FINAL
Remedial Investigation Report

AREA A MUNITIONS RESPONSE SITE

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REMEDIAL INVESTIGATION REPORT

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Chris ten Braak Date

EXECUTIVE SUMMARY

ES.1 BACKGROUND

ES.1.1 The United States (U.S.). Army Corps of Engineers (USACE) retained Parsons to perform a Remedial Investigation (RI), Feasibility Study, Proposed Plan, and Decision Document for Former Area A Munitions Response Site (MRS) formerly located at the Barry M. Goldwater Range (BMGR), Luke Air Force Base, Arizona. The purpose of this phase of the project was to perform RI within Area A (**Figure ES.1**). The Area A MRS occupies 77,703 acres and consists of public lands managed by the Bureau of Land Management (BLM). Area A has been identified as land no longer required by the military and, therefore, management authority resides with the BLM. This project was conducted under Contract Number W912DY-16-D-0024 Delivery Order W9128F17F0255, administered by the United States (U.S.) Army Corps of Engineers, Omaha District (CENWO). Parsons coordinated the RI effort with U.S. Air Force Civil Engineer Center (AFCEC), Luke Air Force Base (LAFB), BLM, CENWO, and Arizona Department of Environmental Quality (ADEQ)

ES.1.2 The RI fieldwork was conducted between January 2019 and May 2021 in general accordance with the Performance Work Statement (PWS), dated September 9, 2017, and the objectives and goals presented in the approved Uniform Federal Policy – Quality Assurance Project Plan (UFP-QAPP). Work completed on this project was performed in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Defense Environmental Restoration Program (DERP) statute (10 U.S. Code [USC] 2701, et seq.), the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations Part 300), and the Military Munitions Response Program (MMRP), as administered by the USACE.

ES.1.3 The primary objective and purpose of the RI is to characterize munitions and explosives of concern (MEC) and munitions constituents (MC) contamination at Area A to identify and quantify associated MEC hazards and MC risks and provide documentation supporting a Feasibility Study (FS) for future remedial action if necessary. Following the completion of the FS, a Proposed Plan (PP) and decision document (DD) will be generated for Area A.

ES.1.4 In support of these goals, a visual surface inspection was completed over 37,122 acres; subsurface anomaly data collection was completed on 174 acres around five known target areas; and intrusive investigations were conducted at 901 identified anomaly locations surrounding the known target areas in Area A. To ensure there was not a release of MC to the environment as a result of conducting explosive demolition shots to safely dispose of MEC, post-demolition incremental sampling methodology (ISM) soil samples were also collected at the location of the demolition operations and analyzed for MC. The field investigation was conducted under a work plan (the UFP-QAPP) approved by USACE and reviewed and accepted by the Systematic Project Planning (SPP) Team, which included representatives from CENWO, LAFB, AFCEC, BLM, ADEQ, and Parsons Government Services, Inc (Parsons).

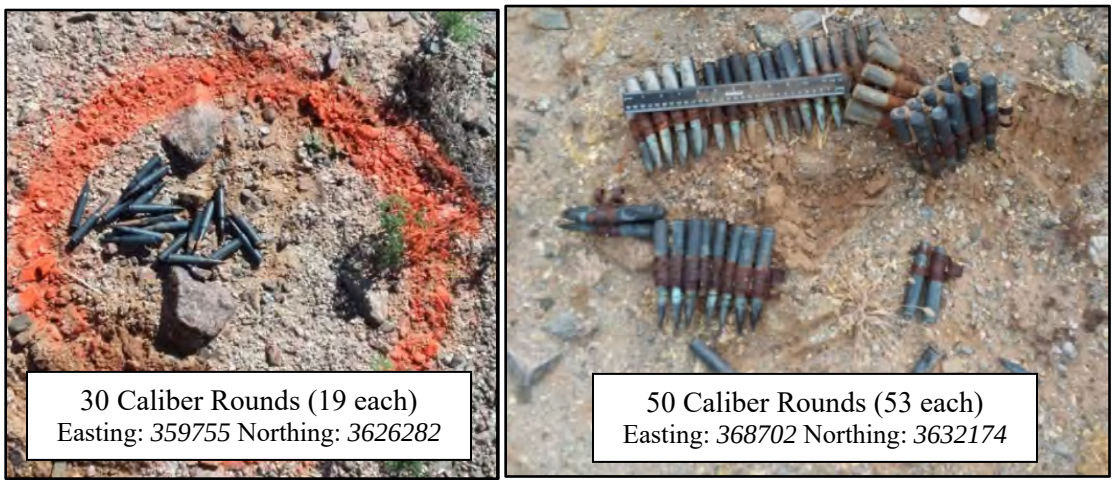
ES.2 CHARACTERIZATION OF MUNITIONS AND EXPLOSIVES OF CONCERN

ES.2.1 Subsurface removal actions (digital geophysical mapping (DGM) and analog) were completed in 2008 in the central areas of the five know target areas and no MEC was recovered. As noted in the Final Area A Targets Investigation Report, due to the limited number of munitions debris (MD) items recovered at the target sites, additional clearance activities in these areas are not warranted. Unexploded ordnance (UXO) items were not identified in the 40-plus acres included in Phase II clearance activities; only non-hazardous MD items were recovered (Weston, 2008b). The scope of the RI was focused on the areas surrounding these prior removal areas. As part of the RI, DGM data was collected in the areas immediately surrounding the prior target area removals. Prior to DGM data collection, a surface removal was completed with the objective to remove metallic items (including potential MEC) that could interfere with the DGM data. The surface removal recovered approximately 300-pounds of metallic items, including seven each 20mm Projectile Cartridges (intact, unfired and tracked as discarded military munition (DMM)) from Artillery Targets 4 and 5, and a countermeasure flare from the Bridge Target.

ES.2.2 DGM surveys in areas surrounding the five known target areas, combined with the intrusive investigation of 901 anomaly locations, resulted in recovery of 22 MEC items and 235 MD items (see **Tables 4.1a**, **4.1c**, and **4.2)**. Each MEC item was DMM and included 21 each 5.56mm blank rounds (recovered from 3 locations) and 1 each 20mm target practice (TP) projectile cartridge. The DMM was recovered from very shallow subsurface (maximum depth 3-inches below ground surface (bgs)). Based on the RI results and the prior removal actions, the potential for MEC in the subsurface in and around the target areas is considered unlikely but can't be ruled out entirely.

ES.2.3 A visual inspection was completed during the RI over 37,122 acres of accessible land within Area A (i.e., slopes generally less than 20%). The RI visual inspection resulted in the identification of 385 MD items and 183 MEC items recovered from 54 separate locations (See **Tables 4.1b**, **4.1c**, and **4.2**). Five locations recorded multiple small arms ammunition (SAA) that accounted for 133 of the 183 individual MEC items. Below are two examples of locations with multiple SAA (intact, unfired SAA as DMM).

Locations with Multiple Small Arms Ammunition as DMM



ES.2.4 During the visual inspection MEC and MD was recovered from most areas of the site except the far northeast portion of the site (an area greater than 7,500 acres). As expected, more surface MEC and MD was recovered along the valley area where the former target areas were located (**Figure ES.2**). Residual MEC within the MRS is consistent with distributions seen in low use target buffer areas. Surface MEC found during the RI was removed and appropriately destroyed (no subsurface MEC was identified). MEC potentially remains in the subsurface of the accessible areas covered by the RI. Additionally, MEC potentially remains on the surface and subsurface in the rugged, steeper terrain of the MRS (approximately 40,500 acres or 52% of the Area A MRS). Given the low concentration of recovered surface MEC within the accessible areas (less than 0.005 MEC per acre), and rockier terrain, the potential for MEC is limited in the rugged, steep areas.

ES.2.5 Access to Area A is limited to permit-only visitation issued by the BLM via a Luke AFB administered online permitting system (i.e., iSportsman) and monitored by Arizona Game and Fish. Most users participate in non-intrusive activities such as hiking and hunting. Given the limited potential for persons accessing steep, rugged terrain in Area A, and limited potential for intrusive activities (BLM workers and possible camping activities), combined with very low MEC density, the potential for encountering MEC is considered minimal. The MEC Hazard Assessment Tool (MHAT) quantifies the hazard as level "3" with "moderate potential explosive hazard conditions".

ES.3 CHARACTERIZATION OF MUNITIONS CONSTITUENTS

ES.3.1 During prior investigations, discrete soil samples were collected at and around target centers and were analyzed for explosives and metals. MC was not detected in any of the samples collected at concentrations exceeding Arizona Soil Remediation Levels. For this reason, additional soil samples were only to be collected if:

- Previously unidentified MEC-contaminated areas (i.e., elevated density areas of MEC/MD) are observed.
- Low order/breached MEC items are found.
- Demolition shots are conducted (post-demolition samples collected).

ES.3.2 No elevated density areas of MEC/MD were observed during the RI and no low order/breached MEC items were identified; therefore, only post-demolition sampling was conducted. ISM sampling was implemented to collect post-demolition soil samples. The ISM was determined to provide a more accurate measure of the mean concentration of contaminants in an area (the "sampling unit", or SU) by providing reproducible, scientifically defensible data. ISM sampling involves defining one or more SUs to be sampled within an area known as the decision unit (DU), from which multiple "sample increments" are collected and composited into a single "incremental sample" for each SU. The process for collecting incremental samples involves designating the incremental sample collection grid, determining the sampling interval, selecting the sample collection origin, and collecting the sample increments.

ES.3.3 A total of 5 post-demolition ISM surface samples were collected, plus an additional three ISM background samples. Consistent with the UFP-QAPP and field change request (FCR) 04, each incremental sample consisted of 50 increments collected from 0 to 2 inches bgs (surface soil). Samples were analyzed for explosives and MC metals (barium, chromium, copper, and lead).

ES.3.4 Soil samples were shipped to APPL, Inc. in Clovis, CA for analysis and analyzed in accordance with the approved Final UFP-QAPP (Parsons, 2018a). Data generated during the sampling effort were validated by the Parsons Project Chemist consistent with requirements in Department of Defense (DoD) Quality System Manual (QSM) Version 5.1. The validation reports state that some data results are considered estimated, but all results qualified as estimated are usable for the purposes of the project. All sample results for chromium, however, were qualified "R" as rejected due to significant contamination demonstrated by the grinding blank. These chromium results were not considered usable for project decision making. One explosive compound, Methyl-2,4,6-Trinitrophenylnitramine (Tetryl), was detected at an estimated value in three samples. The estimated concentrations were all below the project action limit (PAL) for tetryl. This compound was not retained for further evaluation in the risk assessment. Metals were detected in each of the collected ISM soil samples. The non-rejected MC metals (barium, copper, and lead) in the post-demolition soil samples were not detected at concentrations greater than the PALs. Based on these results, no chemicals of potential concern (COPCs) were identified, and no constituents were carried forward for further evaluation in a risk assessment.

ES.4 CONCLUSIONS AND RECOMMENDATIONS

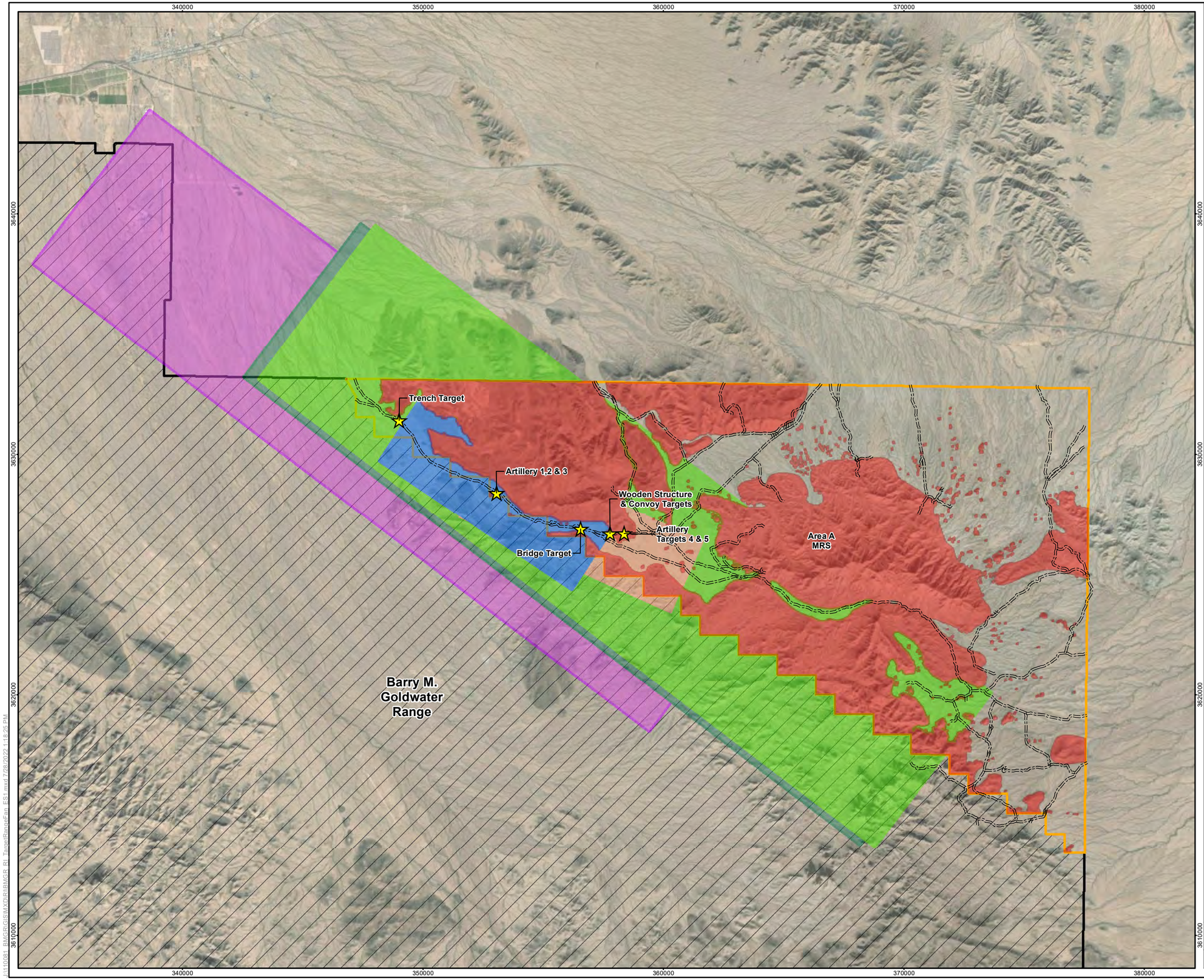
ES.4.1 The results of this RI and the assessments of MEC hazards and MC risks indicate that MEC contamination may pose unacceptable explosive hazards to current and future site workers (BLM employees), recreational users, and site visitors. There are no unacceptable risks and hazards to human health or ecological receptors resulting from exposure to MC in soil under the current or potential future exposure scenarios.

ES.4.2 The presence of MEC hazards negates the potential acceptability of the "no-action" response alternative for Area A MRS. Therefore, conduct of an FS is recommended to evaluate viable response actions that could be implemented to address the MEC and associated hazards/risks that have been identified at Area A MRS. The MEC data collected during the RI was determined to be sufficient to fully characterize Area A, to identify and evaluate any associated potential MEC hazards, and to fully support the recommended FS.

ES.4.3 It should be noted that the RI was limited in scope to the extent of Area A MRS. A review of the target range fans, however, (**Figure ES.1**) shows that the buffer areas for the various targets extend beyond the MRS boundary. There is a possibility that munitions are present within the range fan area beyond the current MRS boundary.

Figure **ES.1**
Munitions Response Site (MRS)
Target Range Fan Location Map
Former Area A

Barry M. Goldwater Range
Luke AFB, Arizona



Legend

- Targets
- Unpaved Road
- Inaccessible Areas (Due to Slope)

Fixed Wing Air to Ground Ranges:

- Artillery 1,2,3 Target: 2 mile x 6 mile range
- Artillery 4,5,6 Target: 5 mile x 20 mile range
- Bridge Target: 2 mile x 6 mile range
- Trench Target: 5 mile x 20 mile range
- Wooden Target: 5 mile x 20 mile range
- Area A MRS
- Barry M. Goldwater Range Boundary

Image Source: ESRI Online



Projection: WGS 1984 UTM Zone 12N, Units: Meter

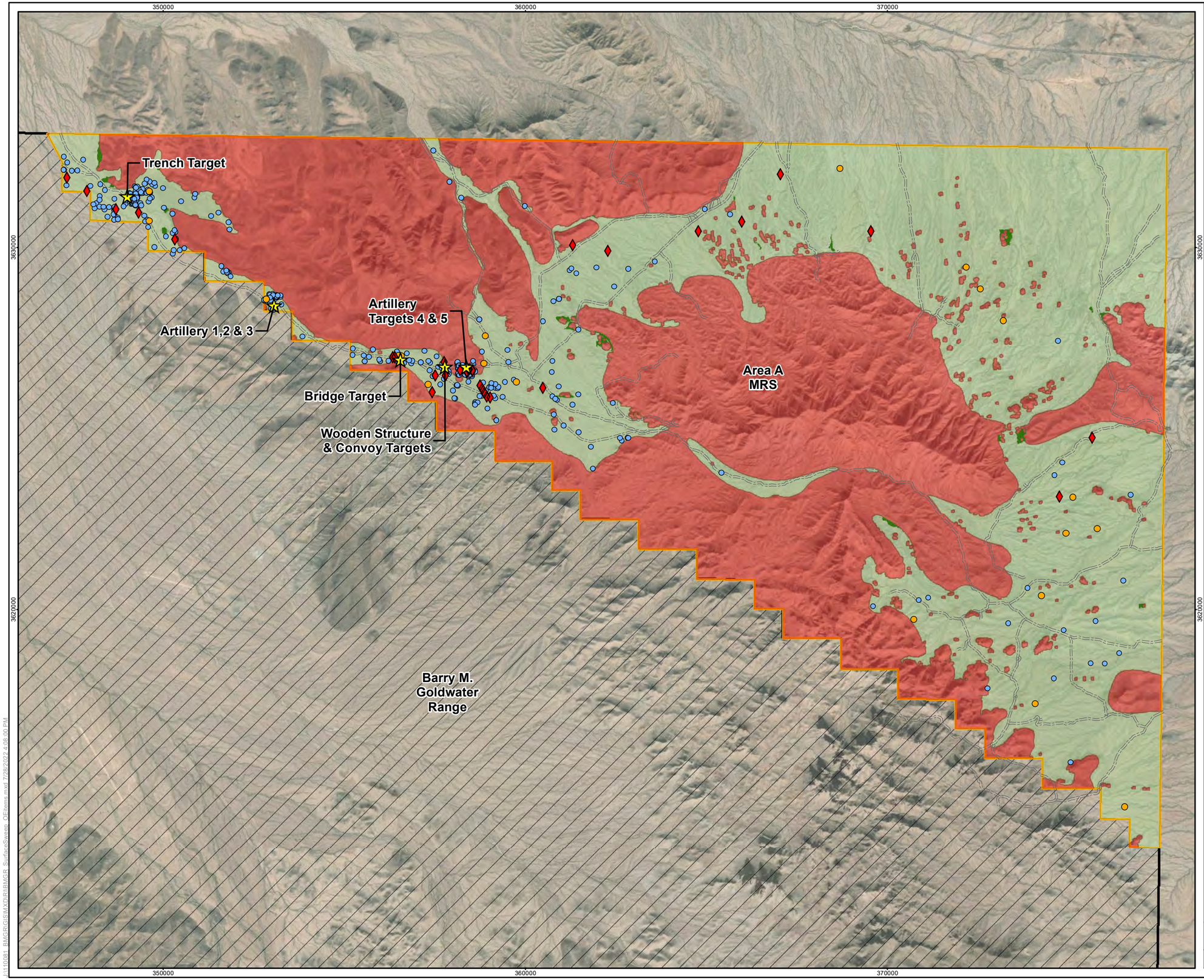
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Figure ES.2
Recovered MEC/MD Locations

Barry M. Goldwater Range
Luke AFB, Arizona



Legend

- Targets
- MEC
- MEC - Small Arms
- Munitions Debris
- Unpaved Road
- Determined Inaccessible During Fieldwork
- Inaccessible Areas (Due to Slope)
- Accessible Areas
- Area A MRS
- Barry M. Goldwater Range Boundary

