforts were conducted across various MRSs during 2005. The Helimag survey was performed by SKY on behalf of the USACE – Omaha District. The objectives of the Helimag survey effort were to collect and evaluate resulting high-resolution geophysical data in order to detect, locate, and identify magnetic anomalies for subsequent field verification. Resulting data were also used to assess the extent of each MRS and determine the relative density of anomalies across each project site. The Helimag survey included the following MRSs: AGGR, BT2, BT3, BT4, BT5, BT6, BT7, Mortar Range, and Rocket Range.

2.3.17 Bombing Target 5 Non-Time Critical Removal Action (2005 through 2006)

In 2005 and 2006, a NTCRA was performed at BT5 by CH2M Hill on behalf of the USACE – Omaha District. MEC removal actions were performed on 628 acres of BT5, and

characterization/investigation was conducted on an additional 98 acres located along the eastern and southern boundaries of BT5. The activities and results of the clearance at BT5 are presented in the *Site-Specific Final Report, Munitions & Explosives of Concern Response Actions, Former Lowry Bombing and Gunnery Range, Bombing Target #5* (CH2M Hill, 2006).

2.3.18 High Plains (Blackstone) Private Clearance (2002 through 2003)

In August 2002 through June 2003, MEC/MD characterization and clearance activities were conducted by Foster Wheeler Environmental Corporation (Foster Wheeler) for U.S. Home Corporation (U.S. Home) on the High Plains site (now called Blackstone), which occupies 628 acres within the southwest corner of the FLBGR (**Figure 2-1**). The High Plains site includes the previous Nose and Tail Gun Target Range, and the previous OQ Gunnery Range. The High Plains site was intended to be developed for recreation, community parks, and public facilities (Foster Wheeler, 2003b, d, and f).

Foster Wheeler personnel performed geophysical surveys using EM61 time domain electromagnetic (TDEM) instruments with the objective of reducing the MEC hazard potential, thereby improving the safety of the land for future use. Activities included the detection, identification, and removal of MEC and MD items. This work was performed under an ICAP submitted under CA 02-11-11-03, on behalf of U.S. Home; the owner developing the property. For the removal action, the High Plains site was divided into three sectors (Alpha, Bravo, and Charlie) to facilitate a rapid transfer of the property to homebuilders and other interested parties (Foster Wheeler, 2003b, d, and f).

The activities and results of the clearance at the High Plains site are presented in the *Alpha Sector Final Completion Report, High Plains, Ordnance Clearance* (Foster Wheeler, 2003b), *Completion Report for High Plains Ordnance Clearance, Volume 2 – Bravo Sector* (Foster Wheeler, 2003f), and *Completion Report for High Plains, Ordnance Clearance, Volume 3 – Charlie Sector* (Foster Wheeler, 2003d).

2.3.19 Beacon Point Private Clearance (2002 through 2003)

In October 2002 through May 2003, MEC/MD characterization and clearance activities were conducted by Foster Wheeler for U.S. Home on the Beacon Point site, which was located in or adjacent to the 20mm Range Fan MRS (**Figure 2-1**). The Beacon Point site consists of approximately 380 acres within Sections 20 and 21, Township 5 South and Range 65 West. The Beacon Point site was intended for residential and commercial development (Foster Wheeler, 2003a and c).

Foster Wheeler personnel performed geophysical surveys using EM61 TDEM instruments with the objective of reducing the MEC hazard potential, thereby improving the safety of the land for future use. Activities included the detection, identification, and removal of MEC and MD items.

This work was performed under an ICAP submitted under CA 02-11-11-03, on behalf of U.S. Home; the owner developing the property. For the removal action, the Beacon Point site was divided into three sectors (Delta, Echo, and Foxtrot) to facilitate a rapid transfer of the property to homebuilders and other interested parties (Foster Wheeler, 2003a and c).

The activities and results of the clearance at the Beacon Point site are documented in the *Delta Sector Final Completion Report, Beacon Point, Ordnance Clearance* (Foster Wheeler, 2003a), and the *Echo/Foxtrot Sector Completion Report, Beacon Point, Ordnance Clearance* (Foster Wheeler, 2003c).

2.3.20 Southshore Private Clearance (2003 and 2005)

In 2003 and 2005, MEC/MD characterization and clearance activities were conducted by Blackhawk Zapata for Laing Village LLC on the Southshore site, which is located in or adjacent to the down-range portion of the 20mm Range Fan MRS (**Figure 2-1**). The Southshore site consists of approximately 800 acres within the eastern half of Section 28, Township 5 South and Range 65 West. The Southshore site was intended for residential development, predominantly single family homes and recreation facilities such as parks and paths. Adjacent property was intended to be developed for public use as parks, golf courses, and schools; commercial use as shopping centers; and residential use as communities of single-family homes (Blackhawk Zapata, 2005).

Blackhawk Zapata personnel performed electromagnetic (EM) geophysical surveys using an MTADS system with the objective of reducing the MEC hazard potential, thereby improving the safety of the land for future use. Activities included the detection, identification, and removal of MEC and MD items. This work was performed under an ICAP submitted under CA 02-11-11-01, on behalf of Laing Village LLC; the owner developing the property. The 2003 effort focused on the 200-acre Area One Southshore. The 2005 effort focused on the 30-acre Area Two Southshore (Blackhawk Zapata, 2005).

The activities and results of the clearance efforts at the Southshore site are presented in the *Draft UXO Investigation to Reduce UXO Hazard Potential Completion Report, Southshore Development Site, Former Lowry Bombing and Gunnery Range* (Blackhawk Zapata, 2003b), and the *Digital Geophysical Mapping Report, Area Two Southshore Development Site, Former Lowry Bombing and Gunnery Range* (Blackhawk Zapata, 2005).

2.3.21 Wheatlands Private Clearance (2003)

In 2003, MEC/MD characterization and clearance activities were conducted by Blackhawk Zapata for Shea Homes for a portion of the Wheatlands site. The Wheatlands site occupies 439 acres adjacent to the western boundary of the FLBGR and southwest of the J/D Range (**Figure 2-1**). The Wheatlands site was intended to be developed for single and multi-family

housing, public areas, and open-space. The 2003 effort was called Phase I and addressed the 100-acres adjacent to Smokey Hill Road and northwest of Murphy Creek (Blackhawk Zapata, 2003a).

Blackhawk Zapata personnel performed geophysical surveys using an EM61 High Power Dual Coil system with the objective of reducing MEC hazard potential, thereby improving the safety of the land for future use. Activities included the detection, identification, and removal of MEC and MD items. This work was performed under CA 02-11-11-01, on behalf of Shea Homes; the owner developing the property (Blackhawk Zapata, 2003a).

The activities and results for Phase I of the clearance effort at the Wheatlands site are included in the *Completion Report, Phase I, Wheatlands Development* (Blackhawk Zapata, 2003a).

2.3.22 Grasslands (Serenity Ridge) Surface Characterization (2003)

In May 2003, Foster Wheeler performed a visual reconnaissance survey for Neumann Homes at the Grasslands site (now called Serenity Ridge) which is located adjacent to the western boundary of the FLBGR, southwest of the Aurora Reservoir. The Grassland site occupies approximately 189 acres within Section 29, Township 5 South and Range 65 West. The visual reconnaissance was performed along transects covering 40 acres of the Grasslands site. The results of the surface reconnaissance are documented in the *Final Report, Surface Ordnance Characterization at the Grasslands Development* (Foster Wheeler, 2003e).