Image Source: ESRI Online



Projection: WGS 1984 UTM Zone 12N, Units: Meter

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ACRONYMS AND ABBREVIATIONS

ADEQ	Arizona Department of Environmental Quality
AFCEC	U.S. Air Force Civil Engineer Center
ARAR	Applicable Relevant and Appropriate Requirements
Bgs	Below Ground Surface
BLM	Bureau of Land Management
BMGR	Barry M. Goldwater Range
CENWO	U.S. Army Corps of Engineers, Omaha District
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cm	Centimeter
COPC	Chemical of Potential Concern
CSM	Conceptual Site Model
DDESB	Department of Defense Explosive Safety Board
DD	Decision Document
DERP	Defense Environmental Restoration Program
DFW	Definable Feature of Work
DGM	Digital Geophysical Mapping
DMM	Discarded Military Munitions
DoD	Department of Defense
DQO	Data Quality Objective
EBS	Environmental Baseline Survey
EM	Engineer Manual
EP	Engineer Pamphlet
ER	Engineer Regulation
ESP	Explosives Site Plan
ESQD	Explosive Safety Quantity-Distance
EZ	Exclusion Zone
FCR	Field Change Request
FS	Feasibility Study
GPS	Global Positioning System
GSV	Geophysical System Verification
HE	High Explosive
HFD	Hazardous Fragmentation Distance
ISO	Industry Standard Object
ISM	Incremental Sampling Methodology
IVS	Instrument Verification Strip
LAFB	Luke Air Force Base
LANL	Los Alamos National Laboratory
LUC	Land Use Control
MC	Munitions Constituents
MD	Munitions Debris
MEC	Munitions and Explosives of Concern
MEC HA	Munitions and Explosives of Concern Hazard Assessment

MGFD	Munition with the Greatest Fragmentation Distance
MHAT	MEC Hazard Assessment Tool
mm	Millimeter
MMRP	Military Munitions Response Program
MPC	Measurement Performance Criteria
MPPEH	Material Potentially Presenting an Explosive Hazard
MQO	Measurement Quality Objective
MRS	Munitions Response Site
MRSPP	Munitions Response Site Prioritization Protocol
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MSD	Minimum Separation Distance
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
PARCC	Precision, Accuracy, Representativeness, Comparability, and Completeness
PAL	Project Action Limit
PDS	Post Digestion Spike
PP	Proposed Plan
PRGs	Preliminary Remediation Goals
PWS	Performance Work Statement
QC	Quality Control
QSM	Quality System Manual
RCA	Root Cause analysis
RI	Remedial Investigation
SDNM	Sonoran Desert National Monument
SU	Sampling Unit
T&E	Threatened and Endangered Species
TBC	To Be Considered
TNT	Trinitrotoluene
UFP-QAPP	Uniform Federal Policy - Quality Assurance Project Plan
U.S.	United States
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UXO	Unexploded Ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist

GLOSSARY OF TERMS

Anomaly	Any item that is seen as a subsurface irregularity after geophysical investigation. This irregularity should deviate from the expected subsurface ferrous and non-ferrous material at a site (i.e., pipes, power lines, etc.).
Chemical of potential concern (COPC)	For purposes of this RI, COPCs are defined as any munitions constituents that are present at concentrations above applicable preliminary action levels (PAL).
Discarded Military Munitions (DMM)	Military munitions that have been abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include unexploded ordnance (UXO), military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed consistent with applicable environmental laws and regulations (10 United States Code [U.S.C.] 2710(e)(2)).
Exclusion Zone (EZ)	A safety zone established around a work area. Only authorized project personnel are allowed within the exclusion zone. Examples of exclusion zones are safety zones around munitions and explosives of concern (MEC) intrusive activities and safety zones where MEC is intentionally detonated.
Geophysical Techniques	Methods used to explore subsurface conditions using quantitative physical properties. Typical properties measured include seismic wave travel time and waveform changes, electrical potential differences, magnetic and gravitational field strength, temperature, etc. For MEC investigations, electromagnetic and magnetic methods are most frequently used.
Military Munitions	Military munitions mean all ammunition products and components produced for or used by the Armed Forces for national defense and security, including ammunition products or components under the control of the Department of Defense, the U.S. Coast Guard, the Department of Energy, and the National Guard. The term includes confined gaseous, liquid, and solid propellants; explosives, pyrotechnics, chemical and riot control agents, smokes, and incendiaries, including bulk explosives and CAs; chemical munitions, rockets, guided and ballistic missiles, bombs, warheads, mortar rounds, artillery ammunition, small arms ammunition, grenades, mines, torpedoes, depth charges, cluster munitions and dispensers, demolition charges, and devices and components thereof. The term does not include wholly inert items, improvised explosive devices, and nuclear weapons, nuclear devices, and nuclear components other than non-nuclear components of nuclear devices, managed under the nuclear weapons program of the Department of Energy after all required sanitization operations under the Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.) have been completed [10 U.S.C. 101(e)(4)(A) through (C)].

Munitions Constituents (MC)	Any materials originating from unexploded ordnance, discarded military munitions, or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions (10 U.S.C. 2710(e)(4)).
Munitions Debris (MD)	Remnants of munitions (e.g., fragments, penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarization, or disposal.
Munitions and Explosives of Concern (MEC)	This term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks, means: (1) UXO as defined in 10 U.S.C. 101(e)(5)(A) through (C), (2) DMM as defined in 10 U.S.C. 2710(e)(2), or (3) munitions constituents (e.g., TNT, RDX) as defined in 10 U.S.C. 2710(e)(3), present in high enough concentrations to pose an explosive hazard.
Project Action Limit (PAL)	This term refers to the screening values used to determine whether a representative concentration of each analyte is considered a COPC to be evaluated in the risk assessment.
Subsurface soil	This term is used in reference to the location of potential MEC or MC contamination. “Subsurface MEC” are those MEC items that are not visible above the soil surface (i.e., they are fully covered by soil). This does not apply to MEC covered by brush or detritus.
Surface soil	This term is also used in reference to the location of potential MEC or MC contamination. “Surface MEC” are those MEC items that are either fully or partially visible above the soil surface. With regard to MC, surface soil is defined as the top 2 inches of soil.
Unexploded Ordnance (UXO)	Military munitions that (1) have been primed, fuzed, armed, or otherwise prepared for action, (2) have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installation, personnel, or material, and (3) remain unexploded either by malfunction, design, or any other cause [10 U.S.C. 101(e)(5)(A) through (C)].

CHAPTER 1 INTRODUCTION

1.1 PURPOSE

1.1.1 The purpose of this project was to perform a Remedial Investigation (RI) at Area A Munition Response Site (MRS) formerly located within the Barry M. Goldwater Range (BMGR), Luke Air Force Base, Arizona (**Figure 1.1**). Area A MRS occupies 77,703 acres and consists of public lands managed by the Bureau of Land Management (BLM). Area A has been identified as land no longer required by the military and, therefore, management authority resides with the BLM. This project was conducted under Contract Number W912DY-16-D-0024 Delivery Order W9128F17F0255, administered by the United States (U.S.) Army Corps of Engineers, Omaha District (CENWO). Parsons coordinated the RI effort with U.S. Air Force Civil Engineer Center (AFCEC), Luke Air Force Base (LAFB), BLM, CENWO, and Arizona Department of Environmental Quality (ADEQ)

1.1.2 Work was performed in accordance with the following:

- The Defense Environmental Restoration Program (DERP) statute (10 U.S. Code [USC] 2701, et seq.);
- The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) (42 USC §9601, et seq.); and
- The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] Part 300).

1.1.3 This RI report presents a detailed discussion of the characterization of the nature and extent of munitions and explosives of concern (MEC) and munitions constituents (MC), the compilation of information to fill identified data gaps, and an evaluation of the potential hazards and risks to human health and the environment for Area A. The overall goal of this process is to obtain stakeholder concurrence on the final RI report and to provide sufficient data to facilitate future remedial action (to be addressed in the Feasibility Study (FS) issued under separate cover). Project stakeholders, including AFCEC, LAFB, CENWO, ADEQ, and BLM helped develop and refine the project strategic technical approach with review and acceptance of the Final Uniform Federal Policy – Quality Assurance Project Plan (UFP-QAPP) (Parsons, 2018a). The UFP-QAPP was approved by USACE, the lead agency.

1.1.4 Organization of this RI Report follows requirements identified in Engineering Pamphlet (EP) 1110-1-18, Military Munitions Response Process for RI Reports (USACE, 2006). Chapters include:

- Chapter 1: Introduction
- Chapter 2: Project Remedial Response Objectives
- Chapter 3: Characterization of Munitions and Explosives of Concern and Munitions Constituents
- Chapter 4: Revised Conceptual Site Model and Remedial Investigation Results
- Chapter 5: Contaminant Fate and Transport for Munitions and Explosives of Concern

- Chapter 6: Baseline Risk Assessment for Munitions Constituents and Hazard Assessment for Munitions and Explosives of Concern
- Chapter 7: Summary of Results
- Chapter 8: References

1.2 PROPERTY DESCRIPTION AND PROBLEM IDENTIFICATION

1.2.1 Project Location and Site Description

1.2.1.1 The Barry M. Goldwater Range is jointly operated by the United States Air Force (USAF) and the United States Marine Corps (USMC) and is divided into BMGR East and BMGR West. Area A, formerly within the BMGR East, is now located within the southwesterly portion of the Sonoran Desert National Monument, southeast of the town of Gila Bend and southwest of the city of Maricopa. Interstate 8 runs to the north of the site (**Figure 1.1**). Area A covers 77,703 acres.

1.2.1.2 Area A consists of public lands managed by BLM. These lands were withdrawn and reserved for military training purposes, initially by Executive Order (EO) 8892 in 1941 and then by the Military Lands Withdrawal Act (MLWA) of 1986. Although the BMGR withdrawal was extended per the MLWA of 1999, the SDNM Area A was excluded from this withdrawal extension request, and the existing MLWA of 1986 withdrawal, as it pertained to Area A, was specifically terminated by the 2001 SDNM Proclamation. The USAF had previously intended to ask Congress to revoke EO 8892 and is presently not utilizing its EO 8892 military purposes use authority for Area A, and as a result, Area A is not recognized by the USAF and BLM as being within the BMGR East boundary. Per the 2001 SDNM, Area A is managed by the BLM as a part of the SDNM. Land to the north and east of Area A has also been designated as part of the Sonoran Desert National Monument. Access to the Area A portion of the Sonoran Desert National Monument is currently, and will likely remain, "by permit only". Therefore, Area A will remain as a buffer between BLM areas to the north, which are accessible to the general public, and BMGR to the south.

1.2.1.3 There are five target areas associated with Area A (**Figure 1.2**):

- Trench Target
- Artillery Targets 1, 2, and 3
- Bridge Target
- Wooden Structure Target
- Artillery Targets 4 and 5

1.2.1.4 A sixth target, Railway/Tunnel Target, is located approximately between the Trench Target and Artillery Targets 1, 2, and 3, but is located just outside of Area A within an active area of BMGR. For this reason, this target was not included in this investigation. The targets in Area A were used in training for bombing, rocket, and air-to-ground gunnery. The targets are aligned along a primary road going through Area A, following the valley floor and bordered on the northwest by the Sand Tank Mountains (**Figure 1.2**). Based on the capabilities of aircraft available during the 1950's, the targets would have been acquired visually from low altitude and therefore, the direction of approach most likely followed the valley floor with training attacks potentially originating from either direction.

1.2.1.5 An Environmental Baseline Survey in 2002 conducted by URS Corporation indicated that Area A was managed to: (1) prevent unauthorized surface access to the East Tactical Range and Manned Range 3; (2) alert surface users to the potential presence of hazardous unexploded ordnance (UXO) through signage, permitting, and enforcement patrol; and (3) exclude surface uses that were not compatible with noise effects from aircraft overflights and ordnance blasts.

1.2.2 Known Explosives Safety Hazards

The presence of MEC as UXO has been confirmed at Area A during previous site investigations and removal actions (discussed in Section 1.3).

1.2.3 Topography and Vegetation

1.2.3.1 Area A is surrounded by the Sand Tank Mountains, which extend east southeast of Gila Bend, Maricopa County, Arizona. Elevation in the Sand Tank Mountains ranges from the major topographic feature Javelina Mountain at 4,000 feet above sea level to 1,000 feet in Sand Tank Wash. The east side of Area A is located on an alluvial valley floor on the west side of the northward trending Vekol Valley. The northwest corner of the project area to the north-central is steep with slopes over 30%. The northwest toward the middle diagonal border side of the project area is located along a wide, braided unnamed wash, while the southern portion of the diagonal border is situated among low hills.

1.2.3.2 Area A is located within the Desert sub-province of the Basin and Range geologic province, which is generally characterized by northwest-southeast trending mountain ranges, separated by wide alluvial valleys (Weston, 2005a). The mountain ranges are narrow, rugged, but not very lofty. The very steep mountain slopes with minimal cover of colluvium indicates the predominance of erosional processes. The broad floodplains and alluvial fans are associated with the major washes.

1.2.3.3 A significant aspect of Area A is its vegetation, which differs from most of the Sonoran Desert. Due to the combination of its location, climate, geology, soils, topography, and hydrology, the Sonoran Desert has developed the most complex and diverse vegetation community of any North American desert (DOI, 2000). The plant communities within the Sonoran Desert can be predictably located by the specific combination of the above-mentioned factors. The lower elevation areas typically have a less diverse plant community compared to the higher elevation plant communities, this diversity also holds true for Area A.

1.2.3.4 In Area A, the Lower Colorado Valley Subdivision, the lower and flatter areas, is limited to a few thousand acres on the western end and is dominated by the creosote/bursage community. The overwhelming majority of Area A is in the Arizona Upland Subdivision. While the specific plant association varies by site, the two dominant associations are the triangle-leaf bursage/foothill palo verde and the triangle-leaf bursage/saguaro/mixed shrub association (USAF, 1999). The entire Arizona Upland Subdivision complex is generally referred to as the palo verde/mixed cacti association. The specific combination of factors on any site determines the specific combination of dominant plant species. But common to all sites are palo verde and saguaro cactus. The palo verde/mixed cacti association in Area A is one of the most structurally complex examples of this association in the Sonoran Desert. Among its outstanding features are the high density of leguminous trees and cacti (Marshall et al., 2000). Scattered through the Sand Tank Mountains, at higher elevations and on north-facing slopes, are remnant small areas of desert grassland. Some

uncommon vegetation in the lower elevation areas include the Coville barrel cactus and California snakebush, both of which can be found on the northern edge of Area A (Geraghty and Miller, Inc. and SWCA, Inc. 1997). Others known from the general vicinity and thus possibly in Area A are Mexican jumping bean, smoke tree, bitter condalia, and naked seed. While these plant species are not rare or endangered, it is of scientific interest that they occur in or near Area 1, well outside their normal range, or in habitats with which they are not normally associated. The military withdrawal has immensely reduced the impact to the environment in Area A in comparison to other public lands with similar topographic and vegetative conditions. This has resulted in a de facto conservation area (DOI, 2000).

1.2.4 Climate

1.2.4.1 The Southwest U.S. has a hot, arid, and variable climate driven by its geographic location. Most precipitation occurs during frontal storms in mid-winter or during late-summer monsoons. Because rainfall patterns are highly irregular some BMGR locations may receive little or no rain during the same year in which other areas receive average or above-average precipitation. Moreover, the Sonoran Desert is subject to frequent and sometimes prolonged droughts. Based on long-term weather patterns around BMGR, the annual average rainfall in the higher elevations, including Area A, is nearly nine inches; however, the annual average over the entire range is less than five inches. Some of BMGR's interior valleys may receive less than two inches of rain per year. When the relatively stable weather patterns that drive the region's arid climate periodically break down, all or portions of BMGR may receive two to three times the normal annual rainfall. Overall effects of the prevailing rainfall patterns are exacerbated by high temperatures and regional evapotranspiration potentials that greatly exceed those of all other known precipitation regimes. With summer daytime temperatures often exceeding 110 degrees Fahrenheit, the annual evaporation potentials, which vary from 72 inches to more than 86 inches, greatly exceeds the typical rainfall amounts.

1.2.4.2 The Southwest became warmer and drier over the twentieth century and climate models project that this trend will continue into the twenty-first century. Droughts are projected to become more severe and winter precipitation events are projected to become more frequent and intense (Overpeck et al. 2013).

1.2.5 Site Geology

1.2.5.1 The mountain ranges consist mainly of consolidated intrusive and metamorphic rocks of Precambrian, Mesozoic, and Tertiary age. Volcanic and sedimentary rocks of Tertiary age are also common in many ranges. The basins contain alluvial deposits and volcanic rocks of late Cenozoic age.

1.2.5.2 In general, sediments contain very little organic material and often are covered by a single layer of desert pavement comprised of pebble sized rock fragments from nearby slopes. Sediments are predominantly stony, weathered in situ materials whose structure reflects the volcanic parent materials. More gravel colluvial sediments are noted covering alluvial fan apexes and along the bases of low volcanic ridges.

1.2.5.3 Relatively well-developed alluvial sediments are confined to stream terraces along major washes (Anderson, 1995). Wide floodplains associated with these washes are composed mainly of

sand, silt, and clay, with locally gravelly channel deposits. Piedmonts are the broad plains that slope gently from the mountains to the axial washes. They are covered by alluvial and eolian deposits, most of which are fairly young Holocene deposits (less than 1,000 years old) (Arizona Geological Survey, 2001).

1.2.6 Groundwater and Surface Water Conditions

1.2.6.1 Area Ais situated in the Basin and Range Lowlands hydrogeologic province characterized by isolated mountain ranges of crystalline rocks separated by alluvial valleys and basins. The mountains serve as aquifer boundaries. The basins are tectonically depressed troughs that have been filled to depths of several thousand feet with unconsolidated alluvium eroded from the mountains. Faulting is common at the margins of the basins as well as in other portions of the basins (ADEQ, 2017).

1.2.6.2 The principal rivers in the region are the Gila and Colorado River. The Gila River is located just north of the BMGR boundary and runs east to west until it connects with the Colorado River northwest of the range. There is minimal surface water on BMGR and Area A, including no perennial or intermittent streams present. Ephemeral stream flow only occurs immediately after substantial rainfall. Surface-water drainage on the range flows away from the mountain ranges in a network of smaller washes that feed into larger washes. These larger washes generally flow north into the Gila River.

1.2.6.3 Monsoon season brings large amounts of precipitation in short time periods, resulting in much of the water flowing off the landscape before it infiltrates. Natural flooding events are highly variable in frequency and intensity. Some storms cause flash flooding in the smaller mountain drainages and short-term flooding in the larger valley washes and floodplains. Rainwater collects in natural rock catchments, human-modified natural catchments, or artificially constructed tanks where the water may remain for weeks or months before evaporating or consumed.

1.2.6.4 Most of the ground water storage is found within the inter-mountain basins. Surface runoff from rainfall carries water to closed alluvial basins or into generally dry washes. Potential aquifers in the local basins are found in coarse gravel and sand wedge zones. Depth to groundwater at BMGR ranges from 24 feet to 663 feet.

1.2.7 Threatened or Endangered Species

1.2.7.1 The diverse plant communities of central Arizona support a wide variety of wildlife, including mammals such as the endangered Sonoran pronghorn, desert bighorn sheep, mule deer, javelina, mountain lion, gray fox, and bobcat as well as the endangered lesser long-nosed bat and the California leaf-nosed bat (Houk 2000:4-46), the Desert Tortoise, Yuman Fringe-toed Lizard, and the Flat-tailed Horn lizard. In addition, the area includes habitats for over 200 species of birds and a diverse population of reptiles and amphibians (Marine Corps Air Station Yuma, 2008).

1.2.7.2 The Sonoran pronghorn has been listed as a federally endangered species since 1967. The United States Fish and Wildlife Service (USFWS) works in conjunction with the military to help preserve the Sonoran pronghorn since they are found on BMGR and Area A. There have been numerous policies and protocols enacted to ensure that no military operations or trainings put the Sonoran pronghorn in any danger.

1.2.8 Wetlands

Wetlands are land areas that are transitional between terrestrial and deep-water habitats in which the water table usually is at or near the surface or in which shallow water covers the land. The USFWS Wetlands Online Mapper (USFWS, 2018) was used to identify potential wetlands located within the MRS. According to this source, no wetlands are present within Area A. The nearest wetlands are associated with the Gila River, and are 12.5 miles from the project site.

1.2.9 Cultural and Archaeological Resources

1.2.9.1 The Arizona Site Stewards Program (ASSP) is a key component of site monitoring efforts at BMGR East. The ASSP trains and uses volunteers to monitor sensitive or threatened historic, prehistoric, and paleontological sites on public lands throughout the state. Their efforts constitute a crucial supplement to the limited staff resources of most federal and state agencies. Site Steward training involves both classroom instruction and fieldwork covering antiquity laws, crime-scene management, site and feature identification, and map reading.

1.2.9.2 The area within and surrounding BMGR is home to some of the most diverse and historical archaeological sites in the country. Archeologists have discovered prehistoric settlements and gravesites from indigenous people who lived in the region more than 10,000 years ago. Most of the cultural resources on the BMGR and surrounding areas are prehistoric archaeological sites situated on the desert landscape, rather than historical buildings.

1.2.9.3 Cultural resources surveys were conducted by Geo-Marine, Inc. in 2005 for the Pilot Study (Weston, 2005a) and in 2008 for the Final Investigation of Area A Roads (Weston, 2008a) along all the roadways within Area A. The surveys determined that 10 cultural resources (archeological) sites that are considered eligible for listing on the National Register of Historic Places (NRHP) are located along roads within Area A. During the Intrusive Investigations in 2008, Northland Research, Inc. completed archeological monitoring at 10 sites located within the Area A. The sites monitored included seven prehistoric sites, one historic mining site, and two multi-component prehistoric/historic sites.

1.2.10 Demographics

Area A lies within Maricopa County, AZ. Maricopa County is the largest of the 15 counties in the state of Arizona. The estimated population of the county was 4,485,414 as of 1 July 2019 (US Census Bureau, V2019). Most of the population resides in the northern part of the county within the greater Phoenix area. Area A is in the southeastern most part of the county. The nearest residential areas to Area A are the town of Gila Bend and the city of Maricopa, which lies in Pinal County. The population of Gila Bend in 2019 was roughly 2,100. The city of Maricopa had an estimated population of 52,127 in 2019 (US Census Bureau, V2019).

1.2.11 Current and Projected Land Use

1.2.11.1 While BMGR is jointly operated by the USAF and the USMC, Area A is managed by the Bureau of Land Management (BLM) as part of the Sonoran Desert National Monument. Currently, access to Area A of the Sonoran Desert National Monument is “by permit only” and will likely remain this way in the future. Area A has been serving as a buffer between BLM areas to the north

and east and BMGR to the south. This helps to ensure public safety from ongoing military training that takes part on BMGR.

1.2.11.2 Activities that take place in Area A by recreational users include:

- hiking
- camping
- hunting
- target practice
- Off-highway vehicle use (on designated roads only)

1.2.11.3 As noted in the SDNM National Environmental Policy Act Record of Decision and Approved Resource Management Plan, the Sand Tanks Mountains area of the SDNM, commonly known as "Area A", is designated as a Special Management Area. Access to the area requires the Barry M. Goldwater Air Force Range entry and public safety permit (for the BLM, these are managed as Individual Special Recreation Permits). Motorized and mechanized use is limited to areas within designated roads, primitive roads, and trails with reasonable use of the shoulder and immediate roadside allowing for vehicle passage, emergency stopping, or parking unless otherwise posted. Before obtaining a permit to access Area A, users must watch a safety, rules, and regulations video. This video helps to keep Area A users informed and safe while ensuring the integrity of the Sonoran Desert National Monument and its wildlife. In addition to recreational visitors and BLM workers, the site is accessed and traversed by trespassers. Drug smugglers and illegal immigrants are suspected to travel through Area A.

1.2.11.4 Limited fencing and signage is present around Area A. The sign shown below was located along a road leading into Area A from the west (entering towards the former trench target location). It is noted, however, that this was the only location where this sign (or type of sign) was identified during RI field activities. This signage is not evident when entering Area A from the north (where most persons legally enter Area A). The other photograph shows a gate on the far east side of Area A. While the sign information is valid, these types of signs (or gates) are generally not present when entering Area A along roads from the north. No signs were encountered along the perimeter of Area A away from the road entrances.





Photographs of signage along Area A West road entry and East road gate entry.

1.2.12 Historical Information

1.2.12.1 On 8 August 1940, the same day the Battle of Britain began, President Franklin D. Roosevelt directed the military to produce 12,000 pilots annually. In response to that order, the Army Air Corps conducted feasibility studies for the construction of eight new airfields. Phoenix City Manager Donald C. Scott announced on 13 February 1941 that the War Department had approved a site two miles north of the town of Litchfield Park, Arizona, for the construction of an advanced single engine flying training base. The site not only had almost year-round flying weather, but it also enjoyed proximity to vast stretches of Sonoran Desert that were ideal for bombing and gunnery practice. Two days later, Lt Col Ennis C. Whitehead arrived in the area to supervise construction of the base and to act as its first commander.

1.2.12.2 Del Webb Corporation broke ground on Litchfield Park Air Base on 31 March 1941, and on 6 June 1941 the installation was renamed Luke Field for 2d Lt Frank Luke, Jr., a Phoenix native, who was a World War I triple ace, and first Army aviator to be awarded the Medal of Honor. The first student pilot class began training the next day. During World War II, Luke Field produced 17,321 graduates from fighter training programs for the US and its allies. The base closed on 30 November 1946. Luke AFB was redesignated an air force base when it reopened on 1 February 1951 in response to a need for fighter aircrews generated by the Korean Conflict.

1.2.12.3 In 1941 President Roosevelt issued Executive Order 8892, withdrawing federal lands at Gila Bend, Arizona, from public use and set land aside for bombing and gunnery practice range. Federal government took possession of 600,000 acres of public domain land to expand range at

Gila Bend in May of 1952. As of December 1953, the Range at Gila Bend included over 2 million acres of public land and over 600,000 acres leased from state or private landowners. On 6 March 1963, the Range was redesignated Luke AFB Air Force Range. On 23 March 1987, Luke AFB Range was renamed Barry M. Goldwater Range for retired U.S. Senator Barry M. Goldwater (56th Fighter Wing History Office, 2020).

1.3 PREVIOUS RELEVANT INVESTIGATIONS

1.3.1 2002 Phase 1 Environmental Baseline Survey

1.3.1.1 On behalf of Luke Air Force Base, 56th Range Management Office, URS conducted an Environmental Baseline Survey (EBS) of lands identified as unnecessary for military purposes at Barry M. Goldwater Range (URS, 2002). An inspection/reconnaissance of "Area 1 – Sand Tank Mountains" was included in the EBS and in July 2001 "inactive target features were identified west of the Papago Indian Chief Mine along a commonly traversed dirt road." The field report described an inactive convoy target, a bridge, and wooden structure. The following munitions debris items were reported to be removed from the targets: 2.25" SCAR (4), BDU-33 practice bomb (1), M38 practice bomb (1), M23 practice bomb parts (1), 20MM projectiles TP (3), M117 closure rings (2), 2.75" rocket warhead fragments (5), and M117 bomb fin (1).

1.3.2 2005 MEC Pilot Study

1.3.2.1 Weston conducted a MEC Pilot Study at Area A from November 2004 through January 2005 (Weston, 2005a). The main objective of the pilot study was to locate, identify, remove, and dispose of any potential MEC, UXO, and munitions debris (MD) on approximately 67 miles of high-priority roads and wash crossings within Area A. A biological assessment was prepared prior to the pilot study for review and concurrence by the USFWS and a cultural resource survey was conducted prior to intrusive fieldwork.

1.3.2.2 A combination of full-scale digital geophysical mapping (DGM), mag and dig, visual surveying, and surface clearance activities were performed on approximately 74.1 miles of roadway and washes within Area A. Weston investigated over 5,309 anomalies identified during DGM, mag and dig, and surface clearance activities. A total of 162 pieces of MD (mostly munitions case fragments, 5.56-millimeter (mm) blank casings, 20mm target projectiles, etc.) and over 600 pounds (lb.) of non-munitions scrap were recovered and removed from Area A during the pilot study (Weston, 2005a). In addition, three UXO items (BDU-33 practice bomb with live spotting charge, unexpended MK 13 distress signal flare, and 2.25-inch (in.) sub-caliber aerial rocket (SCAR) with blocked motor nozzle) were recovered and disposed of during the surface clearance.

1.3.3 2005 Site Inspection

1.3.3.1 Concurrent with the MEC Pilot Study (see above), Weston conducted a site inspection (SI) at Area A from November 2004 through January 2005 (Weston, 2005b). The main objective of this SI was to determine whether MEC remains at four identified target areas in Area A and to determine whether munitions constituents (MC) contamination is present in soil at the target sites. Results from the SI were used to prepare a preliminary conceptual site model (CSM).

1.3.3.2 The following target sites were investigated during the 2005 SI: Simulated Artillery Targets 1, 2, and 3; Bridge Target; Simulated Artillery Target 4; and Wooden Structure Target. The Railway Tunnel Target and Trench Target were identified during the SI and were added to the scope. Surface reconnaissance, full-scale DGM, intrusive investigation, and soil sampling were performed at the target areas.

1.3.3.3 No MEC items were found during the SI, though based on multiple items of MD observed, the target areas were identified as potential source areas for MEC. Based on the analytical data collected during the SI, soils are not contaminated by MC and no unacceptable risks to human health and the environment were identified. Potential risks from MEC hazards were identified at the target areas (Weston, 2005b).

1.3.4 2008 Investigation of Area A Roads – Phase II

1.3.4.1 Weston conducted a Phase II Road Investigation from February 19, 2008, through April 24, 2008, with the main objective of continuing the 2005 investigation and removal activities to locate, identify, remove, and dispose of potential MEC on 57 miles of roads and wash areas within Area A (Weston, 2008a). Geo-Marine, Inc. conducted a cultural resource survey prior to conducting intrusive fieldwork and Logan Simpson Design, Inc. conducted a biological survey of the endangered species cactus ferruginous pygmy owl at select areas within Area A. No cactus ferruginous pygmy owls were detected during the survey (Weston, 2008a).

1.3.4.2 Weston investigated 6,195 anomalies identified during DGM and 1.96 miles of road using analog ("mag and dig") detection methods. Of these anomalies, only 6 were identified as ordnance- or small arms-related. No MEC items were found (Weston, 2008a).

1.3.5 2008 Final Area A Targets Investigation

1.3.5.1 Weston conducted additional investigation of the Area A targets during 2008 (Weston, 2008b) to supplement the work conducted during the 2005 SI. The main objective of this investigation was to locate, identify, remove, and dispose of MEC within the eight targets areas previously investigated during the SI. Weston conducted DGM across a 50ftx50ft grid (full coverage) at the target centers, using a Geonics EM61-MK2 metal detection sensor with a Trimble 5700 RTK global positioning system (GPS). In addition, "step-out" grids using analog ("mag and dig") detection techniques were completed around the DGM at the target center. Anomalies were intrusively investigated (Weston, 2008b).

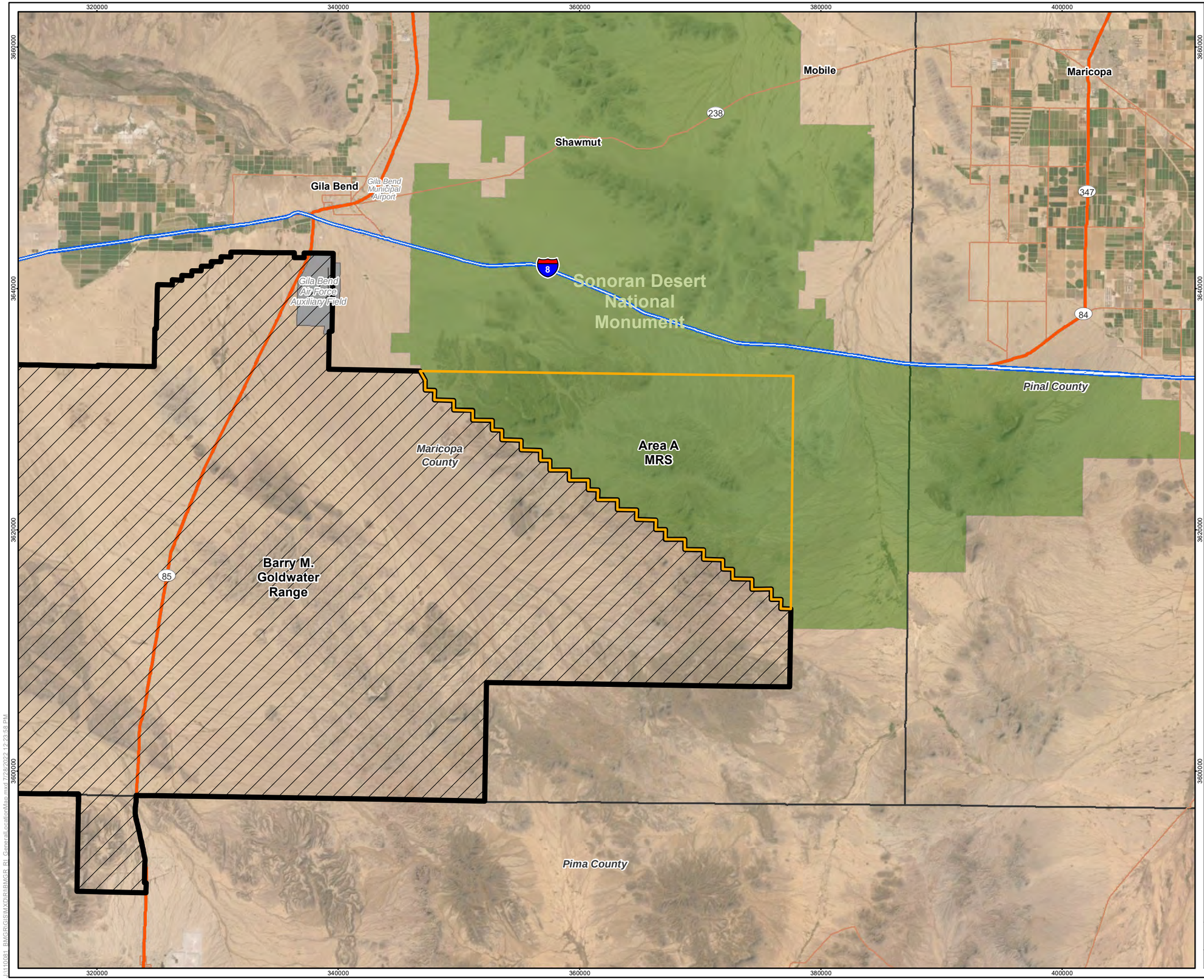
1.3.5.2 During the Area A Targets Investigation, MD materials were removed from 42.6 acres at the former target sites. During the fieldwork, 790 anomalies were investigated, and a total of 419 MD items were removed. Items found included MD related to BDU-33 B/B practice bombs, 5-in. Zuni and undifferentiated rockets, 20mm projectiles, smoke grenades, and various pieces of munitions fragmentation. **Figures 1.3a through 1.3e** depict the five target areas and summarize the results from the removal action.

1.3.5.3 In addition to the removal actions focused on the target centers, munitions-related items were discovered outside the target center areas, and these were classified as "casual finds". These casual finds included a 2.25-in. SCAR, and a BDU-33 B/B practice bomb. The SCAR and the BDU-33 B/B practice bomb were classified as MD. No MEC items were found during the investigation.

1.3.5.4 Based on the results of the target area investigation/removal (i.e., no MEC recovered in the target areas), plus the results from other investigations/removals conducted since 2005 (limited quantities of MEC and MD found), the final report noted that additional clearance activities in the target (and step out) areas are not warranted (Weston, 2008b, emphasis added). Due to the discovery of "casual finds" on the surface away from the target areas, the report recommended that "the Air Force and BLM [should] retain the current 'by permit only' entry requirements established for the Area A portion of the Sonoran Desert National Monument" and advised installing "additional warning signage along the roads leading into and through the target sites area" (Weston, 2008b). It is unknown if additional signage were installed along the roads leading into and through the target sites based on this recommendation.

Figure 1.1
General Location Map
Area A Munitions Response Site (MRS)

Barry M. Goldwater Range
Luke AFB, Arizona



Legend

- Area A MRS
- Barry M. Goldwater Range Boundary
- Limited Access
- Highway
- Major Road
- Airport
- National Monument
- County Boundary

Image Source: ESRI Online



Projection: WGS 1984 UTM Zone 12N, Units: Meter

0 5 10 Miles

PARSONS	U.S. ARMY CORPS OF ENGINEERS, OMAHA
FILE: BMGR_RI_GeneralLocationMap.mxd	DATE: July 2022

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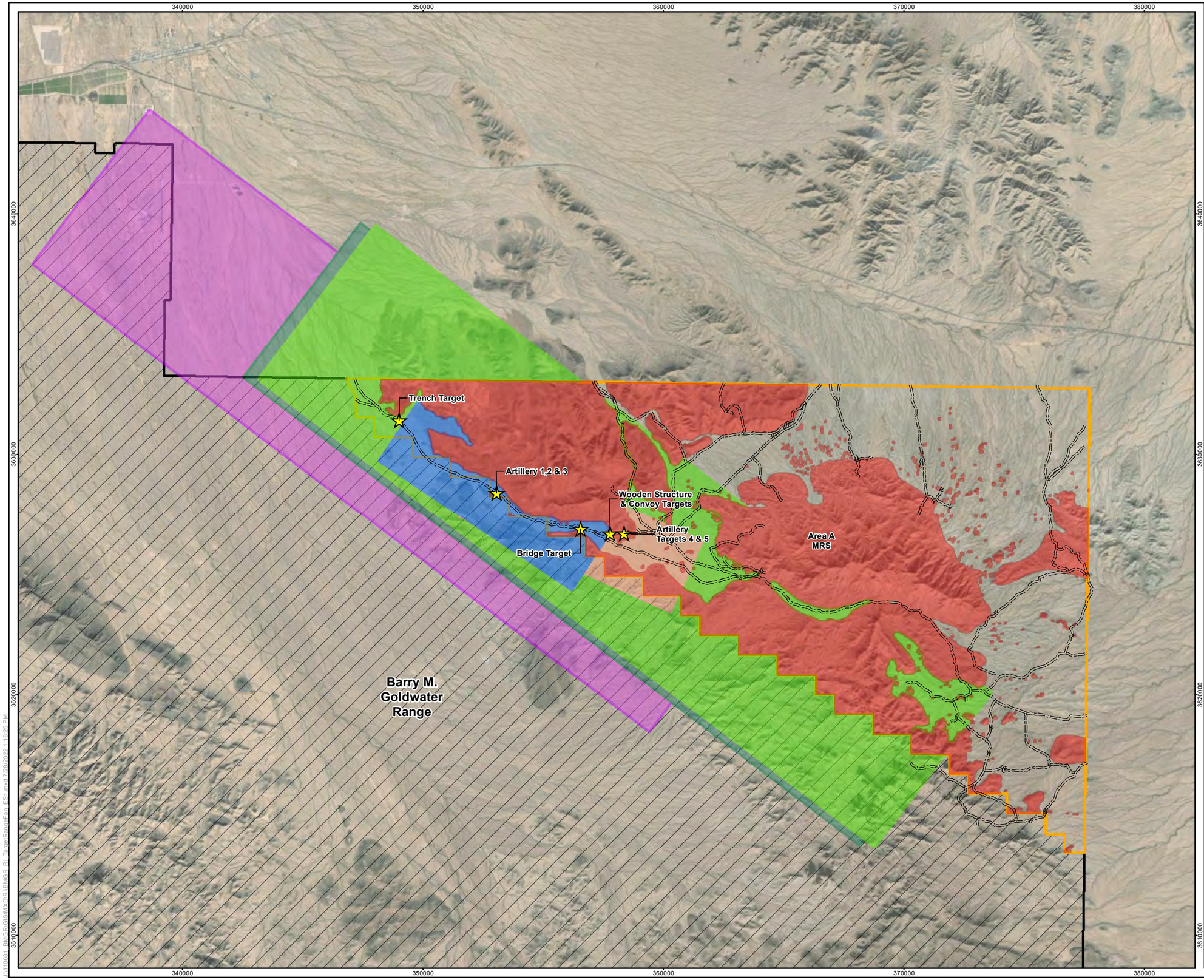


Figure 1.2
Munitions Response Site (MRS)
Target Range Fan Location Map
Former Area A

Barry M. Goldwater Range
Luke AFB, Arizona

Legend

- Targets
- Unpaved Road
- Inaccessible Areas (Due to Slope)

Fixed Wing Air to Ground Ranges:

- Artillery 1,2,3 Target: 2 mile x 6 mile range
- Artillery 4,5,6 Target: 5 mile x 20 mile range
- Bridge Target: 2 mile x 6 mile range
- Trench Target: 5 mile x 20 mile range
- Wooden Target: 5 mile x 20 mile range
- Area A MRS
- Barry M. Goldwater Range Boundary