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3.0 Schedule for Five-Year Reviews

For the FLBGR, reviews will be conducted every five years beginning in 2011. This first Five-Year Review for the FLBGR will primarily cover the MMR actions conducted between 1 January 2006, and 31 December 2010, with the report finalized in 2011. A detailed schedule of the major steps and document reviews for the 2011 review is provided below.

| Component | Schedule | Duration (Calendar Days) |
|--|-----------------------|---|
| Establish Project Delivery Team | 10/20/2010 | 1 |
| Prepare Draft Five-Year Review Plan | 11/1/2010 – 1/19/2011 | 80 |
| Review and Approval of Draft Five-Year Review Plan by USACE – Omaha District PM | 1/19/2011 – 2/7/2011 | 20 |
| Prepare Draft Final Five-Year Review Plan | 2/7/2011 – 2/11/2011 | 5 |
| Review and Concurrence of Draft Final Five-Year Review Plan by USEPA and CDPHE | 2/11/2011 – 3/24/2011 | 42 |
| Finalize Five-Year Review Plan | 3/24/2011 – 4/8/2011 | 16 |
| Review Existing Documentation and Complete Background/Site Description Checklists for Each MRS/AOI | 3/24/2011 – 5/9/2011 | 47 |
| Post Final Five-Year Review Plan to Project Website | 4/11/2011 | 1 |
| Add Final Five-Year Review Plan to Administrative Record and Information Repository | 4/11/2011 | 1 |
| Public Notice for Initiation of Five-Year Review Process and Pre-Review Public Meeting | Week of 4/11/2011 | 1 |
| Public Meeting with Briefing about Five-Year Review Process and the FLBGR Five-Year Review Plan | 4/20/2011 | 1 |
| Conduct Stakeholder/Community Interviews | 4/21/2011 – 6/17/2011 | 58 |
| Conduct Site Inspections and Complete Checklist for Each MRS/AOI | 4/21/2011 – 5/31/2011 | 41 |
| Conduct Analysis and Prepare Pre-Draft Five-Year Review Report | 5/31/2011 – 7/25/2011 | 56 |
| Review and Approval of Pre-Draft Five-Year Review Report by USACE – Omaha District PM | 7/25/2011 – 8/24/2011 | 31 |

| Component | Schedule | Duration (Calendar Days) |
|---|------------------------|-----------------------------|
| Prepare Draft Five-Year Review Report for USACE – Omaha District, Office of Counsel; CDPHE; and USEPA | 8/24/2011 – 8/29/2011 | 5 |
| Review and Approval of Draft Five-Year Review Report by the USACE – Omaha District, Office of Counsel; CDPHE; and USEPA | 8/29/2011 – 9/28/2011 | 31 |
| Prepare Draft Final Five-Year Review Report | 9/28/2011 – 10/4/2011 | 7 |
| Public Notice for Public Meeting and Review Period for Draft Final Five-Year Review Report | 10/5/2011 | 1 |
| Add Draft Final Five-Year Review Report to Information Repository | 10/5/2011 | 1 |
| Public Review/Comment Period on Draft Final Five-Year Review Report | 10/5/2011 – 11/4/2011 | 31 |
| Public Meeting for Draft Final Five-Year Review Report | 10/19/2011 | 1 |
| Responsiveness Summary for Comments on Draft Final Five-Year Review Report | 11/5/2011 – 11/18/2011 | 14 |
| Finalize Five-Year Review Report and Add to Administrative Record and Information Repository | 11/18/2011 – 12/9/2011 | 22 |

Subsequent reviews will be conducted no later than five years from the signature date of the previous Five-Year Review report. The criteria for terminating the Five-Year Reviews at the FLBGR are discussed in **Section 8.0**.

The USACE – Omaha District project manager will use the Formerly Used Defense Sites Management Information System (FUDSMIS) to track the time frame for the Five-Year Review effort at the FLBGR.

If between scheduled reviews, a significant issue is identified with the implemented MMR (for the planned land use for the area) or a MEC incident occurs, then a request may be submitted to the FUDS Manager at the USACE – Omaha District office to have the MMR reviewed. Depending on the nature of the issue/incident, the USACE – Omaha District office may implement an off-cycle Five-Year Review or use a less formal evaluation and documentation method.

4.0 *Review of Existing Documentation*

The existing documentation review will include all final reports and decisions documents, which may include (as applicable to the site) statements of work; work plans; archives search reports; EE/CA or Remedial Investigation/Feasibility Study (RI/FS) reports; institutional analysis; IC plans; explosives safety submissions (ESS); site specific final reports (SSFR); responsiveness summaries; hazardous, toxic, and radioactive waste (HTRW) documents; real estate records; newspaper records; accident reports; incident reports; operation and maintenance records; previously conducted Five-Year Review reports; and current DoD risk prioritization results. The primary list of existing documentation that will be reviewed during the 2011 Five-Year Review is included as **Table 4-1**.

During the existing document review, information will be collected pertaining to the site history and the implemented MMR actions and ICs at the MRSs/AOIs of the FLBGR. In general, the review will accomplish the following objectives:

- Identify and evaluate the basis of the MMR action selection for each MRS/AOI;
- Determine what MMR actions have been completed for each MRS/AOI;
- Determine if the implemented MMR action has performed as expected and is meeting project objectives;
- Determine where MEC items are suspected or were located, if applicable, for each MRS/AOI and document the basis for this determination;
- Determine if there is an immediate threat to human health, safety, or the environment that warrants further response;
- Identify and evaluate the types of ICs (if any), determine whether ICs meet the required protectiveness for the current land use and for any changes in land use, and determine if the ICs are in compliance with State of Colorado regulations; and
- If a determination of technical impracticability was made for a MRS/AOI, determine whether new technology is now available that could address remaining explosives safety risks at the MRS/AOI.

A Background/Site Description Checklist (**Appendix A**) will be completed for each MRS/AOI using the information gathered during the existing documentation review. Information required on the Background/Site Description Checklist includes descriptions of historical military use, the types of MM recovered, soil type, topography, vegetative cover, contaminants of concern, groundwater and wetland locations, presence of threatened or endangered species, presence of archaeological/cultural sites, status of MMR actions, land use restrictions, and access controls.

The results of the existing documentation review will be documented in the Five-Year Review report.

5.0 *Community and Stakeholder Involvement*

The USACE – Omaha District has made community involvement an important aspect of its environmental management and FLBGR-related efforts. The USACE utilizes professional staff, in the form of a Public Affairs Office, and contractor staff (Shaw) to address and manage FLBGR community involvement issues. Additionally, a Restoration Advisory Board (RAB) was established in July 1996 for the FLBGR to ensure that stakeholders could actively participate in the decisions regarding MMR activities. The RAB continues to operate and is comprised of members of the local community, private citizens, representatives of local government institutions, local land developers, commercial interests, the CDPHE project manager, and the USACE – Omaha District project manager. RAB meetings are held quarterly and are open to the public.

Community and stakeholder involvement activities for the FLBGR Five-Year Review will be coordinated through the RAB. Prior to conducting the Five-Year Review, the public notice for a RAB meeting will include an announcement that a Five-Year Review is to be conducted at the FLBGR and that an overview of the process will be presented at the RAB meeting. RAB public notices are published in the *Aurora Sentinel* and the *I-70 Scout* (local daily and weekly newspapers), and posted on the project's website (www.flbgr.org). The Five-Year Review overview to be presented at the RAB meeting will include the purpose of the review, the role of stakeholders and the community in the review process, general methodologies and process, and the schedule.

During the Five-Year Review, one-on-one interviews will be conducted with USACE and contractor technical staff; current and past RAB members; regulatory authorities; all agencies responsible for implementing, maintaining, and/or enforcing ICs; and other key project/community stakeholders. The goal of the interview process is to provide another perspective on the progress and performance of the MMR actions. Community interviews will be conducted to elicit public input regarding MMR-related activities at the FLBGR. Technical interviews will be conducted with USACE and contractor technical staff to collect any information that has not been documented in the project files and resolve any questions identified during the document reviews. Interviews will be conducted with CDPHE and USEPA managers responsible for FLBGR to obtain their input regarding MMR-related activities at the FLBGR. Interviews with the agencies responsible for implementing, maintaining, and/or enforcing ICs at the FLBGR will be performed as required to obtain the status of any ICs. Documentation and summaries of the interviews will be included in the Five-Year Review report.

When the draft Five-Year Review report is submitted for review and approval to the Office of Counsel, USACE – Omaha District, a copy of the draft report will also be submitted to CDPHE

and USEPA for review and concurrence. Shaw and the USACE – Omaha District will prepare a written response summary for comments received from the Office of Counsel, CDPHE, and USEPA. The responsiveness summary will be included the Five-Year Review report. Once concurrence is obtained from the regulators, a copy of the signed concurrence memorandums will be also included in the final Five-Year Review report.