Image Source: ESRI Online

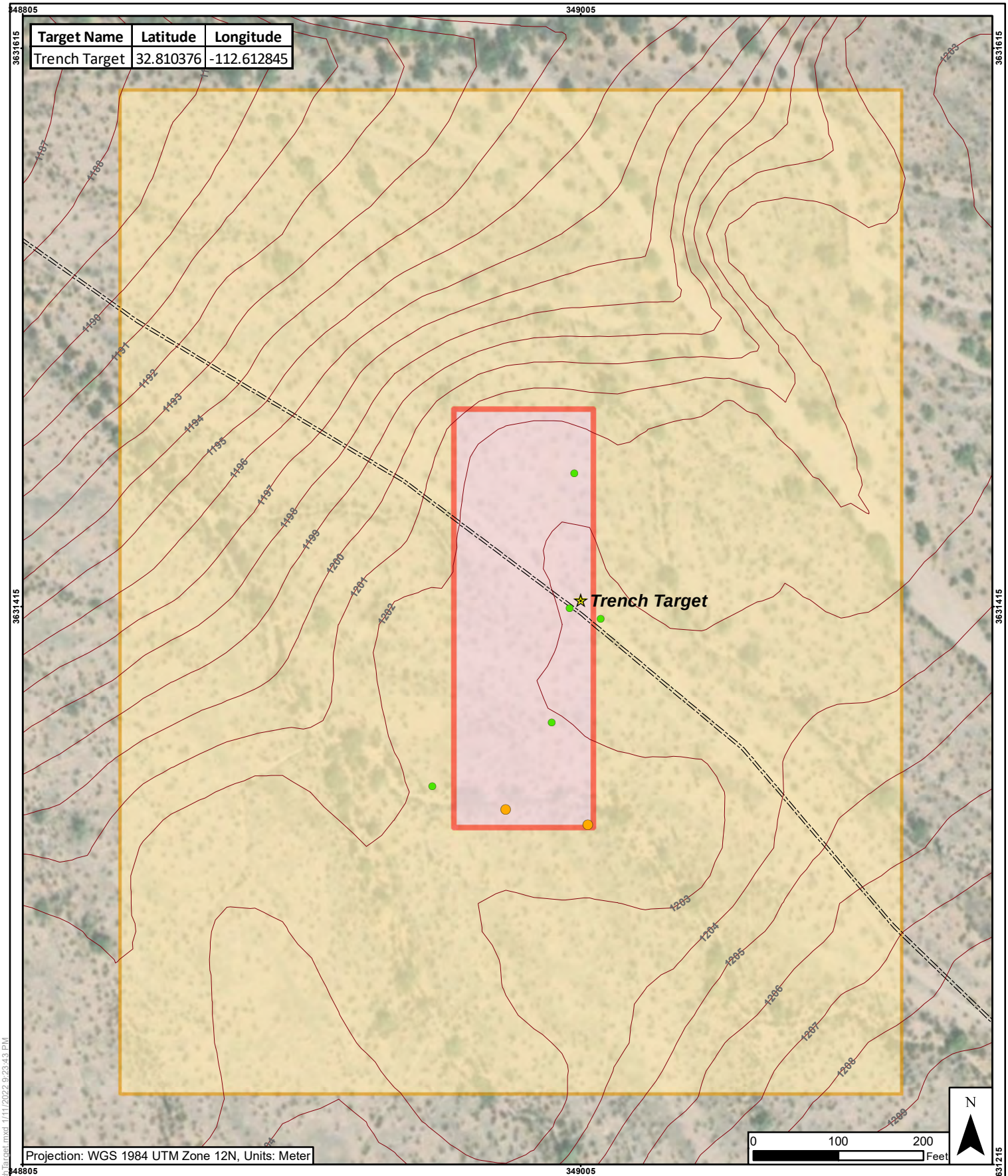


Projection: WGS 1984 UTM Zone 12N, Units: Meter

0 2 4 Miles

PARSONS	U.S. ARMY CORPS OF ENGINEERS, OMAHA
FILE: BMGR_RI_TargetRangeFan_ES1.mxd	DATE: July 2022

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Center of Target
Munitions Debris: frag(2)
Other Debris (hot rock, metal scrap)
Unpaved Road
100% Cleared (DGM/Analog)
Archaeological Survey

"Note: Recoveries shown are from the 2008 investigations (Weston 2008a/2008b)"

Figure 1.3a
Target Area Location Map
Trench Target

Barry M. Goldwater Range
Luke AFB, Arizona

PARSONS

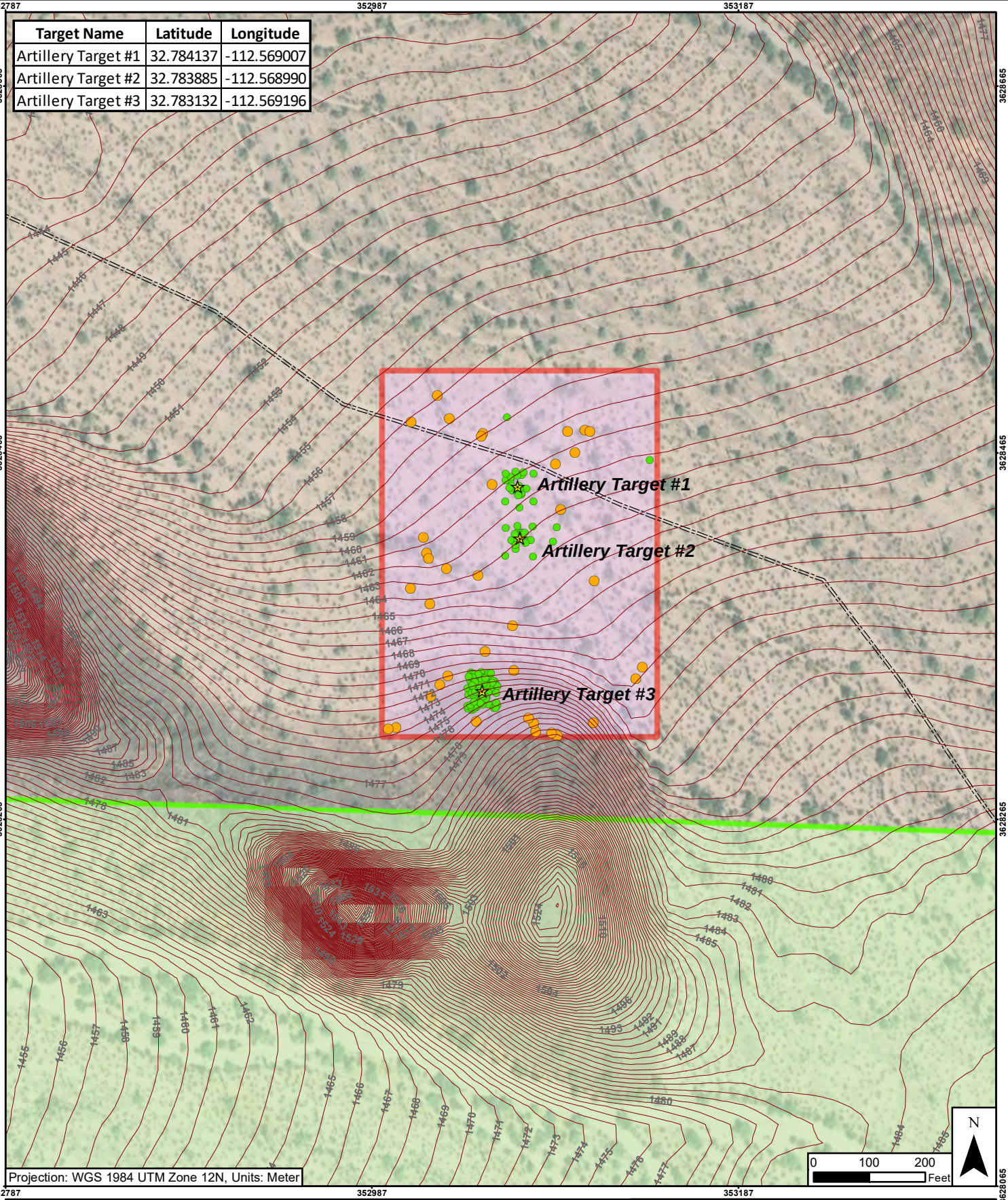
U.S. ARMY CORPS OF ENGINEERS, OMAHA

FILE: Fig1-3a_TrenchTarget.mxd

DATE: January 2022

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Target Name	Latitude	Longitude
Artillery Target #1	32.784137	-112.569007
Artillery Target #2	32.783885	-112.568990
Artillery Target #3	32.783132	-112.569196



- Center of Target
- Munitions Debris: frag(30) and rocket debris(6)
- Other Debris (hot rock, metal scrap)
- Unpaved Road
- 100% Cleared (DGM/Analog)
- Active Range (Outside Area A Boundary)

"Note: Recoveries shown are from the 2008 investigations (Weston 2008a/2008b)"

Figure 1.3b
Target Area Location Map
Artillery Targets 1,2 and 3

Barry M. Goldwater Range
Luke AFB, Arizona

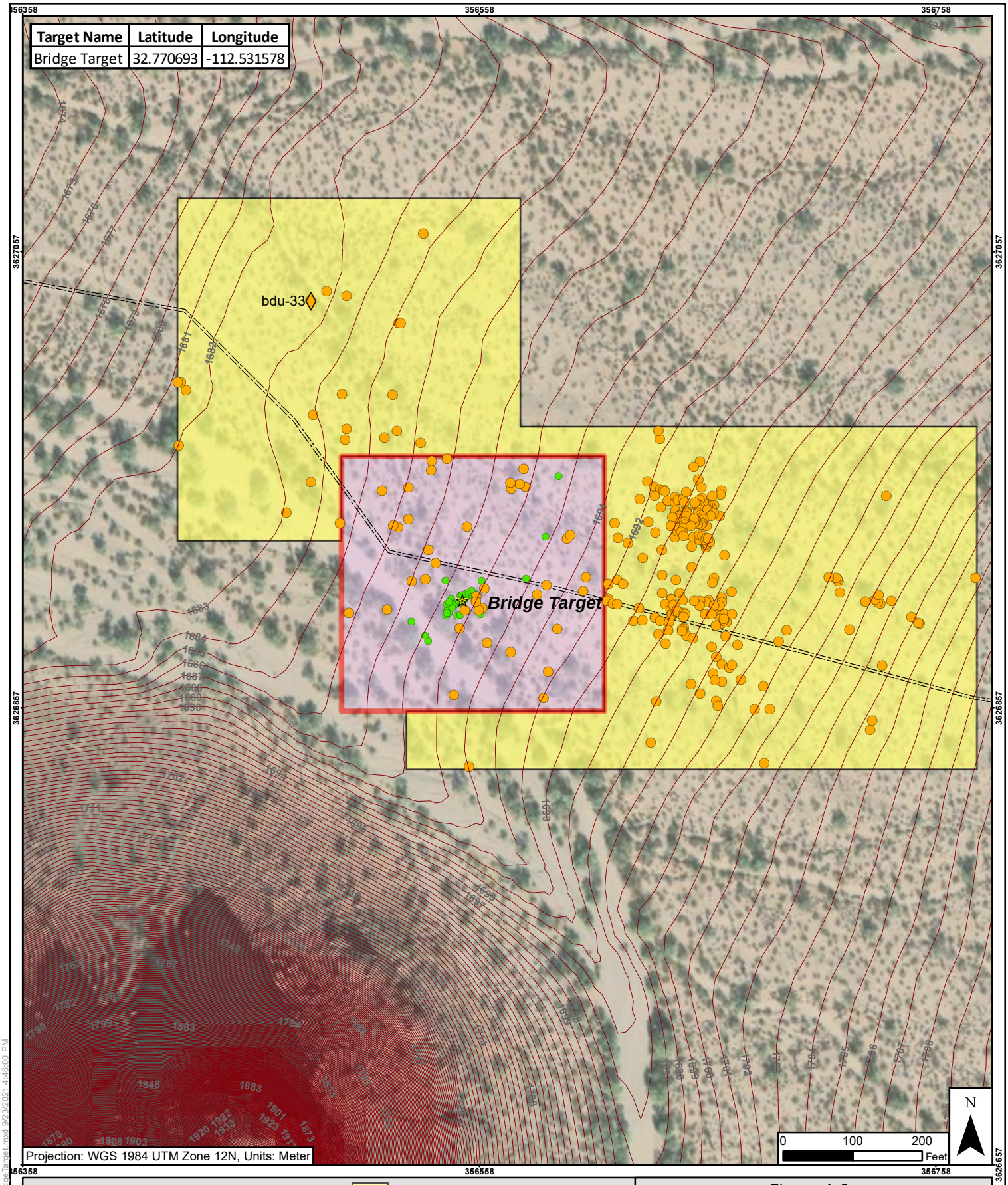
PARSONS

U.S. ARMY CORPS OF ENGINEERS, OMAHA

FILE: Fig1-3b_Artillery1-3Target.mxd

DATE: January 2022

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Center of Target

Munitions Debris: 750# M117(1), frag(231), grenade spoon(8), rocket debris(22), 20mm(4), 5" Zuni(1), BDU 33(2)

Munitions Debris (casual find)

Other Debris (hot rock, metal scrap)

Unpaved Road

Stepout Grids

100% Cleared (DGM/Analog)

"Note: Recoveries shown are from the 2008 investigations (Weston 2008a/2008b)"

Figure 1.3c
Target Area Location Map
Bridge Target

Barry M. Goldwater Range
Luke AFB, Arizona

PARSONS

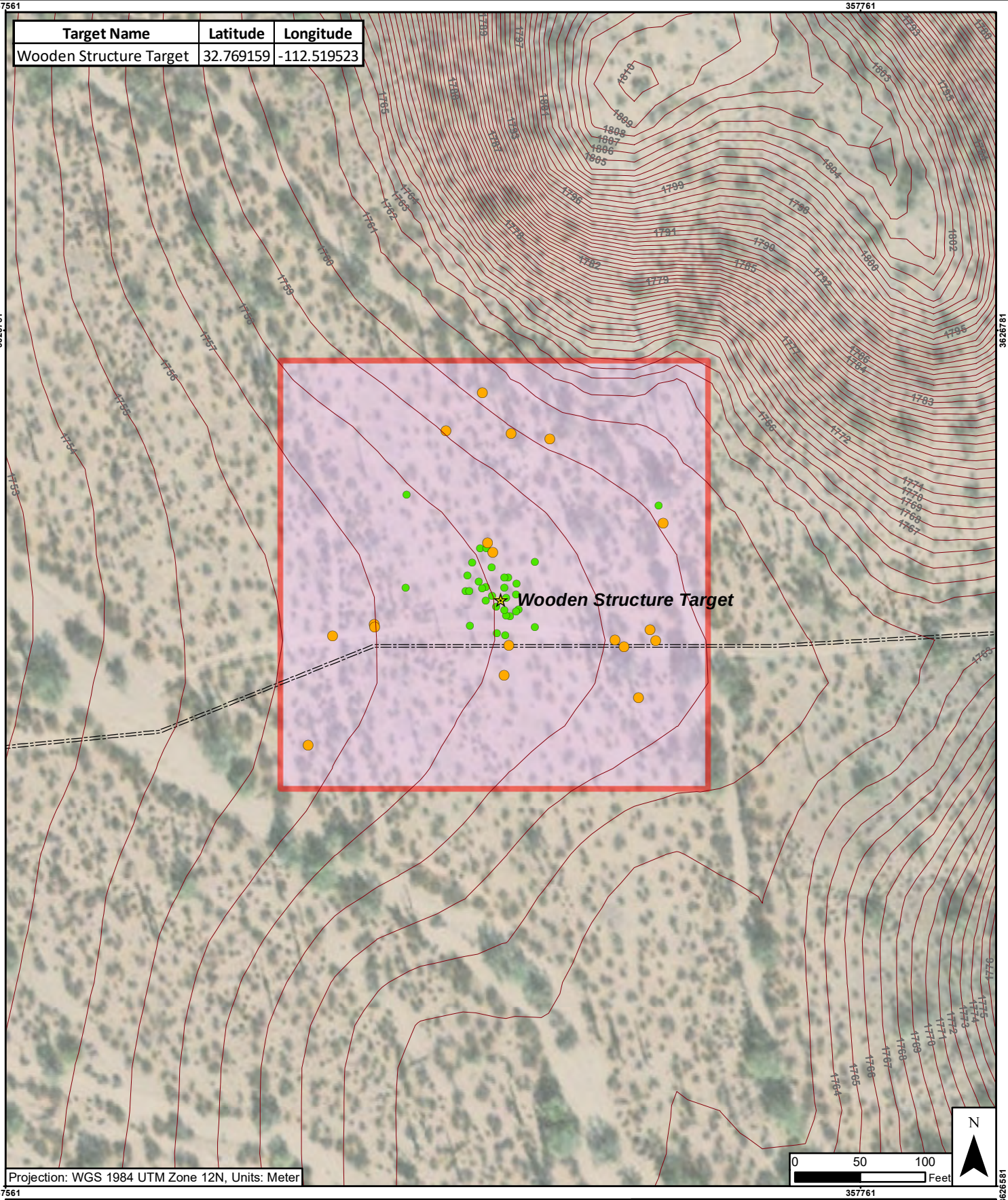
U.S. ARMY CORPS OF ENGINEERS, OMAHA

FILE: Fig1-3c_BridgeTarget.mxd

DATE: January 2022

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Target Name	Latitude	Longitude
Wooden Structure Target	32.769159	-112.519523



Center of Target

Munitions Debris: frag (17), rocket debris(2)

Other Debris (hot rock, metal scrap)

Unpaved Road

100% Cleared (DGM/Analog)

"Note: Recoveries shown are from the 2008 investigations (Weston 2008a/2008b)"

Figure 1.3d
Target Area Location Map
Wooden Structure Target

Barry M. Goldwater Range
Luke AFB, Arizona

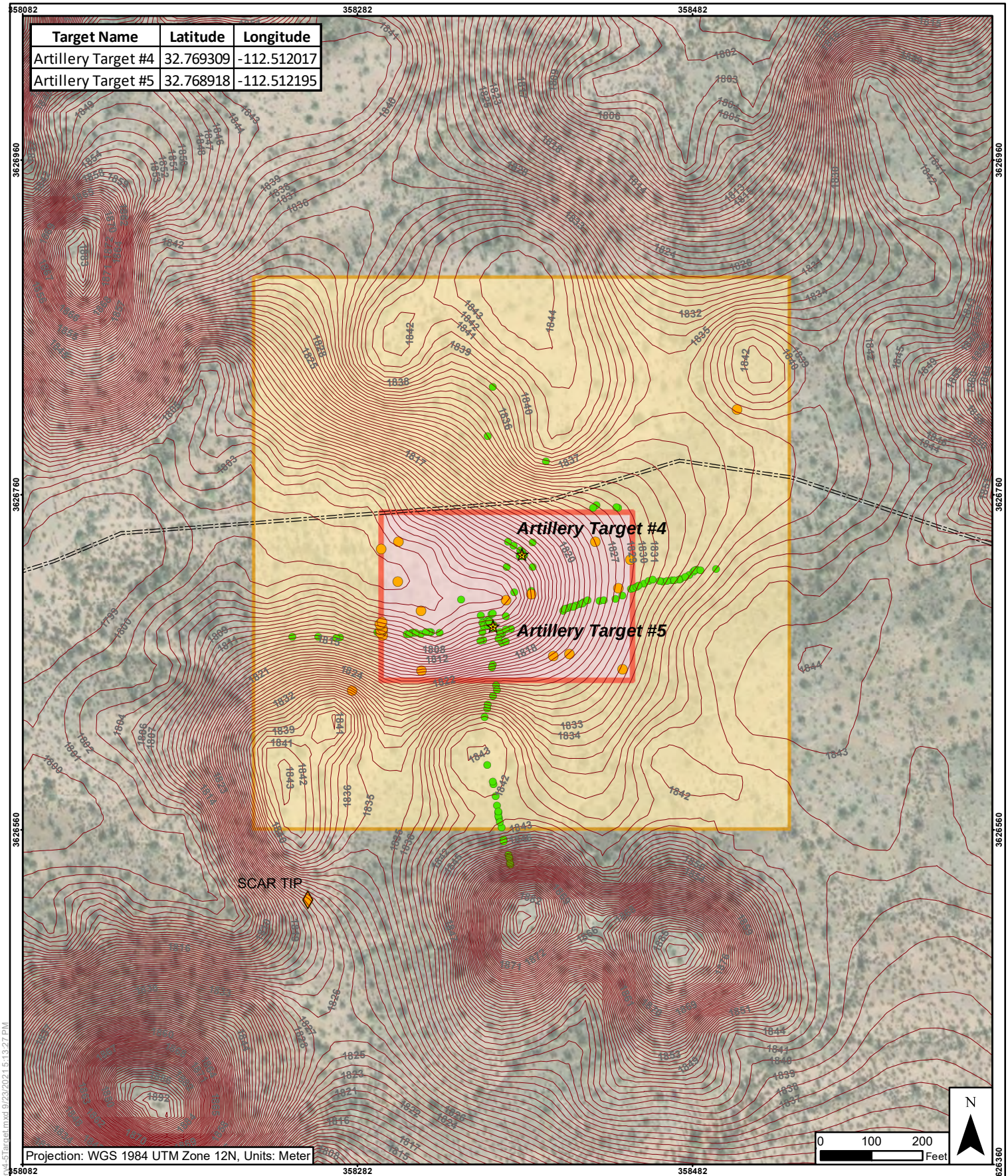
PARSONS

U.S. ARMY CORPS OF ENGINEERS, OMAHA

FILE: Fig1-3d_WoodenStructureTarget.mxd

DATE: January 2022

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Target Name	Latitude	Longitude
Artillery Target #4	32.769309	-112.512017
Artillery Target #5	32.768918	-112.512195

- Center of Target
- Munitions Debris: frag (21), rocket debris (1), 20mm TP (1)
- Munitions Debris (casual find)
- Other Debris (hot rock, metal scrap)
- Unpaved Road
- 100% Cleared (DGM/Analog)
- Archaeological Survey

"Note: Recoveries shown are from the 2008 investigations (Weston 2008a/2008b)"

Figure 1.3e
Target Area Location Map
Artillery Target 4 and 5

Barry M. Goldwater Range
Luke AFB, Arizona

PARSONS

U.S. ARMY CORPS OF ENGINEERS, OMAHA

FILE: Fig1-3e_Artillery4-5Target.mxd

DATE: January 2022

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CHAPTER 2 PROJECT REMEDIAL RESPONSE OBJECTIVES

2.1 CONCEPTUAL SITE MODEL AND PROJECT APPROACH

2.1.1 Preliminary Conceptual Site Model (CSM)

2.1.1.1 The CSM is a model of a site within its environment that attempts to depict the nature and location of contamination, its fate and transport, and the interactions of human and environmental receptors throughout these processes. The CSM also summarizes potential receptor exposure pathways that are, or may become, complete and those which are, and are likely to remain, incomplete. An exposure pathway is considered incomplete unless *all four* of the following elements are present (U.S. Environmental Protection Agency (USEPA), 1989):

- a source of contamination;
- an environmental transport and/or exposure medium;
- a point of exposure at which the contaminant can interact with a receptor; and
- a receptor and a likely route of exposure at the exposure point.

2.1.1.2 If a single element was not present, then the pathway would be incomplete. An incomplete exposure pathway requires that there are no current means by which a receptor (human or ecological) can be exposed to contamination – in this case either MEC or MC. Consequently, no hazards or risks from exposure to MEC or MC would be expected. This information can be used to focus the investigation of the site on complete or potentially complete exposure pathways. The CSM is a 'living document' that is based on existing knowledge and, therefore, can and should be updated throughout the course of the project as more data become available.

2.1.1.3 For the purposes of this RI/FS, a preliminary CSM was developed in accordance with EM 200-1-12. The preliminary CSM, described in the following paragraphs, is summarized in Table 2.1.

2.1.1.4 Preliminary CSMs for the Trench Target; Artillery Targets 1, 2, and 3; Bridge Target; Wooden Structure Target; Artillery Targets 4 and 5; and Accessible Non-Target Areas were developed based on results from previous investigations (**Section 1.3**). The CSMs for these areas indicate that, while there is some potential for MEC to be present in most parts of Area A, the potential is low for most of the site. Based on previous investigations, Artillery Targets 1, 2, and 3, and the Bridge Target have the largest amounts of munitions-related items present. There is the potential for isolated, scattered items throughout Area A, though the presence of concentrated areas is not anticipated unless unidentified targets are present (there is currently no evidence of this). No MC contamination has been identified at Area A based on previous sampling conducted at the Trench Target; Artillery Targets 1, 2, and 3; Bridge Target; Wooden Structure Target; and Artillery Target 4. For this reason, MC contamination is not expected at Area A unless unidentified areas of MEC/MD are present (there is currently no evidence of this).

2.1.1.5 Based on the current CSM, complete exposure pathways are potentially present at Area A that might result in site workers, recreational users, or site visitors being exposed to MEC. Although no major intrusive activities (e.g., excavation, tilling, or construction) are expected to occur at Area A, activities that could result in contact with possible subsurface MEC include site

maintenance (e.g., fence post installation), inserting tent stakes, and/or archeological studies. Also, visitor regulations issued by the BLM require individuals to bury human waste "well below the soil surface," which creates additional potential for contact with subsurface MEC. Maximum intrusive depth for these activities is assumed to be 24 inches below ground surface (bgs).

2.1.1.6 Known or suspected munitions at Area A include 750-lb. and 25-lb. practice bombs, 5-in. and 2.25-in. practice rockets, 20mm target practice (TP) projectiles, smoke grenades, signal flares, and spotting charges. In addition, while no direct evidence has been observed of 5-in. rockets and 20mm projectiles with high explosive (HE) fillers, unidentified munitions fragmentation has been identified in Area A, which is an indication of HE munitions use. For this reason, because there is evidence of historic use of 5-in. practice rockets and 20mm practice projectiles, the presence of 5-in. HE rockets and 20mm HE projectiles is also conservatively assumed.

2.1.1.7 The only metals detected in soil at Area A during previous investigations were barium, chromium, lead, and silver (Weston, 2005b). Results for these metals were well below their corresponding Arizona Residential Soil Remediation Level and were within the range of typical background concentrations for Arizona soils (Weston, 2005b). Silver is not a commonly encountered MC, so would not be expected to be found as a result of munitions use. Copper might be found as it is used in numerous munitions casings. Therefore, the analyte list for MC is barium, chromium, copper, and lead. Because there are no identified sources of MC contamination (Weston, 2005b), there are currently no complete exposure pathways identified at Area A that might result in site workers, recreational users, or site visitors being exposed to MC.

2.1.1.8 The CSMs for the Trench Target; Artillery Targets 1, 2, and 3; Bridge Target; Wooden Structure Target; Artillery Targets 4 and 5; and Accessible Non-Target Areas are summarized in **Table 2.1.** This table describes the known or suspected contamination sources, potential/suspected location and distribution of contamination, contamination source or exposure medium, current and future receptors, and potentially complete exposure pathways. These CSMs may be revised based on project results, and Army, USAF, and stakeholder feedback.

Table 2.1 Overview of Preliminary Conceptual Site Model, Area A MRS, Barry M. Goldwater Range, LAFB, Arizona

SITE DETAILS	Known or Suspected Contamination Source(s)	Potential/Suspected Location and Distribution	Source or Exposure Medium	Current and Future Receptors	Potentially Complete Exposure Pathway
NAME: Trench Target **Acreage**: 8 acres (approx.), 600' x 600' **Suspected Past United States Department of Defense (DoD) Activities (*release mechanisms*)**: UXO from aircraft bomb and rocket training **Current and Future Land Use**: Recreational (permit-required); managed by BLM as part of Sonoran Desert National Monument; no land use changes planned	MEC: Bomb, 750-lb., Practice, M117 Bomb, 25-lb., Practice, BDU-33 Rocket, 5-in., HE, Zuni (1) Rocket, 5-in., Practice, Zuni Rocket, 2.25-in., Practice, SCAR Projectile, 20mm, HE (1) Projectile, 20mm, TP Grenade, Hand, Smoke Signal, Flare, MK 13 Spotting Charge, MK4	MEC unlikely to be present based on previous investigation results. If present, MEC would be concentrated around target, but may be found in other parts of Area A.	Surface and subsurface soil	Site workers (BLM employees), recreational users, and site visitors. Drug smugglers and illegal immigrants are suspected to travel through Area A.	Exposure to surface and/or subsurface MEC
	Munitions Constituents: MC metals (Barium, Chromium, Copper, and Lead) and explosives	Not expected. If present, MC would be at high use area (HUA) or at location of low-order detonations.	Surface and subsurface soil	Site workers (BLM employees), recreational users, and site visitors. Drug smugglers and illegal immigrants are suspected to travel through Area A.	NONE (No identified sources)
NAME: Artillery Targets 1, 2, and 3 **Acreage**: 60 acres (approx.), 1600' x 1600' **Suspected Past United States DoD Activities (*release mechanisms*)**: UXO from aircraft bomb and rocket training **Current and Future Land Use**: Recreational (permit-required); managed by BLM as part of Sonoran Desert National Monument; no land use changes planned	MEC: Bomb, 750-lb., Practice, M117 Bomb, 25-lb., Practice, BDU-33 Rocket, 5-in., HE, Zuni (1) Rocket, 5-in., Practice, Zuni Rocket, 2.25-in., Practice, SCAR Projectile, 20mm, HE (1) Projectile, 20mm, TP Grenade, Hand, Smoke Signal, Flare, MK 13 Spotting Charge, MK4	MD scattered around targets, though no clear HUAs. If present, MEC would be concentrated around targets, reducing in quantity farther into the surrounding range buffer areas.	Surface and subsurface soil	Site workers (BLM employees), recreational users, and site visitors. Drug smugglers and illegal immigrants are suspected to travel through Area A.	Exposure to surface and/or subsurface MEC
	Munitions Constituents: MC metals (Barium, Chromium, Copper, and Lead) and explosives	Not expected. If present, MC would be at HUAs or at location of low-order detonations.	Surface and subsurface soil	Site workers (BLM employees), recreational users, and site visitors. Drug smugglers and illegal immigrants are suspected to travel through Area A.	NONE (No identified sources)

(1) There is direct evidence of historic use of 5-in. practice rockets and 20mm practice projectiles at Area A. No direct evidence has been observed of 5-in. rockets and 20mm projectiles with HE fillers; however, as unidentified munitions fragmentation has been identified in Area A, which is an indication of HE munitions use, the presence of 5-in. HE rockets and 20mm HE projectiles is conservatively assumed.

Table 2.1 Overview of Preliminary Conceptual Site Model for the Area A MRS, Barry M. Goldwater Range, LAFB, Arizona, cont'd.

SITE DETAILS	Known or Suspected Contamination Source(s)	Potential/Suspected Location and Distribution	Source or Exposure Medium	Current and Future Receptors	Potentially Complete Exposure Pathway
NAME: Bridge Target **Acreage**: 34 acres (approx.), 1200' x 1200' Suspected Past United States Department of Defense (DoD) Activities (*release mechanisms*): UXO from aircraft bomb and rocket training **Current and Future Land Use**: Recreational (permit-required); managed by BLM as part of Sonoran Desert National Monument; no land use changes planned	MEC: Bomb, 750-lb., Practice, M117 Bomb, 25-lb., Practice, BDU-33 Rocket, 5-in., HE, Zuni (1) Rocket, 5-in., Practice, Zuni Rocket, 2.25-in., Practice, SCAR Projectile, 20mm, HE (1) Projectile, 20mm, TP Grenade, Hand, Smoke Signal, Flare, MK 13 Spotting Charge, MK4	Most MD observed at target and to west of target center. MEC would be most likely to be present in these areas, reducing in quantity farther into the surrounding range buffer areas.	Surface and subsurface soil	Site workers (BLM employees), recreational users, and site visitors. Drug smugglers and illegal immigrants are suspected to travel through Area A.	Exposure to surface and/or subsurface MEC
	Munitions Constituents: MC metals (Barium, Chromium, Copper, and Lead) and explosives	Not expected. If present, MC would be at HUAs or at location of low order detonations.	Surface and subsurface soil	Site workers (BLM employees), recreational users, and site visitors. Drug smugglers and illegal immigrants are suspected to travel through Area A.	NONE (No identified sources)
NAME: Wooden Structure Target **Acreage**: 8 acres (approx.), 600' x 600' Suspected Past United States DoD Activities (*release mechanisms*): UXO from aircraft bomb and rocket training **Current and Future Land Use**: Recreational (permit-required); managed by BLM as part of Sonoran Desert National Monument; no land use changes planned	MEC: Bomb, 750-lb., Practice, M117 Bomb, 25-lb., Practice, BDU-33 Rocket, 5-in., HE, Zuni (1) Rocket, 5-in., Practice, Zuni Rocket, 2.25-in., Practice, SCAR Projectile, 20mm, HE (1) Projectile, 20mm, TP Grenade, Hand, Smoke Signal, Flare, MK 13 Spotting Charge, MK4	MEC unlikely to be present based on previous investigation results. If present, MEC would be concentrated at target, reducing in quantity farther into the surrounding range buffer areas.	Surface and subsurface soil	Site workers (BLM employees), recreational users, and site visitors. Drug smugglers and illegal immigrants are suspected to travel through Area A.	Exposure to surface and/or subsurface MEC
	Munitions Constituents: MC metals (Barium, Chromium, Copper, and Lead) and explosives	Not expected. If present, MC would be at HUAs or at location of low order detonations.	Surface and subsurface soil	Site workers (BLM employees), recreational users, and site visitors. Drug smugglers and illegal immigrants are suspected to travel through Area A.	NONE (No identified sources)

(1) There is direct evidence of historic use of 5-in. practice rockets and 20mm practice projectiles at Area A. No direct evidence has been observed of 5-in. rockets and 20mm projectiles with HE fillers; however, as unidentified munitions fragmentation has been identified in Area A, which is an indication of HE munitions use, the presence of 5-in. HE rockets and 20mm HE projectiles is conservatively assumed.

Table 2.1 Overview of Preliminary Conceptual Site Model for the Area A MRS, Barry M. Goldwater Range, LAFB, Arizona, cont'd.

SITE DETAILS	Known or Suspected Contamination Source(s)	Potential/Suspected Location and Distribution	Source or Exposure Medium	Current and Future Receptors	Potentially Complete Exposure Pathway
NAME: Artillery Targets 4 and 5 **Acreage**: 60 acres (approx.), 1600' x 1600' Suspected Past United States DoD Activities (*release mechanisms*): UXO from aircraft bomb and rocket training **Current and Future Land Use**: Recreational (permit-required); managed by BLM as part of Sonoran Desert National Monument; no land use changes planned	MEC: Bomb, 750-lb., Practice, M117 Bomb, 25-lb., Practice, BDU-33 Rocket, 5-in., HE, Zuni (1) Rocket, 5-in., Practice, Zuni Rocket, 2.25-in., Practice, SCAR Projectile, 20mm, HE (1) Projectile, 20mm, TP Grenade, Hand, Smoke Signal, Flare, MK 13 Spotting Charge, MK4	MEC unlikely to be present based on previous investigation results. If present, MEC would be concentrated at target, reducing in quantity farther into the surrounding range buffer areas.	Surface and subsurface soil	Site workers (BLM employees), recreational users, and site visitors. Drug smugglers and illegal immigrants are suspected to travel through Area A.	Exposure to surface and/or subsurface MEC
	Munitions Constituents: MC metals (Barium, Chromium, Copper, and Lead) and explosives	Not expected. If present, MC would be at HUAs or at location of low order detonations.	Surface and subsurface soil	Site workers (BLM employees), recreational users, and site visitors. Drug smugglers and illegal immigrants are suspected to travel through Area A.	NONE (No identified sources)
NAME: Accessible Non-Target Areas **Acreage**: 38,000 acres (approx.) **Suspected Past United States DoD Activities (*release mechanisms*)**: None known; aircraft bomb and rocket training conducted nearby **Current and Future Land Use**: Recreational (permit-required); managed by BLM as part of Sonoran Desert National Monument; no land use changes planned	MEC: Bomb, 750-lb., Practice, M117 Bomb, 25-lb., Practice, BDU-33 Rocket, 5-in., HE, Zuni (1) Rocket, 5-in., Practice, Zuni Rocket, 2.25-in., Practice, SCAR Projectile, 20mm, HE (1) Projectile, 20mm, TP Grenade, Hand, Smoke Signal, Flare, MK 13 Spotting Charge, MK4	MEC unlikely to be present based on no known use as range target. Scattered items might be present resulting from overshoots, with likelihood decreasing farther away from the target areas. If unidentified targets are found, MEC might be present at those.	Surface and subsurface soil	Site workers (BLM employees), recreational users, and site visitors. Drug smugglers and illegal immigrants are suspected to travel through Area A.	NONE KNOWN
	Munitions Constituents: MC metals (Barium, Chromium, Copper, and Lead) and explosives	Not expected. If present, MC would be at HUAs or at location of low order detonations.	Surface and subsurface soil	Site workers (BLM employees), recreational users, and site visitors. Drug smugglers and illegal immigrants are suspected to travel through Area A.	NONE (No identified sources)

(1) There is direct evidence of historic use of 5-in. practice rockets and 20mm practice projectiles at Area A. No direct evidence has been observed of 5-in. rockets and 20mm projectiles with HE fillers; however, as unidentified munitions fragmentation has been identified in Area A, which is an indication of HE munitions use, the presence of 5-in. HE rockets and 20mm HE projectiles is conservatively assumed.

Table 2.1 Overview of Preliminary Conceptual Site Model for the Area A MRS, Barry M. Goldwater Range, LAFB, Arizona, cont'd.

SITE DETAILS	Known or Suspected Contamination Source(s)	Potential/Suspected Location and Distribution	Source or Exposure Medium	Current and Future Receptors	Potentially Complete Exposure Pathway
NAME: Steep, Rugged Terrain; Non-Target Areas **Acreage**: 40,500 acres (approx.) **Suspected Past United States DoD** Activities (*release mechanisms*): aircraft bomb and rocket training conducted nearby **Current and Future Land Use**: Recreational (permit-required); managed by BLM as part of Sonoran Desert National Monument; no land use changes planned	MEC: Bomb, 750-lb., Practice, M117 Bomb, 25-lb., Practice, BDU-33 Rocket, 5-in., HE, Zuni [(1)] Rocket, 5-in., Practice, Zuni Rocket, 2.25-in., Practice, SCAR Projectile, 20mm, HE [(1)] Projectile, 20mm, TP Grenade, Hand, Smoke Signal, Flare, MK 13 Spotting Charge, MK4	Scattered items might be present resulting from overshoots, with likelihood decreasing farther away from the known target areas.	Surface and subsurface soil. Shallow soil depth results in greater likelihood of surface presence.	Site workers (BLM employees), recreational users, and site visitors. Drug smugglers and illegal immigrants are suspected to travel through Area A.	Exposure to surface and/or subsurface MEC
	Munitions Constituents: MC metals (Barium, Chromium, Copper, and Lead) and explosives	Not expected. If present, MC would be at high use areas (targets) or at location of low order detonations.	Surface and subsurface soil	Site workers (BLM employees), recreational users, and site visitors. Drug smugglers and illegal immigrants are suspected to travel through Area A.	NONE (No identified sources)

2.1.2 Project Technical Approach

2.1.2.1 Overview

2.1.2.1.1 The technical approach for this RI was based on the findings of previous investigations and other available historical information (**Section 1.3**) and was designed specifically to evaluate potentially complete MEC and MC exposure pathways as identified in the preliminary CSM. Furthermore, the approach was planned to characterize the nature and extent of MEC or MC contamination to support the development of potential remedial alternatives where complete exposure pathways were identified.

2.1.2.1.2 The specific processes and procedures used to conduct this investigation are detailed in the approved final RI UFP-QAPP (Parsons, 2018a), which was reviewed and accepted by the Project Team. These investigation methods are described in **Chapter 4** of this RI report, while the results are presented in **Chapter 6**. A brief summary of the approaches for evaluating MEC and MC is provided below.

- Instrument-aided visual inspection of approximately 38,000 acres of accessible non-target areas; inventory of surface munitions-related items; and disposal of MEC items.
- Geophysical surveys along transects surrounding the prior removal action areas at the five known target areas.
- Geophysical data processed, anomalies identified and select anomalies identified for the "dig list" (approved by the USACE).
- Dig list anomalies reacquired and intrusively investigated. MEC items recovered during intrusive investigation safely disposed of.
- Post-demolition soil samples collected and analyzed for MC metals (barium, chromium, copper, and lead) and explosives.
- Site restoration completed and accepted by USACE.

2.2 PRELIMINARY REMEDIATION GOALS

2.2.1 Preliminary remediation goals (PRGs) are site-specific and contaminant-specific and define the conditions considered by stakeholders to be protective of human health and the environment. As with the CSM, PRGs are reevaluated and refined throughout the RI/FS process as new information becomes available.

2.2.2 The PRG for MEC is to limit any interaction between residual MEC and human receptors accessing SDNM Area A. The PRG for MEC could be achieved by measures such as removing MEC to a depth at which it no longer presents a hazard to the anticipated human receptors, or by implementing land use controls (LUC) that minimize the possibility of receptors being exposed to MEC.

2.2.3 The PRGs for MC are initially based on the screening values that were presented in the UFP-QAPP as being protective of the identified exposure pathways at Area A. The PRG is to ensure that any identified MC contamination at the site determined to pose an unacceptable risk to human health or the environment is addressed to minimize or mitigate those risks.

2.2.4 Response actions must identify and attain or formally waive applicable or relevant and appropriate requirements (ARAR) under federal and state laws (Engineer Regulation [ER] 200-3-1) (USACE, 2004c). ARARs must be complied with to the extent practicable. Although the RI is not considered a response action, preliminary identification of chemical-specific, location-specific, and action-specific ARARs is conducted by the lead and support agencies during RI site characterization as required by the NCP. ARARs are used as a starting point to determine the protectiveness of a site remedy (USAEC, 2009).