A 30-day public review and comment period will be held for the USACE-approved draft final Five-Year Review report. A copy of the draft final report will be placed in the FLBGR information repository located at the main branch of the Aurora Public Library (14949 East Alameda Drive, Aurora, Colorado 80012). The draft report will also be made available for review and download on the project's website (www.flbgr.org). A public notice will be published in the *I-70 Scout* and the *Aurora Sentinel* papers announcing the public review period of the draft report. The public notices will include the following information.

- Notification that the draft Five-Year Review report has been prepared and placed in the information repository;
- Location of the information repository;
- Summary of the Five-Year Review process;
- Summary of the findings and conclusions of the Five-Year Review; and
- Announcement of the formal 30-day public comment period for submission of written comments regarding the draft Five-Year Review report.

A RAB / public meeting will be held during the 30-day public review period. An overview of the 2011 Five-Year Review findings and recommendations will be presented at the meeting. The meeting will also provide an opportunity for the public and stakeholders to submit written comments regarding the draft report.

After the public comment period, a responsiveness summary will be prepared to address any significant public comments received on the draft report. A copy of the responsiveness summary will be included in the final Five-Year Review report.

The final Five-Year Review report will be added the FLBGR information repository at the Aurora Public Library, as well as the administrative record at the FLBGR project site (25950 East Quincy Avenue, Aurora, Colorado 80016).

6.0 *Site Inspections*

A site inspection will be conducted at each of 15 MRSs/AOIs listed in **Section 1.5** to visually confirm and document the current physical conditions of the MRSs/AOIs and the surrounding area, and to document the status and condition of the remedy components present at each MRS/AOI. The site inspections will be conducted in accordance with the project methods described in the FLBGR Master Work Plan and in accordance with the requirements of the FLBGR ESS.

In general, the site inspection field team will walk a meandering path in the MRS/AOI paying particular attention to the target center or other areas with previously documented high concentrations of recovered MEC/MD, current MRS/AOI boundary areas, and on-site drainage areas. Grids or areas where MMR efforts have not yet been completed will not be accessed or included in the assessment. Because MMR efforts are currently ongoing for various portions of the range, all site inspections will be coordinated with the on-site USACE On-Site OE Safety Specialist, the Senior Unexploded Ordnance (UXO) Supervisor (SUXOS), and the UXO Safety Officer (UXOSO) to ensure that the field team does not enter an exclusion zone while MEC removal activities are being performed. The field teams will use handheld global positioning system (GPS) units to document the areas walked during their site inspection. The GPS tracks will be downloaded to the geographic information system (GIS) and graphically represented in the Five-Year Review report.

During the site inspection, the field team will only perform visual reconnaissance activities. Sampling and/or other intrusive activities will not occur. The field team will include a qualified UXO Technician II or III to serve as the UXO Escort. MEC avoidance activities will be performed under the direction and supervision of the UXO Technician. If appropriate, the UXO Technician will use a Schonstedt metal detector as a safety aid to locate any ferrous items that may be camouflaged or hidden by vegetation. MD, MPPEH, and potential RCWM items are not to be handled as part of the Five-Year Review site inspection. Non-UXO personnel will be properly instructed and closely supervised to prevent them from disturbing or handling any MD, MPPEH, or RCWM items.

If a potential MM item is found during the site inspection, work will immediately stop. In the event that MPPEH or RCWM is identified by the UXO Technician, the item shall be handled in the same fashion as any other MPPEH item on the FLBGR, following the FLBGR Master Work Plan and FLBGR ESS requirements. The item shall be evaluated with respect to the condition of its fuze, likely explosive material content, and potential for other hazardous materials. The Shaw UXOSO and SUXOS, in conjunction with the USACE On-Site OE Safety Specialist, shall make

a determination as to the appropriate minimum separation distance and decide on a course of action that may consist of one of the following options:

- Detonate the item in place (preferred option);
- Relocate the item to a safe, isolated location for detonation; or
- Guard the item pending the arrival of an Army EOD Team or Technical Escort Unit (TEU) personnel.

Further details on MEC and RCWM identification and disposal procedures are included within the FLBGR Master Work Plan.

A handheld GPS unit will be used to determine the location of any MD (excluding small arms), MPPEH, or RCWM items found on the ground surface. Photographs of the item will be taken if safe to do so. The GPS coordinates for any MD (excluding small arms), MPPEH, or RCWM items encountered on the ground surface during the site inspection will be downloaded to the GIS and graphically represented in the Five-Year Review report. The Five-Year report will also include photographs of any MPPEH and RCWM items encountered.

The site inspection for each MRS/AOI will be documented by taking photographs of site conditions during the inspection and by completing a Five-Year Review Site Inspection Checklist (**Appendix B**). The following are examples of the type of information to be collected for each MRS/AOI during the site inspection:

- Development at or in the vicinity of the MRS/AOI;
- Changes in land use at or within the vicinity of the MRS/AOI;
- Recreational or other activities at or within the vicinity of the MRS/AOI;
- Changes in accessibility to the MRS/AOI;
- Presence of MEC/MD (excluding small arms) on ground surface;
- The condition of gates, fences, and any associated signage;
- Presence and condition of any equipment, facilities, and infrastructure;
- Any health and safety concerns related to USACE or contractor staff; and
- Evidence of vandalism, fire, storm damage, significant erosion, or frost heave at the MRS/AOI.

The Five-Year Review report will include a copy of the completed inspection checklist for each MRS/AOI and photographs documenting the current conditions of the MRS/AOI.

The USACE – Omaha District and Shaw will ensure that valid rights-of-entry are in place prior to conducting the site inspections since none of the FLBGR is owned or controlled by the DoD. Shaw will work with USACE – Omaha District’s Real Estate Office in identifying private

property requiring access for the Five-Year Review site inspections. Shaw will also work with the USACE in contacting the affected property owner and obtaining signature of the right-of-entry form. Personnel associated with the site inspection will typically access the FLBGR through the USACE Site Compound.

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7.0 *Five-Year Review Report*

At the conclusion of the review process, Shaw will prepare a report to document the information collected and evaluated during the Five-Year Review. The Five-Year Review Report will specify the answers to the following questions for each MRS/AOI listed in **Section 1.5** using the information collected during the existing documentation review, the community and stakeholder interviews, and the site inspection:

1. Is the MMR action functioning as intended (meeting its objectives)?
2. Are the assumptions used at the time of the MMR action selection still valid?
3. Does any new information indicate that the previously selected MMR action no longer minimizes explosives safety risks or is no longer protective of human health, safety, and the environment, considering the best available technology?

If conditions that could result in unacceptable risks are identified, the report will document whether or not the conditions are being controlled during the MMR action. If any response deficiencies or risk-related concerns are noted during the Five-Year Review, the report will include recommendations for follow-up actions to address the deficiencies or concerns. The report will also provide current estimated MMR action timelines for each MRS/AOI, and recommend the due date and period covered for the next FLBGR Five-Year Review. The report will also document the status of any implemented ICs and if they are operating as intended. For each MRS/AOI, the final Five-Year Review report will include a signed determination by the USACE – Omaha District Commander stating that the MMR action continues/does not continue to minimize explosives safety risks and is/is not protective of human health, safety, and the environment.

One report will be prepared for the entire range and will include site specific sections for each of the 15 MRSs/AOIs. The contents and general order of presentation of the Five-Year Review report will be based on the requirements of EP 75-1-4 *Recurring Reviews on Ordnance and Explosives (OE) Response Actions* (USACE, 2003), and USEPA's 540-R-01-007 *Comprehensive Five-Year Review Guidance* (USEPA, 2001).

The stakeholder and public review process for the draft Five-Year Review report is summarized in **Section 5.0**.

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8.0 Termination of Five-Year Reviews

The Five-Year Review process at the FLBGR will be terminated when the USACE, CDPHE, USEPA, and key project stakeholders agree that the FLBGR is stable based on the results of previous Five-Year Reviews and the MMR actions conducted at the range. The FLBGR will be considered stable when:

- No issues are identified at the FLBGR that significantly change the effectiveness of the MMR actions;
- Erosion, frost heave, or other environmental conditions at the FLBGR do not significantly impact the MMR actions;
- No post-closure MEC incidents occur at the FLBGR; and
- No significant changes in land use occur at the FLBGR.

At the appropriate time, the last Five-Year Review report for the FLBGR will state that no further Five-Year Reviews will be conducted for the FLBGR. The last Five-Year Review report will include the justification for terminating the Five-Year Reviews and will document the agreement between the USACE, CDPHE, USEPA, and key project stakeholders.

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9.0 References

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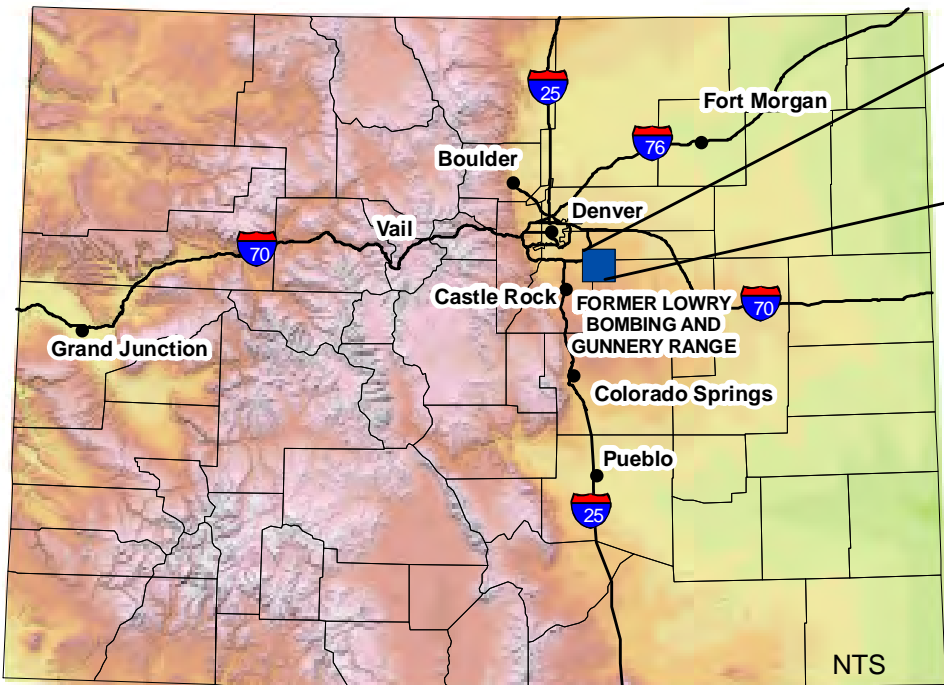
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Figures


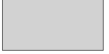



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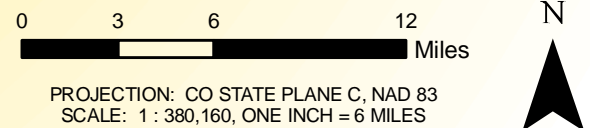




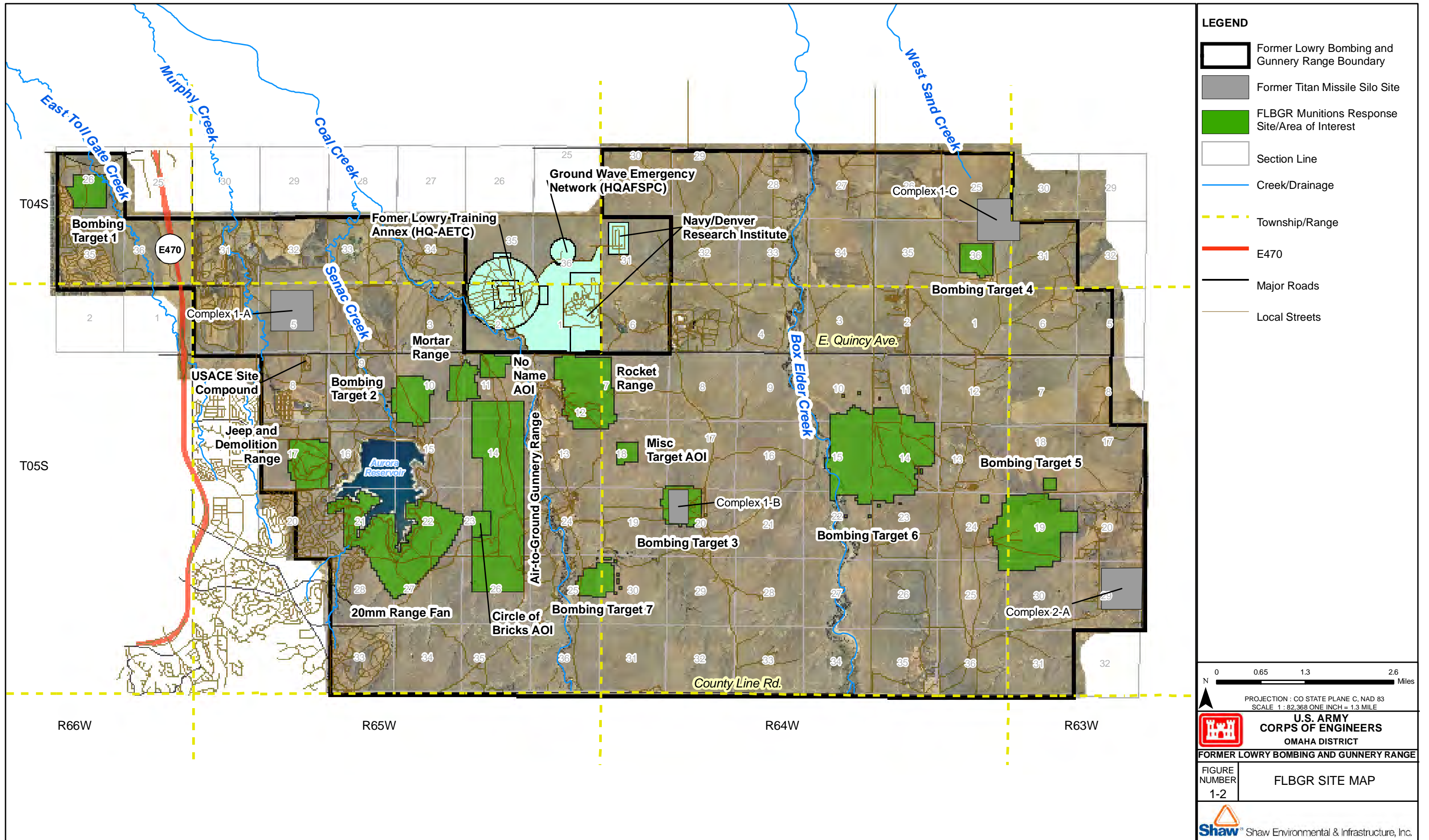
Colorado

LEGEND

-  Interstate Highway
-  Denver County
-  County Boundary
-  Capital
-  City



| | |
|---|--------------|
|  | |
| U.S. ARMY CORPS OF ENGINEERS OMAHA DISTRICT | |
| FORMER LOWRY BOMBING AND GUNNERY RANGE | |
| FIGURE NUMBER 1-1 | LOCATION MAP |
|  Shaw Environmental & Infrastructure, Inc. | |



- LEGEND**
- Former Lowry Bombing and Gunnery Range Boundary
 - Former Titan Missile Silo Site
 - FLBGR Munitions Response Site/Area of Interest
 - Section Line
 - Creek/Drainage
 - Township/Range
 - E470
 - Major Roads
 - Local Streets