2.2.5 As the RI/FS process continues, the list of ARARs is updated, particularly as guidance is issued by state and federal agencies. ARARs will be used as a guide to establish the appropriate extent of MRS cleanup; to aid in scoping, formulating, and selecting proposed treatment technologies; and to govern the implementation and operation of the selected remedial alternative. As part of the FS (prepared under separate cover), primary consideration will be given to remedial alternatives that attain or exceed the requirements of the identified ARARs. Throughout the CERCLA process, ARARs are identified and used by considering the following:

- Contaminants suspected or identified to be at the site;
- Chemical analysis performed or scheduled to be performed;
- Types of media (air, soil, groundwater, surface water, and sediment);
- Geology and other site characteristics;
- Use of site resources and media;
- Potential contaminant transport mechanisms;
- Purpose and application of potential ARARs; and
- Remedial alternatives considered for site cleanup.

2.2.6 Chemical-specific ARARs (**Table 2.2**) are promulgated health-based or risk-based numerical values that establish the acceptable amount or concentration of a chemical that may remain in, or be discharged to, the ambient environment. Risk-based screening levels (e.g., USEPA risk screening levels [RSLs]) are not considered chemical-specific ARARs because they are not promulgated.

2.2.7 Location-specific ARARs (**Table 2.3**) generally are restrictions placed on the concentration of a hazardous substance or the conduct of activities solely because they are in special locations.

2.2.8 Action-specific ARARs (**Table 2.4**) are usually technology or activity-based requirements, or limitations placed on actions taken with respect to remedial/removal actions, or requirements to conduct certain actions to address specific circumstances at a site. These actions include removal, decontamination, and/or control of such media.

2.2.8 When ARARs do not exist for a particular chemical or remedial activity, other criteria, advisories, and guidance referred to as To Be Considered (TBC) are useful in designing and selecting a remedial alternative. The TBC information identified for Area A is presented in Tables 2.2-2.4.

Table 2.2
Potential Contaminant-Specific Applicable or Relevant and Appropriate Requirements (ARARs) and "To Be Considered" (TBC) Criteria for SDNM Area A, Arizona

Potential ARAR	Contaminant	Medium	Requirements	Preliminary Determination	Remarks
Arizona Soil Remediation Standards (AAC RIS-7-201 et seq.) March 2009	As listed	Soil	Soil will be remediated so as to not cause a violation of the Water Quality Standards, be protective of aquifer water quality and surface water quality, not exhibit a hazardous waste characteristic, or cause an adverse impact to ecological receptors. In addition, soil will be remediated so that concentration of contaminants remaining in the soil after remediation is less than or equal to background, as determined by site-specific historical information, site-specific sampling of unaffected soils, or statistical analysis, or to a site-specific remediation level, or to a predetermined soil remediation level (SRL).	Potentially relevant and appropriate	These regulations apply to a person legally required to remediate soil contamination under the Arizona Hazardous Waste Program, Solid Waste Management Program, Underground Storage Tank Program, or Aquifer Protection Program. Since the activities herein are being conducted under the federal CERCLA program, these regulations would not be applicable, but would be relevant and appropriate.

Table 2.2 (continued)
Potential Contaminant-Specific Applicable or Relevant and Appropriate Requirements (ARARs)
and "To Be Considered" (TBC) Criteria for SDNM Area A, Arizona

Potential ARAR	Contaminant	Medium	Requirements	Preliminary Determination	Remarks
Groundwater Protection Limits (ADEQ, 1996)	As listed	Soil	Under the Arizona Soil Remediation To Be Considered Standards (TBCs) Soil Remediation Levels (SRLs), a party conducting soil remediation may use a risk-based approach for determining the appropriate soil cleanup standard, or they may elect to use the "off-the-shelf' SRLs as cleanup standards. In either case, the residual concentration of soil contamination cannot cause or threaten to cause contamination of groundwater to exceed the A WQS. ADEQ (1996) is a guide to determining if residual concentrations of soil contamination could cause or threaten to cause groundwater contamination. The GPL values are based on a one-dimensional vadose zone transport model developed by ADEQ. There are three options for determining GPLs: (1) minimum GPLs are provided in ADEQ (1996) based on a "worst-case" scenario; (2) calculated GPLs based on site-specific depth to groundwater and vertical extent of contamination in vadose zone; and (3) calculated GPLs based on vadose zone and groundwater modeling using site-specific data collected and documented for the site in question.	To be considered	The screening method for determining GPLs has not been promulgated under Arizona code. Therefore, the screening method can only be considered as a TBC standard.

Table 2.3
Potential Location-Specific Applicable or Relevant and Appropriate Requirements (ARARs) and "To Be Considered" (TBC) Criteria for SDNM Area A, Arizona

Potential ARAR	Location	Requirements	Preliminary Determination	Remarks
Archaeological Resources Protection Act [16 USC 470]	Land	Any eligible or potentially eligible prehistorical, historical, and archaeological data that might be destroyed as a result of a federal, federally assisted, or federally licensed activity or program must be preserved.	Potentially applicable	Should such data be identified, the requirement would be potentially applicable during a remedial action.
Federal Land Management Policy Act [43 U.S.C. § 1701(a)(8)] [43 U.S.C. § 1712(a), 43 C.F.R. § 1610 et seq] [43 U.S.C. § 1732(a)] [43 U.S.C. § 1702(c)]	Land	Public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values; that will provide food and habitat for fish and wildlife and domestic animals. Also, sets out standards for promulgating resource management plans. Requires the Secretary of the Interior to "manage the public lands under principles of multiple use and sustained yield, in accordance with the land use plans developed by him under section 1712. "management of the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people; . . . a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and nonrenewable resources, including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific and historical values; and harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment	Applicable	A remedial action must meet land use plans for SDNM.

Potential ARAR	Location	Requirements	Preliminary Determination	Remarks
SDNM National Environmental Policy Act Record of Decision & Approved Resource Management Plan (September 2012). 2.2.13; 2.2.15; 2.2.16 TM-1; 2.2.19	Land	Establishes guidelines for multiple use management and sustained yield management of BLM-managed public lands under the jurisdiction BLM Lower Sonoran Field Office. Area A is unavailable for livestock grazing; Recreational management restrictions, designating Area A as a Special Management Area requiring the BMGR USAF-administered public safety permit; Limiting motorized use within the SDNM; and addressing hazardous materials and public safety, to include appropriate signage, educating the public, and restricts Area A to permit access only via the USAF BMGR permitting system. This permitting does not apply to Air Force or its contractors.	Applicable	The permit system will remain in place and remedial action alternatives will need to adhere to the restrictions in the resource management plan.
2001 SDNM Proclamation	Land	The Proclamation 1) prohibits all motorized and mechanized vehicle use off road, except for emergency or authorized administrative purposes, 2) withdraws the land from the public land laws, U.S. mining laws, and mineral and geothermal leasing laws, and 3) requires that the current procedures for public access Area A "shall remain in full force and effect", (note that the permitting does not apply to Air Force or its contractors) except to the extent that the USAF agrees to different procedures which the Bureau of Land Management determines are compatible with the protection of the objects identified in the proclamation.	Applicable	Applicable during a remedial action

Table 2.4
Potential Action-Specific Applicable or Relevant and Appropriate Requirements (ARARs) and "To Be Considered" (TBC) Criteria for SDNM Area A, Arizona

Potential ARAR	Action	Requirements	Preliminary Determination	Remarks
Solid Waste Disposal Act, as amended (42 U.S.C. 6901 et seq.); Hazardous Waste Regulations (40 CFR 262, 264,265); Arizona Hazardous Waste Regulations (AAC R1S-S- 262,264,265)	Hazardous waste management	Hazardous waste may be accumulated on-site for 90 days without a permit. Containers, containment buildings, and tanks used to accumulate the waste must meet certain standards. Waste must be transferred to a permitted facility by a permitted transporter. If waste is to be stored for more than 90 days, treated or disposed of on-site, Resource Conservation and Recovery Act (RCRA) standards for the particular unit would have to be met (e.g., surface impoundment or waste piles).	Potentially applicable	Any hazardous wastes generated during the remediation, including investigation-derived wastes, wastewaters, contaminated soil, or debris, must be managed in accordance with these regulations.

2.3 SUMMARY OF INSTITUTIONAL ANALYSIS

2.3.1 Institutional analyses are prepared to support the development of institutional control strategies and plans of action such as a munitions response alternative. These strategies rely on existing powers and authorities of government agencies to protect the public at large from potential MEC hazards and MC risks.

2.3.2 The objectives of the institutional analysis are to illustrate the opportunities that exist to implement an institutional control program at the site; identify government agencies having jurisdiction over MEC and MC contaminated lands; and assess the appropriateness, capability, and willingness of government agencies to assert their control over MEC contaminated lands. The typical strategies for addressing the presence of MEC on an MRS are physical removals and institutional controls. Although physical removals are conducted to reduce the amount of MEC at an MRS, many variables affect the completeness of the removals, and current technologies may not be adequate to detect and remove *all* ordnance present. Therefore, institutional controls are implemented to manage residual risk remaining at an MRS following the completion of a physical removal or in lieu of a physical removal altogether, as a stand-alone response.

2.3.3 A review of government institutions and private entities that exercise jurisdiction and ownership of indicates that they are primarily under the control of BLM. The institutional analysis and Institutional Analysis Report are provided as **Appendix C** to this RI report.

2.4 DATA NEEDS AND DATA QUALITY OBJECTIVES

2.4.1 Data Needs

The preliminary CSM for Area A indicates that MEC in the form of UXO or DMM are present within the MRS based on evidence gathered during previous field surveys. MC may also be present as a result of the munitions use at the sites. The project objectives for the RI are to obtain data to sufficiently characterize the nature and extent of any MEC or MC contamination at Area A, and to evaluate potential MEC hazards or MC risks related to any identified contamination. The data needs for this project were reviewed by the Project Team and include collecting adequate data to assess MEC contamination and MC in the soil at Area A. The data quality objectives (DQOs) associated with the data to be collected during the RI were developed by the SPP Team and included in the approved Final UFP-QAPP (Parsons, 2018a).

2.4.2 Data Quality Objectives

2.4.2.1 DQOs are qualitative and quantitative statements that specify the quality and level of data required to support the decision-making processes for a project. Guidance for DQO development is contained in *Guidance on Systematic Planning Using the Data Quality Objectives Process* (EPA QA/G-4, February 2006, EPA/240/B-06/001).

2.4.2.2 The overall goal of this project is to obtain acceptance of an RI, FS, Proposed plan (PP), and Decision Document(s) (DD) in compliance with the CERCLA, as amended, and DoD, and USACE regulations and guidance. Based on this overall goal, the general project DQOs are to obtain data to sufficiently characterize the nature and extent of MEC or MC contamination present at Area A, and to evaluate potential MEC hazards or MC risks related to identified contamination. The data obtained must also be sufficient to assess human health and ecological risks to facilitate

development of the future FS. Specific DQOs have been established for both the MEC and MC investigations, and these are presented in **Table 2.5**. These DQOs follow the USEPA's seven-step, iterative process for DQO development.

2.4.2.3 The status of the MEC and MC DQOs following completion of the RI are summarized in **Section 4.1.3 and 4.2.3**, respectively. The status of the geophysical measurement quality objectives (MQO) are described in **Chapter 3** and **Chapter 4**.

Table 2.5 Data Quality Objectives and Technical Approach Summary for Five Target Areas (1), Area A Munitions Response Site, Barry M. Goldwater Range, LAFB, Arizona

State the Problem	Identify the Decision to Be Made	Identify Inputs to the Decision	Define the Study Boundaries	Develop Decision Rules	Specify Limits on Decision Errors	Optimize the Design for Obtaining Data
MEC: Evidence of past use as munitions practice target; MEC might remain in the area, so a potentially complete exposure pathway exists and there is a potential hazard to human health and the environment. Therefore, the nature and extent of MEC contamination at the site needs to be characterized to support future remedial action. (Note: MEC contamination is assumed because this is a known former range area.)	The principal question is "What is the nature and extent of MEC contamination at the site?" Because MEC contamination is assumed, the only possible action resulting from the principal question is to conduct a remedial response to address identified risks. Based on the above, the project decision statement is: Determine the nature and extent of MEC present to support a future remedial response, as needed.	Up-to-date CSM summarizing site conditions. Historical data, including results of previous investigations. Results of geophysical surveys and subsequent intrusive investigation. Land use and receptors.	Boundaries of target areas requiring investigation, based on PWS, defined on **Figures 1.3a – 1.3e**. There are no time constraints on data collection.	*Geophysical Surveys and Anomaly Selection* • If planned minimum acreage of DGM transects is investigated at a target area, then geophysical surveys are complete. • If the visual surveys identify a cluster (2) of MEC/MD adjacent to the survey area, then additional DGM transects be recommended to evaluate extent of MEC contamination. • If a detected anomaly exceeds the selection threshold, then it will be identified for possible intrusive investigation. The number of anomalies will vary by target area (see Project Design column). *Intrusive Investigation* • If selected transect anomalies have been resolved, then the intrusive investigation is complete. *MEC Characterization* • If the geophysical surveys and intrusive investigations are complete and visual surveys have not identified clusters (2) of MEC/MD adjacent to the survey area, then the characterization of horizontal MEC contamination extent is complete. • If selected transect anomalies have been resolved, then the characterization of MEC nature and vertical extent is complete.	Geophysical and intrusive investigations shall achieve applicable measurement performance criterion (MPCs) as stated in UFP-QAPP Worksheet #12 and confirmed/modified by Instrument Verification Strip (IVS) Report, unless MPC failures can be adequately explained and/or justified.	*Geophysical Surveys and Anomaly Selection* Transects will be swept to detect and remove MEC in advance of the DGM surveys. DGM surveys performed through the five target areas along transects as shown in the UFP-QAPP. Select anomalies for intrusive investigation. Anomalies considered most likely to be MEC (based on response and other anomaly characteristics) will be selected for investigation. This selection will be submitted to the Army Geophysicist for concurrence prior to intrusive investigations being conducted. *Intrusive Investigation* Intrusively investigate and resolve selected anomalies and draw characterization conclusions to support the preparation of an FS. Dispose of MEC encountered using approved procedures.

State the Problem	Identify the Decision to Be Made	Identify Inputs to the Decision	Define the Study Boundaries	Develop Decision Rules	Specify Limits on Decision Errors	Optimize the Design for Obtaining Data
Munitions Constituents: Past munitions use may have resulted in MC being released to environmental media. If MC contamination is present, it may pose a risk to human and ecological receptors.	The principal question is "Is MC contamination present and, if it is, what is its nature and extent, and does it pose unacceptable risks to human health and the environment?" The possible alternative actions resulting from the principal question are (1) take no further action or (2) conduct a remedial response to address identified unacceptable risks. Based on the above, the project decision statement is: Determine whether MC requires no further action or a remedial response, as needed.	Historical data, including results of previous investigations. Results of geophysical surveys and subsequent intrusive investigation (for determining sample locations). Field sampling data and laboratory analysis results for soil samples. Land use and receptors.	Boundaries of target areas defined on **Figure 1.2**. MC analytes and sample media limited to those listed in CSM. There are no time constraints on data collection.	*Soil Sample Collection and Analysis* • If a previously unidentified cluster (2) of munitions-related items is discovered, then an incremental soil sample will be collected and analyzed for MC analytes. • If a low order or cracked MEC item is discovered, then a discrete soil sample will be collected and analyzed for MC analytes. • If demolition shots are performed, then post-demolition soil samples will be collected at demolition locations. • If incremental or discrete soil samples are collected, then at least three (3) ambient soil samples of the appropriate type(s) will be collected for background comparison. *Analytical Results Evaluation* • If an analyte is detected at a concentration > project action limit (PAL) (3), then that analyte is a chemical of potential concern (COPC). If COPCs are identified, then additional samples may be recommended to evaluate COPC extent based on risk evaluation.	Sampling and analysis shall achieve applicable MPCs as stated in UFP-QAPP Worksheet #12, unless MPC failures can be adequately explained and/or justified.	*Soil Sample Collection and Analysis* Collect incremental soil samples if previously unidentified clusters (2) of munitions-related items is discovered and collect discrete soil samples if a low order or cracked MEC item is discovered. Collect post-demolition soil samples at demolition locations. Analyze soil samples for MC analytes and compare results against PALs (3).

(1) Target Areas include the Trench Target; Artillery Targets 1, 2, and 3; Bridge Target; Wooden Structure Target; and Artillery Targets 4 and 5.
(2) For the investigation at the five target areas, a "cluster" is defined as an estimated surface and subsurface MEC and/or MD density of 50 items or greater located within a 200-foot by 200-foot area. For DGM-surveyed areas, densities will be estimated based on transect coverage and an assumed path width of 2½ feet.
(3) PALs are described in UFP-QAPP Worksheet #15.

Table 2.6 Data Quality Objectives and Technical Approach Summary for Accessible Non-Target Areas, Area A Munitions Response Site, Barry M. Goldwater Range, LAFB, Arizona

State the Problem	Identify the Project Goals	Identify Information Inputs	Define the Boundaries of the Project	Develop Project Approach (Decision Rules)	Specify Project-specific MPCs	Project Design and Workflow
MEC: Evidence of past use as munitions practice target; MEC might remain in the area, so a potentially complete exposure pathway exists and there is a potential hazard to human health and the environment. Therefore, the nature and extent of MEC contamination at the site needs to be characterized to support future remedial action. (Note: MEC contamination is assumed because this is a known former range area.)	The principal question is "What is the nature and extent of MEC contamination at the site?" Because MEC contamination is assumed, the only possible action resulting from the principal question is to conduct a remedial response to address identified risks. Based on the above, the project decision statement is: Determine the nature and extent of MEC present to support a future remedial response, as needed.	Up to date CSM summarizing site conditions. Historical data, including results of previous investigations. Results of instrument-aided visual surveys. Land use and receptors.	Boundaries of Area A and accessible non-target areas defined on **Figure 1.2**. There are no time constraints on data collection.	*Visual Surveys and MEC Characterization* • If visual surveys are completed throughout the accessible non-target areas and observations have been recorded, then the MEC characterization is complete. • If the visual surveys identify a cluster (1) of MEC/MD, then additional DGM transects may be recommended to identify subsurface anomalies and evaluate the extent of MEC contamination.	Visual surveys shall achieve applicable MPCs as stated in UFP-QAPP Worksheet #12, unless MPC failures can be adequately explained and/or justified.	*Visual Surveys* Perform instrument-aided visual surveys through the accessible non-target areas as shown on **Figure 1.2**. Traverse the survey area in a line with nominal 10-foot spacing between each person on the survey line (the spacing adjusted based on field conditions, such as vegetation and visibility). Inventory and record positions of munitions-related items observed during surveys to support the preparation of an FS. Dispose of MEC encountered using approved procedures.
Munitions Constituents: Past munitions use may have resulted in MC being released to environmental media. If MC contamination is present, it may pose a risk to human and ecological receptors.	The principal question is "Is MC contamination present and, if it is, what is its nature and extent, and does it pose unacceptable risks to human health and the environment?" The possible alternative actions resulting from the principal question are (1) take no further action or (2) conduct a remedial response to address identified unacceptable risks. Based on the above, the project decision statement is: Determine whether MC requires no further action or a remedial response, as needed.	Historical data, including results of previous investigations. Results of instrument-aided visual surveys (for determining sample locations). Field sampling data and laboratory analysis results for soil samples. Land use and receptors.	Boundaries of Area A and accessible non-target areas defined on **Figure 1.2** MC analytes and sample media limited to those listed in CSM. There are no time constraints on data collection.	*Soil Sample Collection and Analysis* • If a previously unidentified cluster (1) of munitions-related items is discovered, then an incremental soil sample will be collected and analyzed for MC analytes. • If a low order or cracked MEC item is discovered, then a discrete soil sample will be collected and analyzed for MC analytes. • If demolition shots are performed, then post-demolition soil samples will be collected at demolition locations. • If incremental or discrete soil samples are collected, then at least three (3) ambient soil samples of the appropriate type(s) will be collected for background comparison. *Analytical Results Evaluation* • If an analyte is detected at a concentration > PAL (2), then that analyte is a COPC. • If COPCs are identified, then additional samples may be recommended to evaluate COPC extent based on risk evaluation.	Sampling and analysis shall achieve applicable MPCs as stated in UFP-QAPP Worksheet #12, unless MPC failures can be adequately explained and/or justified.	*Soil Sample Collection and Analysis* Collect incremental soil samples if previously unidentified clusters (1) of munitions-related items is discovered and collect discrete soil samples if a low order or cracked MEC item is discovered. Collect post-demolition soil samples at demolition locations. Analyze soil samples for MC analytes and compare results against PALs (2).

(1) For the investigation at the Accessible Non-Target Areas, a "cluster" is defined as an estimated surface MEC and/or MD density of 50 items or greater located within a 200-foot by 200-foot area.
(2) PALs are described in UFP-QAPP Worksheet #15.