0 0.65 1.3 2.6 Miles

PROJECTION : CO STATE PLANE C, NAD 83
SCALE 1 : 82,368 ONE INCH = 1.3 MILE

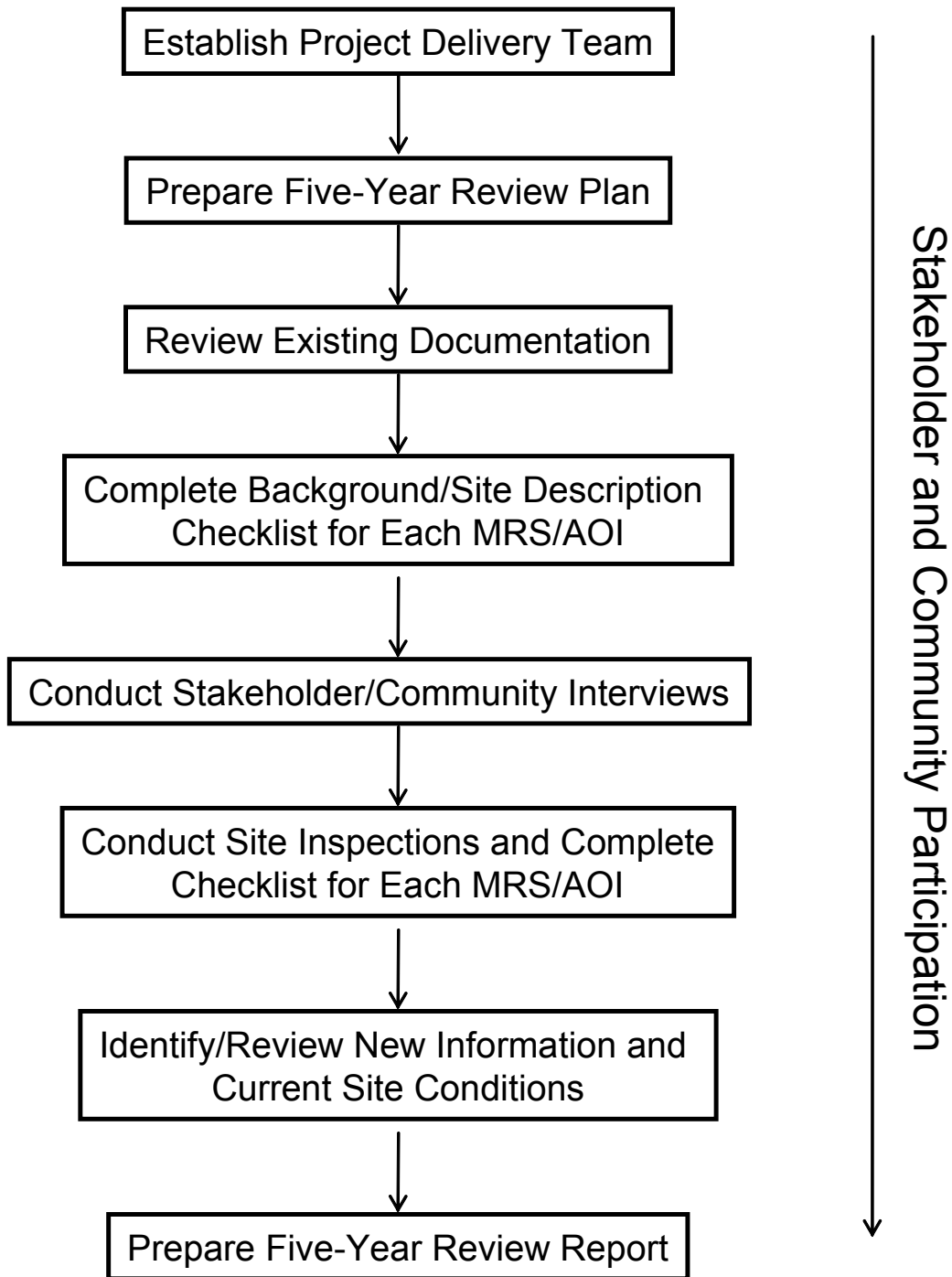
**U.S. ARMY
CORPS OF ENGINEERS**
OMAHA DISTRICT



FORMER LOWRY BOMBING AND GUNNERY RANGE

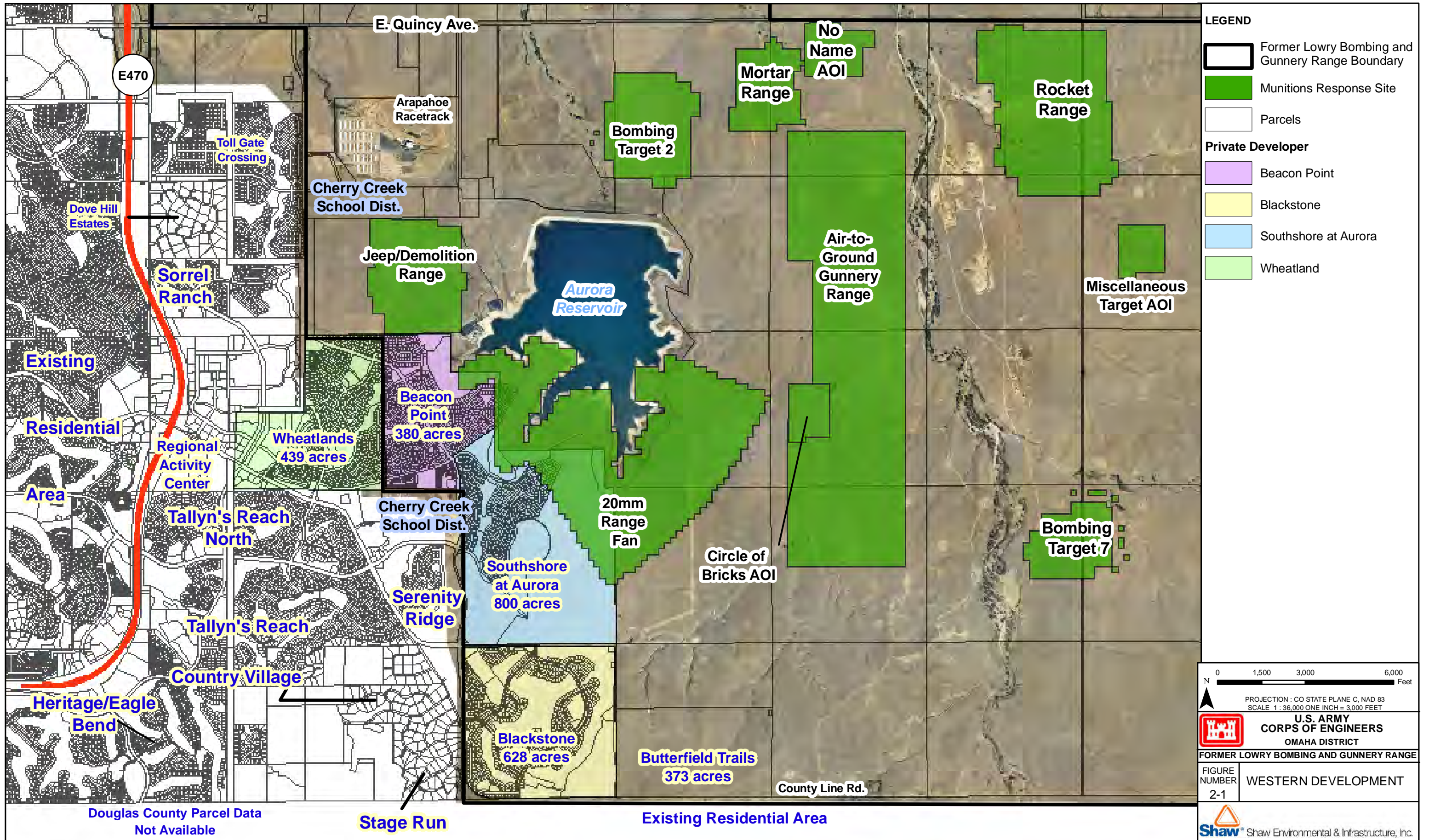
FIGURE NUMBER
1-2

FLBGR SITE MAP

Shaw Shaw Environmental & Infrastructure, Inc.



| | |
|--|--|
|  | U.S. ARMY CORPS OF ENGINEERS OMAHA DISTRICT |
| FORMER LOWRY BOMBING AND GUNNERY RANGE | |
| FIGURE NUMBER 1-3 | FIVE YEAR REVIEW PROCESS |
|  Shaw ® Shaw Environmental & Infrastructure, Inc. | |



Tables

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**Table 4-1
Existing Documentation**

| Document Title | Document Date | Prepared By | Prepared For | Document Location |
|---|----------------------|---------------------------|---------------------|--------------------------|
| Archives Search Report, Findings, Buckley Field, Arapahoe County, Colorado | May-95 | USACE, St. Louis District | N/A | AR and IR |
| Archives Search Report, Conclusions and Recommendations, Buckley Field, Arapahoe County, Colorado | May-95 | USACE, St. Louis District | N/A | AR and IR |
| Time Critical Removal Action, Former Buckley Bombing Range, Work Plan | 7/26/1996 | HFA | USAESCH | AR |
| Final Removal Report, Time Critical Removal Action, Former Buckley Bombing Range, Aurora, Colorado | 3/21/1997 | HFA | USAESCH | AR and IR |
| Addendum 001 to Time Critical Removal Action, Former Buckley Bombing Range, Work Plan | 3/28/1997 | HFA | USAESCH | AR |
| Addendum 001 Change 001 to Time Critical Removal Action, Former Buckley Bombing Range, Work Plan | 4/3/1997 | HFA | USAESCH | AR |
| Addendum 001 Change 002 to Time Critical Removal Action, Former Buckley Bombing Range, Work Plan | 4/7/1997 | HFA | USAESCH | AR |
| Master Work Plan, Engineering Evaluation/Cost Analysis, Former Buckley Field (Lowry Bombing and Gunnery Range), Aurora, Colorado (Final) | 5/5/1997 | Earth Tech | USAESCH | AR |
| Work Plan Supplement - Zone 1, Engineering Evaluation/Cost Analysis, Former Buckley Field (Lowry Bombing and Gunnery Range), Aurora, Colorado (Final) | May-97 | Earth Tech | USAESCH | AR |
| Work Plan Supplement - Zone 2, Engineering Evaluation/Cost Analysis, Former Buckley Field (Lowry Bombing and Gunnery Range), Aurora, Colorado | Jun-97 | Earth Tech | USAESCH | AR |
| Work Plan Supplement - Zone 3, Engineering Evaluation/Cost Analysis, Former Buckley Field (Lowry Bombing and Gunnery Range), Aurora, Colorado (Final Draft) | Sep-97 | Earth Tech | USAESCH | AR |

**Table 4-1
Existing Documentation**

| Document Title | Document Date | Prepared By | Prepared For | Document Location |
|--|----------------------------|-----------------------------|-----------------------------------|--------------------------|
| Archival Photo Analysis, Buckley Field, Arapahoe County, Colorado | Sep-97 | USACE, St. Louis District | USAESCH | AR and IR |
| Institutional Analysis Report, Former Buckley Field, (Lowry Bombing and Gunnery Range), Aurora, Colorado | Sep-97 | Earth Tech | USAESCH | AR and IR |
| Master, Engineering Evaluation/Cost Analysis, Former Buckley Field (Lowry Bombing and Gunnery Range), Arapahoe County, Colorado (Draft) | 1/19/1998 | Earth Tech | USAESCH and USACE, Omaha District | AR and IR |
| Engineering Evaluation/Cost Analysis, Zone 1 Addendum, Former Buckley Field (Lowry Bombing and Gunnery Range), Arapahoe County, Colorado (Draft) | 1/19/1998 | Earth Tech | USAESCH and USACE, Omaha District | AR and IR |
| Engineering Evaluation/Cost Analysis, Zone 2 Addendum, Former Buckley Field (Lowry Bombing and Gunnery Range), Arapahoe County, Colorado (Draft) | 1/19/1998 | Earth Tech | USAESCH and USACE, Omaha District | AR and IR |
| Engineering Evaluation/Cost Analysis, Zone 3 Addendum, Former Buckley Field (Lowry Bombing and Gunnery Range), Arapahoe County, Colorado (Draft) | 1/19/1998 | Earth Tech | USAESCH and USACE, Omaha District | AR and IR |
| Explosive Safety Submission (ESS), Non-Time Critical Clearances, Ordnance and Explosives (OE), Removal Action (RA), Buckley Field, Arapahoe, County, Colorado (included: Addendum 1, Addendum 2, Addendum 3, Addendum 4, and Addendum 5) | 3/25/1998 through 1/1/2002 | HFA / Stone & Webster, Inc. | USAESCH | AR and IR |
| Settlement Agreement between the US Army Corps of Engineers and Colorado Department of Public Health and Environment | 4/28/1998 | N/A | N/A | AR and IR |
| Final Visual OE Surface Reconnaissance Work Plan for Lowry Bombing and Gunnery Range | 8/7/1998 | Golder Associates Inc. | USACE, Omaha District | AR |
| Work Plan Addendum, Geophysical Mapping and Analysis of the 20 Millimeter Range Fan Area, Former Buckley Field (Lowry Bombing and Gunnery Range), Arapahoe County, Colorado (Revised Final) | 10/13/1998 | Montgomery Watson | USAESCH | AR |

**Table 4-1
Existing Documentation**

| Document Title | Document Date | Prepared By | Prepared For | Document Location |
|---|----------------------|------------------------------------|------------------------|--------------------------|
| Final Report for 2,000-Acre Visual Surface Ordnance and Explosive (OE) Reconnaissance at the Former Lowry Bombing and Gunnery Range | 11/23/1998 | Golder Associates Inc. | USACE, Omaha District | AR and IR |
| Former Lowry Bombing and Gunnery Range (aka Former Buckley Field), Non-Time Critical Clearances Addendum to the Master Work Plan | 12/27/1999 | HFA | USACE | AR |
| Former Buckley Field (Lowry Bombing and Gunnery Range), Arapahoe County, Colorado, Interim Removal Action Report | 7/1/2000 | Montgomery Watson | USAESCH | AR and IR |
| Site-Specific Final Report Ordnance and Explosives (OE) Removal Action, Former Lowry Bombing and Gunnery Range, Aurora, CO | 11/3/2000 | HFA | Stone & Webster, Inc. | AR and IR |
| Jeep/Demolition Range, Technical Summary Document, Former Lowry Bombing and Gunnery Range, Arapahoe County, Colorado, Revision 1 | 4/16/2002 | Stone & Webster, Inc. | USACE, Omaha District | Project Files |
| Amendment 6, Explosive Safety Submission, Former Lowry Bombing and Gunnery Range (Former Buckley Field), Arapahoe County, Colorado | 3/12/2003 | Shaw | USACE, Omaha District | AR and IR |
| Draft Phase 1 and Phase 2 Digital Geophysical Mapping, Jeep/Demolition Range, Former Lowry Bombing and Gunnery Range, Arapahoe County, Colorado, Revision 1 | 3/27/2003 | Stone & Webster, Inc. | USACE, Omaha District | Project Files |
| Final Integrated Corrective Action Plan, Beacon Point Ordnance Clearance | 4/25/2003 | Foster Wheeler Environmental, Corp | U.S. Home, Lennar Corp | Project Files |
| Delta Sector Final Completion Report, Beacon Point, Ordnance Clearance | 4/25/2003 | Foster Wheeler Environmental, Corp | U.S. Home, Lennar Corp | Project Files |

**Table 4-1
Existing Documentation**

| Document Title | Document Date | Prepared By | Prepared For | Document Location |
|---|----------------------|------------------------------------|------------------------|--------------------------|
| Alpha Sector Final Completion Report, High Plains, Ordnance Clearance | 5/2/2003 | Foster Wheeler Environmental, Corp | U.S. Home, Lennar Corp | Project Files |
| Echo/Foxtrot Sector Final Completion Report, Beacon Point, Ordnance Clearance | 5/13/2003 | Foster Wheeler Environmental, Corp | U.S. Home, Lennar Corp | Project Files |
| Final Ordnance and Explosives, Surface Clearance Report, Bennett Army National Guard Facility, Arapahoe County, Colorado, Revision 1 | 5/29/2003 | Shaw | USACE, Omaha District | Project Files |
| Completion Report for High Plains Ordnance Clearance, Volume 3 - Charlie Sector | 5/30/2003 | Foster Wheeler Environmental, Corp | U.S. Home, Lennar Corp | Project Files |
| Final Report, Surface Ordnance Characterization at the Grasslands Development, Aurora, Colorado | 6/6/003 | Foster Wheeler Environmental, Corp | Neumann Homes | Project Files |
| Integrated Corrective Action Plan, Southshore Development Workplan, Aurora, Colorado, Revision 3 | 6/20/2003 | Blackhawk UXO Service | Laing Village LLC | Project Files |
| Completion Report for High Plains Ordnance Clearance, Volume 2 - Bravo Sector | 6/27/2003 | Foster Wheeler Environmental, Corp | U.S. Home, Lennar Corp | Project Files |
| Integrated Corrective Action Plan (ICAP), Wheatlands Project Site, South of the Jeep/Demolition Range Area of Concern | 7/23/2003 | Blackhawk UXO Service | Shea Homes | Project Files |
| Completion Report, Phase I, Wheatlands Development, Arapahoe County, Colorado | 8/20/2003 | Blackhawk UXO Service | Shea Homes | Project Files |
| UXO Investigation to Reduce UXO Hazard Potential Completion Report, Southshore Development Site, Former Lowry Bombing and Gunnery Range, Aurora, Colorado (Draft) | 9/9/2003 | Blackhawk UXO Service | Laing Village LLC | Project Files |