CHAPTER 3 CHARACTERIZATION OF MUNITIONS AND EXPLOSIVES OF CONCERN AND MUNITIONS CONSTITUENTS

3.0.1 The work was conducted in accordance with the performance work statement (PWS) Revision 3 dated March 23, 2018, and the objectives and goals presented in the approved Final UFP-QAPP (Parsons, 2018a), except for the authorized departures described at the end of this chapter. Work completed on this project was performed in accordance with the requirements of CERCLA, as amended, the DERP statute, the NCP and DoD, Army and USACE regulations and guidance.

3.0.2 The RI field work was conducted by dividing the investigation area into two distinct subareas (Target Areas and Accessible Non-Target Areas). The two investigation subareas are identified based on the investigation method: the Target Areas is where DGM was performed, and the accessible non-target areas is where visual surface inspection was completed. Note that, due to accessibility constraints, steep, rugged non-target areas were not included in the RI fieldwork.

3.0.3 The investigation involving the five known target areas covered approximately 174 cumulative acres. A surface sweep of each target area took place to remove surface MEC, MD, or metallic debris that was present. DGM along transects covering 25% or more of each target area took place to identify and select anomalies for intrusive investigation.

3.0.4 In addition to the DGM conducted at the five known target areas, visual surface inspection was completed over 37,122 acres. The visual inspection area was traversed by a sweep team that inventoried and recorded the position of munitions-related items during the inspection. MEC items that were encountered were disposed of using approved procedures. Soil samples were taken following demolition operations using the incremental soil method and analyzed for MC analytes and compared against PALs.

3.1 CULTURAL AND NATURAL RESOURCES PROTECTION

3.1.1 Cultural Resources Protection

3.1.1.1 Cultural resources surveys were conducted by Geo-Marine, Inc. in 2005 for the Pilot Study (Weston, 2005a) and in 2008 for the Final Investigation of Area A Roads (Weston, 2008a) along roadways within Area A. The surveys determined that 10 cultural resources (archeological) sites that are considered eligible for listing on the National Register of Historic Places (NRHP) are located along roads within Area A. During the Intrusive Investigations in 2008, Northland Research, Inc. completed archeological monitoring at 10 sites located within the Area A. The sites monitored included seven prehistoric sites, one historic mining site, and two multi-component prehistoric/historic sites.

3.1.1.2 None of the archaeological sites that were deemed eligible for listing on the National Register of Historic Places discovered in previous investigations were in or near the five known Target Areas. Therefore; no special avoidance measures were needed to be put into place for cultural resources for the DGM and intrusive portions of the RI.

3.1.2 Natural Resources Protection

3.1.2.1 Various measures were used to mitigate environmental impacts during the field effort. In addition to close coordination with the BLM, the following measures were taken during on-site activities for visual inspection, geophysical mapping, intrusive investigations, and soil sampling. It is anticipated that similar measures would be required for future remediation at the site.

- Site-specific training was given on awareness of threatened and endangered species (T&E) species indigenous to the area and proper avoidance procedures.
- Vehicle travel was restricted to existing roads and, when authorized by BLM, along dry drainages. Damage to brush, shrubs, and the native wildlife habitat was minimized. Areas that were impacted by the project were restored to the extent practicable to the previously existing condition.
- No burning took place during this project.
- Emissions sources consisted of site vehicles. All vehicles and equipment were in good working order and met applicable vehicle emissions requirements.

3.2 MUNITIONS AND EXPLOSIVES OF CONCERN CHARACTERIZATION

3.2.1 Overview of Subsurface Characterization

General MEC subsurface characterization tasks conducted in support of this RI included conducting DGM followed by intrusive source investigation of subsurface anomalies. The following subchapters address these tasks, geophysical system verification (GSV), MEC safety, and MEC characterization quality control (QC).

3.2.2 Geophysical System Verification

3.2.2.1 Parsons initiated a GSV as part of the RI at Area A. The purpose of GSV, which involved both the use of an instrument verification strip (IVS) and "blind seeding" of the investigation area, was to demonstrate the DGM instruments and data collection strategies selected for the site functioned as intended for the duration of the field investigation. Blind seeds were emplaced on March 6 and 7, 2021 in accordance with the UFP-QAPP. Fifteen seeds were placed horizontally throughout the 5 target areas at a depth of 23 centimeters (cm). Details of the seeds location and findings can be found in **Appendix J**. An IVS was constructed for Area A to confirm the equipment was functioning correctly, establish baseline expected responses for the test items, verify that the site noise levels were low enough for the planned anomaly selection approach to be effective, and to determine anomaly selection thresholds for the instrument used on the project. Initial IVS data was collected on March 8 and March 11, 2019. The instruments selected for conventional DGM was the PDM8® metal detector. The PDM8® was used due to its maneuverability in the vegetated and treacherous rocky terrain and reduced geological noise associated with the volcanic rock. Details of the IVS results and findings for all instruments are contained in the IVS memorandum located in **Appendix J**.

3.2.2.2 Aside from determining the applicability of the proposed MPCs based on site conditions, the other main purpose of the IVS testing was to establish anomaly selection thresholds for the

PDM8®. The selection thresholds were based on background noise levels set at 10 times the site-specific background noise level, in accordance with the UFP-QAPP.

3.2.3 MEC Investigation

3.2.3.1 DGM Transect Surveys

The objectives of the DGM transect surveys were to determine the nature and vertical extent of MEC across the five known target areas, and to collect the necessary data to meet the specified DQOs (**Table 2.3**). To achieve these objectives, DGM data was collected at ≥ 25% of the target area of interest in each of the five known targets with a PDM8® footprint of 2.5feet. Transect paths (shown on **Figures 3.1a through 3.1e**), positioned with Trimble RTK GPS, were oriented perpendicular to the slope of the terrain where possible to reduce the risk of slips, trips, and falls. Some of the initially planned transects were not used because adverse terrain prevented collecting high quality data. Based on stakeholder input and BLM desire to minimize vegetation disturbance, the PDM8® was used for all transect data collection. The PDM8® adapts to different geologic conditions through ground balancing, which helped to account for the varying background response across the site. The resulting coverage from the transect surveys, collected on March 11 through April 12, 2019, were analyzed in ESRI's ArcView and found to have met the MPCs in the QAPP and **Table 3.1**.

Table 3.1 Target Area DGM Summary and Measurement Performance Criteria for Coverage

Target	Target Area/ MPC Coverage Requirement (acres)	DGM Transect Miles/Acres (1)	MPC Coverage Requirement Met?
Trench	10 / 2.5	9.28 / 2.7	Yes
Artillery 1, 2, and 3	60 / 15	62.48 / 15.3	Yes
Bridge	34 / 8.5	33.68 / 8.7	Yes
Wooden Structure	10 / 2.5	10.7 / 2.5	Yes
Artillery 4 and 5	60 / 15	55.17 / 15.5	Yes

(1) Due to overlapping transects, not every mile of DGM data was able to convert to coverage

3.2.3.2 Anomaly Selection

3.2.3.2.1 The Parsons Geophysicist processed the DGM data using Geosoft's Oasis Montaj and picked peaks along profiles of the sum channel and identified anomalies with responses above the anomaly selection threshold of 30.7 counts as detailed in the IVS Report (**Appendix J**). This threshold, however, as noted in FCR01 (**Appendix K**), was found to be too low; creating numerous false positives during initial intrusive investigation at the Trench Target. In response to the numerous false positives, the results from the initial 50 randomly selected targets in the Trench Target were re-assessed. Over half of the false positives (i.e., no contact or "hot rock")

were associated with low threshold selection (less than 50 counts). Therefore, to reduce the no contact and "hot rock" occurrences, the threshold was revised to 49 counts. In addition, 31 anomalies were added to the Trench Target selection (all above 50 counts) to verify the newer threshold.

3.2.3.2.2 A total of 5,027 anomalies greater than 30 counts were identified across all target areas and 901 were selected for intrusive investigation:

- 300 of 1,298 anomalies selected for intrusive investigation at Artillery Targets 4, and 5
- 300 of 2,703 anomalies selected for intrusive investigation at Artillery Targets 1,2 and 3
- 170 of 415 anomalies selected for intrusive investigation at Bridge Target
- 81 of 319 anomalies selected for intrusive investigation at Trench Target
- 50 of 292 anomalies selected for intrusive investigation at Wooden Structure Target
  A summary of the anomalies is contained in **Appendix J**.

3.2.3.3 Anomaly Reacquisition and Intrusive Investigation

3.2.3.3.1 The objective of intrusive investigation was to characterize the nature and extent (vertical and horizontal) of MEC to include the characteristics of sources (i.e., size, shape, metal composition) recovered from anomalies identified by DGM. The intrusive team navigated to the location of each DGM anomaly selected for investigation using RTK GPS positioning. Once the location was reacquired with the GPS, a marker flag was placed at the location and a 0.5-m radius around the flag was resurveyed using the PDM8® to confirm the selected anomaly.

3.2.3.3.2 Directly following reacquisition, anomalies were excavated with hand tools by qualified UXO technicians on May 9 to May 21, 2021. The intrusive team began the excavation in the location of highest response and continued the excavation until the detection reading had been removed or the area around the 0.5-m search radius was adequately characterized. The results of the intrusive investigation were recorded on the project dig sheets (**Appendix F.1**). The results are discussed in **Chapter 4**. A final reading was taken with the PDM8® at the anomaly location to confirm that the area had been cleared. In addition to the post-intrusive checks by the intrusive team, the UXO QC Specialist (UXOQCS) checked 100% of investigated anomalies to confirm that they were properly resolved in accordance with the approved anomaly resolution SOP. A geophysicist subsequently reviewed the intrusive results and compared the intrusive teams' findings with the geophysical anomalies selected from the DGM data. The intrusive information collected has been determined to be sufficient to determine the nature and extent of the MEC hazard in the site.

3.2.3.3.3 The intrusive teams photographed the excavated items and recorded the following information about those objects:

- Target ID
- Anomaly Type (e.g., Munitions Debris, Small Arms, Other Debris, Mineralized Soil, material potentially presenting an explosive hazard (MPPEH)/MEC, Nothing Found, QC Seed, or Range Related Debris)
- Description (as needed)
- Depth (in)
- Size (length of item in in)
- Weight (approximate in pounds)

- Quantity
- Comments (as needed)
- MEC Type (Discarded Military Munitions or Unexploded Ordnance)
- MD Type (Partial Item, Intact Inert Item, or Fragmentation)
- Nomenclature Category (MPPEH/MEC and Intact Inert MD Items)
- Nomenclature (MPPEH/MEC and Intact Inert MD Items)
- Geophysical Response (pre-excavation and post-excavation)

3.2.3.4 Visual Surface Inspection

3.2.3.4.1 An instrument-aided visual surface inspection of 37,122 acres of accessible non-target areas was performed. These areas were identified in the UFP-QAPP using the ESRI ARCGIS 3D Analyst tool to calculate the percent slope in the study area using the United States Geological Survey National Elevation Dataset. Accessible areas were defined as those less than 20% slope. The visual survey teams comprised of a maximum of 22 people, consisting of two UXO Technician IIIs (one UXO Team Leader), three UXO Technician IIs, and 17 sweep personnel. UXO Technicians II and III carried handheld GPS units. The visual surface inspection occurred over three seasons/stages with mobilizations occurring the day before the start of fieldwork and demobilizations occurring the day after the end of field work. The first stage starting on January 8, 2019, and, due to extreme heat, finishing on May 24, 2019. Stage two took place between the dates of November 5, 2019, and March 18, 2020, demobilization was forced due to the COVID-19 pandemic. The final stage took place between March 1, 2021, and May 5, 2021, at which time the visual surface inspection was completed within accessible areas of Area A.

3.2.3.4.2 Each day prior to the start of field operations each person was required to power on, test, and verify that their analog metal detector (ML3) was operational. If an ML3 failed to power on or operate correctly then it would be replaced with a backup. To complete the surveys, the visual survey team formed a line with three UXO Technician IIs and up to 17 sweep personnel spaced at nominal 10-foot intervals. The UXO Technician IIs were positioned at each end of the line and one in the middle. Two UXO Technician IIIs (one of whom was the team leader) were positioned behind the line to supervise the visual survey team and monitor line spacing. One of the UXO Technician III was permitted to change places with a UXO Technician II on the line, if needed. The nominal 10-foot interval was permitted to be adjusted by the Team Leader based on field conditions, such as vegetation and visibility. The visual survey team traversed the survey area in line formation looking for munitions-related items. Munitions-related items included MEC, MPPEH, MD, and range-related debris. The GPS units carried by the two UXO Technician IIs at each end of the survey line were used to record survey paths for progress-tracking. Each GPS unit was QC tested each morning before field activities were conducted and at the end of each day to ensure accurate GPS recording. **Figure 3.2** shows the tracts recorded during the visual inspection by the field teams. As noted, not every field team member carried a GPS; in addition, dense vegetation and locally steep terrain had to be avoided; therefore, the GPS lines indicated on **Figure 3.2** are not straight lines and small coverage gaps can be observed. A UXOQCS assistant supported the UXOQCS with performing QC checks behind the sweep line per the MPCs. QC inspection was also conducted while carrying a GPS unit. **Figure 3.3** shows the tracts recorded during the QC inspection.

3.2.3.4.3 Munitions-related items observed during the instrument-aided visual surveys were inspected by UXO-qualified personnel for the presence of potential MEC before further action was

taken. The team leader ensured the coordinates and description of munitions-related items encountered were recorded with a hand-held GPS unit and/or data recorder system and marked the item location using a pin flag, spray paint, or other method to indicate the item has been recorded. Representative photographs of items found were also taken.

3.2.4 Munitions and Explosives of Concern Safety

3.2.4.1 Munition with the Greatest Fragmentation Distance

The munition with the greatest fragmentation distance (MGFD) is based on the MEC item that is reasonably expected to be found within the site. The MGFD for Area A was presented in the DoD Explosives Safety Board (DDESB)-approved Explosives Site Plan (ESP) (Parsons, 2018b). The MGFD for Area A was a M117, 750lb, Practice Bomb and the maximum horizontal fragmentation distance was 3,401 feet.

3.2.4.2 Minimum Separation Distance

The minimum separation distance (MSD) is a personnel protective distance based on the characteristics of the MGFD and Department of the Army Pamphlet 385-63 (Department of the Army, 2012). The specific MSDs for Area A were presented in the DDESB-approved ESP (Parsons, 2018b) and the approved Final UFP-QAPP (Parsons, 2018a). MSDs for unintentional detonations were established for nonessential personnel based on the hazardous fragment distance (HFD) of 709-feet for the MGFD. MSDs for intentional detonations were also established for disposal operations, based on the maximum fragmentation distance, horizontal for the MGFD.

3.2.4.3 Exclusion Zones

Exclusion zones (EZs) were established during the RI to protect the public and nonessential personnel from both intentional and unintentional detonations. The primary protective distance used was the MSD for unintentional detonations, which was based on the HFD for the appropriate MGFD (709-feet). These EZ distances were enforced during all intrusive operations at Area A.

3.2.5 Measurement Performance Criteria for MEC-Related Tasks

The field operations for this project involved multiple elements, or "definable features of work." **Table 3.2** summarizes the Measurement Performance Criteria that were established for the definable features of work associated with the MEC-related tasks conducted during the MEC investigation. The quality of these procedures and the related results have been evaluated for compliance with DQOs through a review of overall precision, accuracy, representativeness, comparability, and completeness (PARCC). Note that MPCs are required to indicate that the relevant data are of adequate quality to support project decisions; however, not all definable features of work are related to project decisions and for this reason not all definable features of work have related MPCs. The full list of MPCs evaluated for the RI is included in **Table 3.2**, which also includes a pass/fail decision for each MPC. Failures and other discrepancies noted in the table are described in more detail below.

3.2.5.1 Geophysical Investigation Quality Control

The information pertaining to geophysical QC, including the IVS reports, dig sheets, Microsoft Access Database, Field Change Requests (FCRs), Root Cause Analyses (RCAs), and raw geophysical data for the RI are included as attachments within **Appendices F, J, and K**. For all

non-conformances, root cause analyses were performed and approved, and corrective actions were implemented.

- Coverage: All target areas had 25% coverage.
- Velocity: All datasets contained velocity of 95%< 4 miles per hour.
- Along line: All datasets had 98% of along-line measurement spacings ≤ 0.25m.
- IVS Data Collection: All position offsets for the IVS were less than 0.25m.
- Blind Seeding: All 15 small industry standard object (ISO) blind seeds, buried at 23cm, were detected above the original target threshold and all were within 72.5cm for data collected.
- Target Selection: All anomalies were picked using the original target threshold of 10 times noise level and revised with the threshold of 50 Counts described in Field Change Request (FCR) 01.
- Detection Instrument Function: All instruments used for intrusive operations had a consistent audible response over the IVS.
- RTK GPS: All RTK units were checked out daily with less than 0.3m of known positions.
- Reacquisition Response: All anomalies and reacquisition responses were reviewed
- Anomaly Resolution: All anomalies were resolved.
- Confirmed Removal: All holes were checked by the UXOQC and confirm for resolution.

3.2.5.2 Intrusive Investigation Quality Control

Each anomaly selected for intrusive investigation was resolved. The intrusive team leader documented the source of the anomaly and verified that the anomaly had been adequately characterized. A final reading was taken with the PDM8® at the anomaly location to confirm that the area had been cleared. Any remaining response at an anomaly location was investigated until a depth of 2-foot bgs was reached. In addition to the post-intrusive checks by the intrusive team, the UXO QC Specialist (UXOQCS) checked 100% of investigated anomalies to confirm that they were properly resolved in accordance with the anomaly resolution SOP. A geophysicist reviewed the intrusive results and compared the intrusive teams' findings with the geophysical anomalies selected from the DGM data. The intrusive information collected for Area A has been determined to be sufficient to determine the nature and extent of the MEC hazard in the site.

Table 3.2 Measurement Performance Criteria for MEC-Related Tasks and Status Following Remedial Investigation

Definable Feature of Work (*Data Type*)	Data Quality Indicator(s)	Activity to Assess Measurement Performance and/or QC Sample	Measurement Performance Criteria	Frequency	Action in Event of Failure
DFW 1 **Mobilization**	None	NA	NA	NA	NA
DFW 2A **Visual Surveys** (Global Positioning System [GPS] Functionality)	Accuracy	Operator records coordinates at a known point or monument	Compare measured coordinates with known coordinates to confirm that the offset is < 2 meters (m)	Once daily per instrument	Perform RCA and determine if measured positions are adequate; consider recollecting data if possible. No failures noted.
DFW 2A **Visual Surveys** (Coverage/Detection)	Completeness	1-2 personnel (UXOQCS and/or UXOQCS assistant) will follow behind survey line (50-100 feet in a meandering path	MEC 20mm or larger and munitions related material recorded and marked by survey team	QC personnel check 5-10% of surveyed area per day	Perform RCA and determine corrective action; presumptive corrective action is to conduct immediate remedial training and repeat 200 feet of visual survey prior to the missed item
DFW 2A **Visual Surveys** (MEC Disposal)	Completeness	UXOQCS will track MEC disposal and confirm each item identified has been disposed of by the Demolition Team	MEC 20mm or larger properly disposed of by Demolition Team	For each MEC item recorded by visual survey team	Perform additional disposal of any remaining MEC items
DFW 2B **MEC Surface Clearance** (GPS functionality)	Accuracy	Operator records coordinates at a known point or monument	Compare measured coordinates with known coordinates to confirm that the offset is < 2m	Once daily per instrument	Perform RCA and determine if measured positions are adequate; consider recollecting data if possible

Table 3.2 Measurement Performance Criteria for MEC-Related Tasks, cont'd.

Definable Feature of Work (*Data Type*)	Data Quality Indicator(s)	Activity to Assess Measurement Performance and/or QC Sample	Measurement Performance Criteria	Frequency	Action in Event of Failure
DFW 2B **MEC Surface Clearance** (Coverage/Detection)	Completeness	UXOQCS and/or UXOQCS assistant will sweep a minimum of 10% of surface clearance footprint.	No MEC or metallic objects found larger than 2"x2" on the surface.	A minimum of 10% of each clearance lane (i.e., the path cleared from one pass across the clearance footprint).	Perform RCA and determine corrective action; presumptive corrective action is to conduct immediate remedial training and repeat surface clearance of the affected area.
DFW 3 **DGM Surveys** (Coverage)	Completeness	DGM processor evaluates coverage using Geosoft Coverage Calculation QC tool.	Transects cover 25% of the target area of interest using an instrument footprint of 2.5 feet.	Once per target area.	Collect additional transects to achieve the 25%.
DFW 3 **DGM Surveys** (Velocity)	Precision	DGM processor evaluates velocity using Geosoft Velocity Calculation QC tool.	95% ≤ 4 miles per hour.	Once per dataset (which includes all non-IVS files per team per day).	Perform RCA and determine if any part of data is usable; re-collect unusable data.
DFW 3 **DGM Surveys** (Along line measurement spacing)	Completeness	DGM processor measures the spacing between data points in DGM data.	98% of along-line measurement spacings ≤ 0.25m	Once per dataset (which includes all non-IVS files per team per day).	Perform RCA and determine if any part of data is usable; re-collect unusable data.
DFW 3 **DGM Surveys** (IVS data collection)	Precision	DGM operator collects data over IVS with each instrument to be used [(6)].	Measured responses are greater than target selection threshold. Position offset of seed item targets ≤ 0.25m for real-time kinematic (RTK) GPS positioning.	Twice per day [(1) (2)].	Re-collect affected data [(1)].
DFW 3 **DGM Surveys** (blind seeding)	Precision	UXOQCS or designee places seeds along a marked section of the DGM transect; blind seeds will be small industry standard objects (ISOs) buried at 23 cm bgs [(3)]. After survey, QC Geophysicist checks processed response and interpreted location of blind seed items.	All blind coverage seeds detected with at least 75% of minimum expected response at maximum horizontal offset; positional accuracy of blind seed within 72.5cm for data collected with RTK GPS positioning.	Seeds should be buried such that one seed should be mapped per team per day [(3)(4)].	Re-collect affected data.