**Table 4-1
Existing Documentation**

| Document Title | Document Date | Prepared By | Prepared For | Document Location |
|--|----------------------|---|-----------------------------------|--------------------------|
| Final Chemical Safety Submission, Former Lowry Bombing and Gunnery Range, Jeep/Demolition Range, Arapahoe County, Colorado | 9/23/2003 | Parsons | USAESCH and USACE, Omaha District | Project Files |
| Work Plan, Recovered Chemical Warfare Materiel (RCWM) Removal Action, Former Lowry Bombing and Gunnery Range, Jeep/Demolition Range, Arapahoe County, Colorado, Revision 4 | 11/21/2003 | Parsons | USAESCH and USACE, Omaha District | Project Files |
| Amendment 7/8 to Explosives Safety Submission (ESS) for the Former Lowry Bombing and Gunnery Range, Arapahoe County, Colorado | 4/12/2004 | Shaw | USACE, Omaha District | AR and IR |
| Final Removal Action Report, Former Lowry Bombing and Gunnery Range, Jeep/Demolition Range, Arapahoe County, Colorado | Nov-04 | Parsons | USAESCH and USACE, Omaha District | Project Files |
| Jeep / Demolition Digital Geophysical Mapping and PIG Discrimination Project, Former Lowry Bombing and Gunnery Range, Denver, Colorado | 3/9/2005 | Shaw | USACE, Omaha District | AR |
| Former Lowry Bombing and Gunnery Range, Wide Area Assessment, Final Report | 3/16/2005 | Sky | USACE, Omaha District | AR and IR |
| Integrated Corrective Action Plan for a Geophysical Prove-Out, Amendment to the ICAP Dated June 20, 2003, Southshore Development Workplan, Aurora, Colorado | Aug-05 | Blackhawk, a Division of Zapata Engineering | Southshore | Project Files |
| Digital Geophysical Mapping, Area Two Southshore Development Site, Former Lowry Bombing and Gunnery Range, Aurora, Colorado | Nov-05 | Blackhawk Zapata | Southshore, Laing/Village LLC | Project Files |
| RCWM Risk/Probability Assessment, Jeep/Demolition Range, Former Lowry Bombing and Gunnery Range (Formerly Buckley Field), Arapahoe County, CO | 4/26/2006 | USACE, Omaha District | USAESCH | AR |

**Table 4-1
Existing Documentation**

| Document Title | Document Date | Prepared By | Prepared For | Document Location |
|--|----------------------|--------------------|-----------------------|---------------------------|
| Explosive Safety Submission, Amendment 9, Munitions & Explosives of Concern Response Actions, Former Lowry Bombing and Gunnery Range, Bombing Target #5, Arapahoe County, Colorado | Jun-05 | CH2M Hill | USACE, Omaha District | AR and IR |
| Work Plan, Munitions & Explosives of Concern Response Actions, Former Lowry Bombing and Gunnery Range, Bombing Target #5, Arapahoe County, Revision 3 | Sep-05 | CH2M Hill | USACE, Omaha District | Project Files |
| Prioritization Scoring for Former Lowry Bombing & Gunnery Range Areas of Concern for 2006 | 2006 | Correlation Corp. | RAB, USACE, and CDPHE | www.flbgr.org, AR, and IR |
| Amendment 11, Explosive Safety Submission, Former Lowry Bombing and Gunnery Range (Formerly Buckley Field), Arapahoe County, Colorado | Feb-06 | Shaw | USACE, Omaha District | AR and IR |
| Amendment 10, Explosive Safety Submission, Former Lowry Bombing and Gunnery Range (Formerly Buckley Field), Arapahoe County, Colorado | Mar-06 | Shaw | USACE, Omaha District | AR and IR |
| Amendment 12, Explosive Safety Submission, Former Lowry Bombing and Gunnery Range (Formerly Buckley Field), Arapahoe County, Colorado | Aug-06 | Shaw | USACE, Omaha District | AR and IR |
| Site-Specific Final Report, Munitions & Explosives of Concern Response Actions, Former Lowry Bombing and Gunnery Range, Bombing Target #5, Arapahoe County, Colorado, Revision 0 | Dec-06 | CH2M Hill | USACE, Omaha District | Project Files |
| Amendment 13, Explosive Safety Submission, Former Lowry Bombing and Gunnery Range (Former Buckley Field), Arapahoe County, Colorado | 8/2007 | Shaw | USACE, Omaha District | AR and IR |
| Amendment 14, Explosive Safety Submission, Former Lowry Bombing and Gunnery Range (Formerly Buckley Field), Arapahoe County, Colorado | Oct-07 | Shaw | USACE, Omaha District | AR and IR |

**Table 4-1
Existing Documentation**

| Document Title | Document Date | Prepared By | Prepared For | Document Location |
|---|----------------------|--------------------|-----------------------|--------------------------|
| Final Post Removal Verification Plan, Bombing Target 7, Former Lowry Bombing and Gunnery Range, Colorado | Sep-08 | Sky | USACE, Omaha District | AR |
| Amendment 15, Explosive Safety Submission, Former Lowry Bombing and Gunnery Range (Formerly Buckley Field), Arapahoe County, Colorado | Jul-09 | Shaw | USACE, Omaha District | AR and IR |
| Draft Post Removal Verification Plan, Bombing Target 6, Former Lowry Bombing and Gunnery Range, Colorado | Aug-09 | Sky | USACE, Omaha District | AR |
| Draft Post Removal Verification Plan, Mortar Range, Former Lowry Bombing and Gunnery Range, Colorado | Aug-09 | Sky | USACE, Omaha District | AR |
| Draft Post Removal Verification Plan, No Name Area of Interest, Former Lowry Bombing and Gunnery Range, Colorado | Aug-09 | Sky | USACE, Omaha District | AR |
| Final Master Work Plan, Unexploded Ordnance Investigation and Clearance Activities, Former Lowry Bombing and Gunnery Range, Arapahoe County, Colorado, Revision 8 | 3/10/2010 | Shaw | USACE, Omaha District | AR and IR |

AR: Administrative Record

HFA: Human Factors Applications, Inc.

IR: Information Repository

N/A: Not Available

RCWM: Recovered Chemical Warfare Materiel

Shaw: Shaw Environmental, Inc.

Sky: Sky Research, Inc.

USACE: United States Army Corps of Engineers

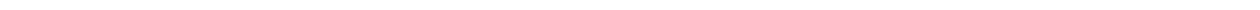
USAESCH: U.S. Army Corps of Engineers, Engineering and Support Center, Huntsville

Documents in the IR are available for viewing and copying at the Aurora Public Library, Reference Section, 14949 E. Alameda Dr., Aurora, CO 80012.

The FLBGR AR file documents are available by appointment for review at the site compound (Shaw Environmental, Inc. 303-690-3816).

Appendix A
Five-Year Review Background/Site Description Checklist

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Five-Year Review Background/Site Description Checklist

Former Lowry Bombing and Gunnery Range, Arapahoe County, Colorado

MRS/AOI Name: _____

MRS/AOI Status: _____

Owner(s) of Property: _____

Classification (check all that apply):

- Testing Disposal (Burial)
- Training Emergency Destruction
- Buffer Open Burn/Open Detonation (OB/OD)
- Other*

*Please specify: _____

Range Type (check all that apply):

- Air-to-Air Land-to-Land
- Air-to-Water Land-to-Water
- Air-to-Land Land-to-Air
- Other*

*Please specify: _____

Site Type (check all that apply):

- Air-to-Land Multi-Use Range
- Air-to-Water Open Burn
- Burial Pit Open Detonation
- Burn Pit Propellant and Pyrotechnics
- Biological Warfare Pistol Range
- Buffer Zone Pyrotechnics Residue Holding Area (expended munitions, range clearance, etc.)
- Chemical Weapons
- Depleted Uranium Range Residue Graveyard (targets and debris)
- EOD Area Safety Fan
- EOD Range Small Arms Range
- Fire Range Strafing Run-In Lane
- Firing Line Surface Disposal Area
- Grenade Range Target Area
- Heavy Explosive Training and Maneuver Area
- Munition Burial Trap and Skeet Range
- Medium/Large Caliber Unexploded Munitions Area

Area:

Total Acreage _____

Acreage Confirmed as Containing UXO _____

Acreage Suspected or Potentially Containing UXO _____

Acreage Confirmed as NOT Containing UXO _____

Anomaly Density (check one):

- Low (<10 anomalies per acre)
- Medium (10 to 50 anomalies per acre)
- High (>50 anomalies per acres)

Five-Year Review Background/Site Description Checklist

Former Lowry Bombing and Gunnery Range, Arapahoe County, Colorado

MRS/AOI Name: _____

Ordnance Types (check all that apply);

- Ballistic Missiles
- Blasting Caps
- Bombs (explosive other than HE)
- Bombs (practice)
- Demolition Charges
- Explosive Detonators
- Explosive Grenades (hand or rifle)
- Explosive Landmines
- Explosive Rockets
- Flares, Signals, and Simulators (other than white phosphorus)
- Fuzes, Boosters, Burstors
- Guided Missiles
- High Explosive Bombs
- Incendiary Material
- Less Sensitive Explosives (ammonium nitrate, explosives D, etc.)
- Medium/Large Caliber (20mm and larger)
- Military Dynamite
- Mortars
- Practice Grenades (with spotting charges)
- Practice Landmines (with spotting charges)
- Practice Ordnance (without spotting charges)
- Primary or Initiation Explosives
- Radiological Ordnance (e.g., depleted uranium)
- Riot Control Agents (vomiting, tear)
- Secondary Explosives (PETN, Compositions A, B, C, Tetryl, TNT, RDX, HMX, HBX, Black Powder, etc.)
- Skeet
- Small Arms Complete Round (0.22-0.50 cal)
- Small Arms, Expended
- Solid or Liquid Propellants
- Torpedoes
- Toxic Chemical Agents (choking, nerve, blood, blister)
- War Gas Identification Sets
- Warheads
- White Phosphorus
- Other

Predominant Soil Type (check one):

- | | |
|---|--|
| <input type="checkbox"/> Clay/Sand with Stone | <input type="checkbox"/> Clay-Sand/Clay Silt |
| <input type="checkbox"/> Sand/Gravel-Sand | <input type="checkbox"/> Gravel/Gravel-Sand |
| <input type="checkbox"/> Sand-Silt/Sand-Clay | <input type="checkbox"/> Rock |
| <input type="checkbox"/> Silt/Silty Clay | <input type="checkbox"/> Water Range |
| | <input type="checkbox"/> Other* |

*Please specify: _____

Five-Year Review Background/Site Description Checklist
Former Lowry Bombing and Gunnery Range, Arapahoe County, Colorado

MRS/AOI Name: _____

Predominant Topography (check one):

Flat _____ Mountainous _____
Flat with Gorges and Gullies _____ Rolling with Gorges and Gullies _____
Gently Rolling _____ Water Range _____
Heavily Rolling _____ Other* _____

*Please specify: _____

Predominant Vegetation (check one):

Barren or Low Grass _____ Shrubs and Some Trees _____
Low Grass and Few Shrubs _____ Heavily Wooded _____
Heavy Grass and Many Shrubs _____ Water Range _____
Heavy Shrubs and Trees _____ Other* _____

*Please specify: _____

Contaminants of Concern (check all that apply):

Acids/Caustics _____ Ordnance (residual) _____
Asbestos _____ PCBs _____
Fuels _____ Pesticides _____
Low Level Radioactive _____ SVOCs _____
Metals _____ VOCs _____
Ordnance (not residual) _____ Other* _____

*Please specify: _____

Potential for Contamination of Drinking Water (check one):

Actual (Known) _____ No Potential _____
Potential _____ Unknown _____

Depth to Groundwater:

Groundwater Depth _____ Feet

MRS/AOI Located Above Drinking Water Aquifer?

Yes _____ Not Applicable (water range) _____
No _____

Sole Source Aquifer?

Yes _____ No _____

Threatened or Endangered Species Present?

Yes _____ No _____

Archaeological or Cultural Sites Present?

Yes _____ No _____

Has a RCRA Subpart X Permit Been Pursued for Water Management Activities at This MRS/AOI?

Yes _____ No _____

If yes, does the permit or permit application have RCRA corrective action requirements that apply?

Yes _____ No _____

Five-Year Review Background/Site Description Checklist
Former Lowry Bombing and Gunnery Range, Arapahoe County, Colorado

MRS/AOI Name: _____

Are Any Wetland Areas Associated with This MRS/AOI?

Yes No
Unknown

If Yes, Please List Acreage: _____

Have Environmental Response Activities Been Initiated/Conducted on This MRS/AOI?

Yes No

If yes, what is the scope of the activities? (check all that apply)

Past Practices Chemical Contamination
Current Practices Ordnance and Explosives, including UXO

If yes, what is the status of the environmental response activities? (check all that apply)

Data Investigation Operations and Maintenance
Investigation Monitoring
Response/Remedial Action Close Out

If yes, under what authority were/are response actions conducted?

CERCLA Both CERCLA and RCRA
RCRA

What Types of UXO Response Actions Have Been Initiated/Conducted at the MRS/AOI?

(check all that apply)

None Non-Time Critical Removal Actions with EE/CA
Emergency Response Actions Routine Range Clearance/Maintenance
Time-Critical Removal Actions Other

Land Use Restrictions:

No Public Access Authorized
 Limited Public Access (livestock grazing, wildlife preserve)
 Public Access (agriculture/forestry, surface recreation, hunting, vehicle parking, surface supply)
 Unrestricted (commercial, residential, utility, subsurface recreational, construction)
 Other: _____

Access Control:

No Controls Fencing Around Entire Range
Signs Locked/Secured Gates
Log-In Book Security Patrol
Partial Fencing Other*

*Please specify: _____

Appendix B
Five-Year Review Site Inspection Checklist

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Five-Year Review Site Inspection Checklist
Former Lowry Bombing and Gunnery Range, Arapahoe County, Colorado

| | |
|--|--|
| MRS/AOI Name: | |
| Date: | |
| Time: | |
| Weather/Conditions: | |
| Inspection Team/Affiliation: | |
| Documented Current Land Use: | |
| Visual Observations | |
| Development at or in the vicinity of MRS/AOI: | |
| Changes in land use at or in the vicinity of MRS/AOI: | |
| Recreational or other activities at or in the vicinity of the MRS/AOI: | |
| Changes in accessibility to the MRS/AOI: | |
| Condition of gates, fences, and any associated signage: | |
| Presence and condition of any equipment, facilities, and infrastructure: | |
| Any health and safety concerns related to USACE or contractor staff: | |
| Vandalism: | |
| Fire Damage: | |
| Storm Damage: | |

Five-Year Review Site Inspection Checklist
Former Lowry Bombing and Gunnery Range, Arapahoe County, Colorado

| | | |
|----------------------------|--|---|
| MRS/AOI Name: | | 0 |
| Visual Observations | | |
| Significant Erosion: | | |
| Frost Heave: | | |
| MEC/MD: | | |
| Other: | | |