Table 3.2 Measurement Performance Criteria for MEC-Related Tasks, cont'd.

Definable Feature of Work (*Data Type*)	Data Quality Indicator(s)	Activity to Assess Measurement Performance and/or QC Sample	Measurement Performance Criteria	Frequency	Action in Event of Failure
DFW 4 **Process Data and Document Anomaly Locations** (Target Selection)	Accuracy	QC Geophysicist confirms all anomalies meeting project requirements are selected and retained in the project's anomaly database.	A detection threshold of ten times the site-specific background noise will be used for the transect survey.	For each survey unit (includes all transect data for a given target).	Reanalyze dataset to select all anomalies meeting project requirements.
DFW 5 **Intrusive Investigation** (Detection Instrument Function – Static Repeatability)	Accuracy	Instrument operator collects static test data over a standard test object at least once daily; compare measured response with expected response.	Consistent audible response over standard items at an IVS (PDM8®).	Once daily per instrument.	Day's reacquisition responses are unreliable and must be re-measured. If anomalies have already been investigated, they must be revisited to confirm they have been resolved.
DFW 5 **Intrusive Investigation** (RTK GPS)	Accuracy	Operator records coordinates at a known point or monument.	Recorded positions should be within 0.3m of known position (5).	Once daily per instrument.	Perform RCA and determine if reacquired locations are reliable; re-check reacquired positions if GPS readings are determined to be unreliable.
DFW 5 **Intrusive Investigation** (Reacquisition Response)	Precision	QC Geophysicist or their designee reviews reacquisition results to confirm they are consistent with initial values.	Recovered items are reasonable given the anomaly response and size (PDM8®).	Weekly at minimum.	Review anomalies not meeting MPC to determine reason the MPC was not met; if necessary, reassign anomaly to field team for verification.
DFW 5 **Intrusive Investigation** (Anomaly Resolution (3))	Completeness	Removal team checks post excavation anomaly response within 0.5m search radius using PDM8®.	No audible signal which can be attributed to a source within the search radius remains (PDM8®).	After resolving DGM anomaly.	Intrusively investigation anomaly source further (down to max. removal depth); if source remains beyond max. removal depth, make note on dig sheet that anomaly source remains and define if hot rocks are the source of the anomaly.
DFW 5 **Intrusive Investigation** (Confirm Removal)	Completeness	Reacquisition/intrusive location will be performed as described in **Standard Operating Procedure (SOP) DGM-05**. All holes will be checked as described in DFW for anomaly resolution by UXOQCS.	All anomalies are resolved (6).	Following lot (7) completion.	Resurvey all anomalies in affected lot (7); prepare and submit RCA.

Table 3.2 Measurement Performance Criteria for MEC-Related Tasks, cont'd.

Definable Feature of Work (*Data Type*)	Data Quality Indicator(s)	Activity to Assess Measurement Performance and/or QC Sample	Measurement Performance Criteria	Frequency	Action in Event of Failure
DFW 6 **MPPEH Handling, Certification, and Disposal** (*MPPEH/MEC Identification*)	Accuracy	UXOQCS verifies identification of MEC items using review of photographs	MEC item correctly identified	Daily	Revise dig sheet records; re-brief field personnel
DFW 6 **MPPEH Handling, Certification, and Disposal** (*MEC Disposal Complete*)	Completeness	SUXOS verifies complete destruction of item(s)	All energetic materials (donor explosives and MPPEH/MEC) in disposal shot are consumed by the explosion and there are no kick-outs	Per event	Perform additional disposal of any remaining materials
DFW 6 **MPPEH Handling, Certification, and Disposal** (*Material Documented as Safe [MDAS] Certified*)	Completeness	UXOQCS audits MPPEH management	MDAS is segregated from other materials, stored in locked container, and accounted for by weight and quantity; chain of custody (COC) and final disposition accounted for on DD Form 1348-1	As required.	Rectify non-conformance immediately; re-brief and retrain, or replace, personnel
DFW 6 **MPPEH Handling, Certification, and Disposal** (*MDAS Disposal Complete*)	Completeness	Parsons PM confirms MDAS containers shipped to approved facility for proper disposal	Disposal documentation received and on file for all MDAS transported off site	After each shipment of MDAS off site	Contact disposal facility to con-firm destruction; request copies of disposal documentation
DFW 7 **Donor Explosives Management** (*Appropriate Explosives Delivered*)	Accuracy	Demolition Team Leader (DTL) and UXOQCS reconciles delivery documents with explosives ordered and received	Quantity of explosives ordered and received match delivery documents	Each explosives delivery	Immediately report discrepancies to SUXOS and Parsons PM Parsons PM notifies USACE PM and contacts explosives distributor to reconcile differences
DFW 7 **Donor Explosives Management (All Explosives Accounted For)**	Accuracy	DTL and UXOQCS reconcile entries on Explosives Usage Record(s) and Magazine Data Card(s) through physical count	Quantity of explosives used correctly entered	End of each MEC disposal	Correct entry

Table 3.2 Measurement Performance Criteria for MEC-Related Tasks, cont'd.

Definable Feature of Work (*Data Type*)	Data Quality Indicator(s)	Activity to Assess Measurement Performance and/or QC Sample	Measurement Performance Criteria	Frequency	Action in Event of Failure
DFW 7 **Donor Explosives Management** (*All Explosives Consumed or Returned*)	Completeness	DTL and UXOQCS record all returned or transferred items on Magazine Data Card(s)	All unused explosives either disposed of by detonation or custody and accountability have been transferred back to the distributor	End of project	Correct entry or report discrepancies to SUXOS and Parsons PM
DFW 8 **MC Sampling and Analysis**	See **Section 3.4** for analytical MPCs.				
DFW 9 **Demobilization**	None	NA	NA	NA	NA

(1) It is intended that the IVS be collected twice a day for DGM surveys. However, weather may result in days during which there is no end-of-day IVS data collection. Submittals will not be failed. The results of that day's morning IVS data collection, previous and subsequent days' IVS results will be considered in determining the acceptability of the data in question.

(2) IVS will be rerun after instrument changes (including repairs) or with personnel changes.

(3) If the survey team fails to see the flagged seed item (or marking of the item is disrupted in some way) and does not cross over the item, this will not constitute a failure.

(4) It is intended at least one blind seed item be mapped per team per day, and the number of seeds placed during the project will be determined with this in mind. However, equipment problems, weather, and/or survey progress may result in days during which no seed items are crossed. Submittals will not be failed if a blind seed item is not crossed. The results of that day's IVS data collection and previous and subsequent days' blind seed item results will be considered in determining the acceptability of the data in question.

(5) The reacquisition locations of PDM8® anomalies will be checked versus the picked location to ensure that the correct location was investigated.

(6) Resolved is defined as (a) no geophysical signal remains at the flagged/selected location, or (b) signal remains but it is too low or too small to be associated with MEC, or (c) signal remains but is associated with fixed or surface material which when moved results in low, or no signal at the interpreted location, or (d) signal remains and a complete rationale for its presence exists (rationale for remaining signal includes item being present at greater than the specified removal depth). For situations (c) or (d), the removal team will make a note on the dig sheet explaining the reason for the remaining signal.

(7) For the purposes of these MPCs each anomaly will be checked for resolution and therefore each anomaly will be considered a separate "lot".

3.2.5.3 During RI fieldwork, four RCAs were completed documenting MPC failure (and the corrective action). The RCAs are in **Appendix K**, References. The RCAs are summarized as follows:

1. RCA01 (February 15, 2019): The team performing surface clearance within target area 4 & 5 did not recover a metallic item larger than 2" x 2". The UXOQCS found a metal can measuring 5" x 2.5". The team was re-trained, and the area was re-swept.
2. RCA02 (March 6, 2019): The visual inspection surface sweep team missed an item larger than MPC (12" x 2" piece of metal) in Grid D5. Item was not on bare ground and difficult to see. Re-training included an emphasis on speed and thoroughness of the visual inspection team. The team re-swept 200' prior to the missed item.
3. RCA03 (March 7, 2019): The visual inspection surface sweep team missed and munitions-related item (LUU-2 flare body) in Grid E5. Re-grouping after avoidance of a steep slope caused a gap in the line; the team was re-trained and avoiding gaps after a steep slope was emphasized. The team re-swept 200' prior to the missed item.
4. RCA04 (March 8, 2019): The visual inspection surface sweep team missed and munitions-related item (BDU-33 practice bomb) in Grid D5. Walking across a steep slope caused a gap in the line; the team was re-trained and maintaining correct distance along a steep slope was emphasized. The team re-swept 200' prior to the missed item.

3.2.5.4 It is noted that each of the RCAs for MPC failure occurred during the beginning of the first field season. After the initial MPC failures, the team was able to adjust and correct the speed and distance between personnel to effectively execute the scope of work while meeting the quality objectives. Each acre of surface inspection and each anomaly intrusive investigation passed government quality assurance (QA) inspection. Copies of the USACE QA Reports (Form 6048s) are included in **Appendix K**.

3.3 UXO/MPPEH MANAGEMENT AND DISPOSITION

All surface MEC encountered during the surface inspection was logged, GPS marked, and reported to USACE and BLM. One BIP was necessary of a M117, 750lb, Practice Bomb as it was too large to relocate. With concurrence from the Project Team, including on-site OESS, surface MEC findings were transferred to a collection area within the MRS. The MEC were disposed of by detonation on the dates of March 22, 2019, May 22, 2019, December 18, 2019, March 12, 2020, April 02, 2021, and May 04, 2021 (**Appendix D** contains detailed demolition operations information).

3.4 MUNITIONS CONSTITUENT CHARACTERIZATION

3.4.1 Overview

3.4.1.1 To support the characterization of soil, samples for MC analysis were collected during the RI at Area A. The objective of this definable feature of work (DFW) was to determine whether activities at the site have resulted in a release of MC to soil, to refine the nature and extent of MC contamination if there had been a release, and to evaluate the risk to human health and the environment from MC contamination that might be present. Since soil samples were collected, background samples were also collected for results comparison.

3.4.1.2 During prior investigations, discrete soil samples were collected at and around target centers and were analyzed for explosives and metals. MC was not detected in any of the samples collected at concentrations exceeding Arizona Soil Remediation Levels. For this reason, additional soil samples were only to be collected if:

- Previously unidentified MEC-contaminated areas (i.e., elevated density areas of MEC/MD) are observed.
- Low order/breached MEC items are found.
- Demolition shots are conducted (post-demolition samples collected).

3.4.2 Munitions Constituents Investigation

3.4.2.1 No elevated density areas of MEC/MD were observed during the RI and no low order/breached MEC items were identified; therefore, only post-demolition sampling was conducted. **Figure 3.4** shows the sample locations. ISM sampling was implemented to collect post-demolition soil samples. The Incremental Sampling Methodology (ISM) was determined to provide a more accurate measure of the mean concentration of contaminants in an area (the "sampling unit", or SU) by providing reproducible, scientifically defensible data. ISM sampling involves defining one or more SUs to be sampled within an area known as the decision unit (DU), from which multiple "sample increments" are collected and composited into a single "incremental sample" for each SU. The process for collecting incremental samples involves designating the incremental sample collection grid, determining the sampling interval, selecting the sample collection origin, and collecting the sample increments. Samples were collected consistent with the Soil Sampling SOP (ENV-01 Rev03) incorporated into the Area A UFP-QAPP.

3.4.2.2 A total of 5 post-demolition ISM surface samples were collected, plus an additional three ISM background samples. Consistent with the UFP-QAPP and FCR04, each incremental sample consisted of 50 increments collected from 0 to 2 inches bgs (surface soil). Although 6 demolition events occurred, only 5 post-demolition ISM surface samples were collected because one demo location (BMGR-ANT-DU01-002-0-2, Figure 3.4) was utilized for two demolition operations.

3.4.2.3 Three surface SUs were collected to determine the naturally occurring concentrations of metals at Area A. These three background ISM samples were analyzed for MC metals (barium, chromium, copper, and lead) only. An explanation of the background threshold value (BTV) and its role in determination of the PALs is described further in **Section 3.4.4.** The analytical results of the background samples are presented in **Appendix B**.

3.4.2.4 All ISM samples, including background samples, were collected in accordance with the approved UFP-QAPP (Parsons, 2018a) and FCR04 (copies of both these documents are in **Appendix K**).

3.4.3 Analytical Laboratory and Analyses

3.4.3.1 All samples were shipped to APPL, Inc. in Clovis, CA for analysis. The samples were analyzed in accordance with the approved Final UFP-QAPP (Parsons, 2018a). Analytical data were verified using both editorial and technical reviews. Laboratory extraction, analytical methods, and target analytes were conducted in accordance with the approved Final UFP-QAPP (Parsons, 2018a).

3.4.3.2 The analytical data generated during the sampling effort were validated by the Parsons Project Chemist in accordance with the requirements identified in the approved Final UFP-QAPP (Parsons, 2018a). The validation included requirements in DoD Quality System Manual (QSM) Version 5.1. Data validation reports were generated by the project chemist for all data packages and are provided in **Appendix B** of this report. The validation reports state that some data results are considered estimated due to the reasons cited below, however, all results qualified as estimated are usable for purposes of the project. As described in detail in the data validation reports (**Appendix B**), reasons for data results being considered estimated include:

- Precision infractions due to column confirmation and field triplicate exceedances;
- Matrix spike/matrix spike duplicate (MS/MSD) and post digestion spike (PDS) recovery exceedances;
- Blank contamination; and
- Professional judgement due to deviation from the project specific UFP-QAPP (Parsons, 2018a).

All sample results for chromium, however, were qualified "R" as rejected, except for sample BMGR-ANT-DU01-005-0-2 (which was J-flagged), due to significant contamination demonstrated by the grinding blank. Rejected samples failed the completeness and representativeness validation criteria. While the rejection of the chromium data presents a data gap for chromium specifically, when the data are viewed in their entirety, the weight of evidence is that there is no evidence of a release of MC from munitions related activities conducted at the site (specifically the demolition shots). No other metals or explosives were present at concentrations greater than PALs. Since chromium is a minor constituent of ordnance when compared to the other MC metals, the absence of usable chromium data is not a critical flaw. These chromium results were not considered usable for project decision making; however, this does not affect the conclusions of the RI Report.

3.4.4 Selection of Project Action Limits

3.4.4.1 This section provides the parameters to be analyzed and their associated detection limits (DLs), limits of detections (LODs), and LOQs to satisfy overall DQOs. This information is provided by the analytical laboratory. The PALs, as referenced in the DQOs, are also included as **Table 3.3**. The PALs for this RI are the lower of the Human Health and Ecological Screening Values. As presented in the Final UFP-QAPP (Parsons 2018a), the human health screening values are the USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, Residential Soil, Target Risk = 1E-06; Target Hazard Quotient = 0.1, while ecological screening values are the USEPA Ecological Soil Screening Levels, supplemented by values from the Los Alamos National Laboratory EcoRisk Database.

3.4.4.2 Metals are naturally occurring. The site-specific background was based on the results of the incremental soil samples collected to determine the naturally occurring concentrations of metals at the site. Background samples were collected from low anomaly-density areas to determine site-specific background data for Area A. Comparison to background included comparison of site samples to a background threshold value (BTV). Because the BTV is to be used for point-by-point individual site observation comparisons, an upper percentile, Upper Prediction Limit (UPL), or Upper Tolerance Limit (UTL), should be used. Since the objective is to verify exceedances of samples of interest in comparison to background samples, the UPL is

more appropriate. A 95% UPL value denotes that there is 95% confidence that a single sample from an established population will fall below the BTV. With background sampling of size 3, shape distributions cannot be verified so nonparametric UPL should be used. Note since the background sample size is 3, the 95% UPL corresponds to the maximum background sample value for each variable of interest. MC soil sample locations are shown on **Figure 3.2.**

3.4.5 MC Characterization Quality Control and Quality Assurance

Sampling activities were conducted in accordance with the approved Final UFP-QAPP (Parsons, 2018a). The UFP-QAPP addressed the DQOs, analytical methods, specific QA and QC activities, laboratory requirements, and data validation activities required to achieve the MC data quality goals of the project.

3.5 SIGNIFICANT EVENTS

3.5.1 COVID-19

3.5.1.1 The COVID-19 pandemic that befell the world in late February, early March 2020 suspended field efforts on March 16, 2020. Due to its highly contagious nature and lack of knowledge on the virus at the time, the RI was suspended indefinitely. Fortunately, as information about COVID-19 became more abundant along with preventative measures, remobilization began again on March 1, 2021.

3.5.1.2 Following re-mobilization, health and safety precautions were implemented to reduce the chances of infection of COVID-19. All employees were required to perform health monitoring each day before work began. Despite field work occurring out in the open, when social distancing could not be achieved (mobilizing to site via UTV), workers were required to wear a face covering.

3.6 DEPARTURES FROM PLANNING DOCUMENTS

3.6.1 Area A MRS was investigated in accordance with the approved Final UFP-QAPP (Parsons, 2018a) with the following deviations as detailed in the Field Change Request (FCR) Forms (**Appendix K**):

- FCR-01, dated May 10, 2019, changed the detection threshold from ten times the site-specific background noise at the IVS to a threshold of 50 Counts on the Sum Channel. The reason for this change was to reduce the number of false positives (over 50% for 50 randomly selected Trench Target anomalies). Adjusting the target lists to intrusively investigating anomalies above the 50-count threshold increased the data usability.

- FCR-03, dated February 18, 2020, allowed for field teams to use electronic logbooks instead of hard copy logbooks. The reason for this change was to allow for more flexibility in how field notes are recorded and stored (easier to save/archive and less likely to lose information). They also allow for more efficient and consistent data documentation, storage, and QC. There were no negative impacts associated with this change.

- FCR-04, dated February 18, 2020, was made to clarify conflicting text within the UFP-QAPP regarding the sampling method used at demolition locations. The change to

the UFP-QAPP took place in Worksheet 18, Table 18.1; third row, fourth column under "Sample Type", changed from Discrete to Incremental (50 increments) and fifth column under "Depth" from 0-6 in. bgs to 0-2 in. bgs.

- FCR-05, dated March 9, 2020, applied to UFP-QAPP Appendix E- Explosives Management Plan. The FCR requested to clarify how intact small arms ammunition (SAA) will be included in demolition operations. Intact SAA has a much lower explosive risk than conventional MEC and therefore was consolidated on site until the next demolition operation for a conventional MEC item occurred or until one week prior to demobilization from the site. This change reduced the amount of demolition operations conducted which increased productivity and cost efficiency.

3.6.2 Note that FCR-02 was not implemented (and is skipped in the count). No other departures from planning documents occurred about the RI performed at Area A.

Table 3.3 Project Action Limits and Reference Limits for Metals in Soil (SW846 6020A)

Analyte	CAS Number	Project Action Limits (mg/kg) [1]	Background Threshold Value (mg/kg) [2]	Achievable Laboratory Limits		
				LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
Barium	7440-39-3	330	128	0.25	0.20	0.07
Chromium	16065-83-1	26	N/A	0.5	0.20	0.07
Copper	7440-50-8	28	13.4	2.5	0.20	0.04
Lead	7439-92-1	11	36.3	0.1	0.05	0.02

(1) The values are the lesser of the human health screening value and ecological screening level. Human health screening value selected from USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, residential soil, target risk = 1E-06; Target Hazard Quotient = 0.1. Updated May 2018. Available at: https://semspub.epa.gov/work/HQ/197235.pdf.
Ecological screening value selected from USEPA Ecological Soil Screening Levels. Lowest value of plant, invertebrates, mammals, and avians. Various dates. Available at: https://www.epa.gov/chemical-research/interim-ecological-soil-screening-level-documents.

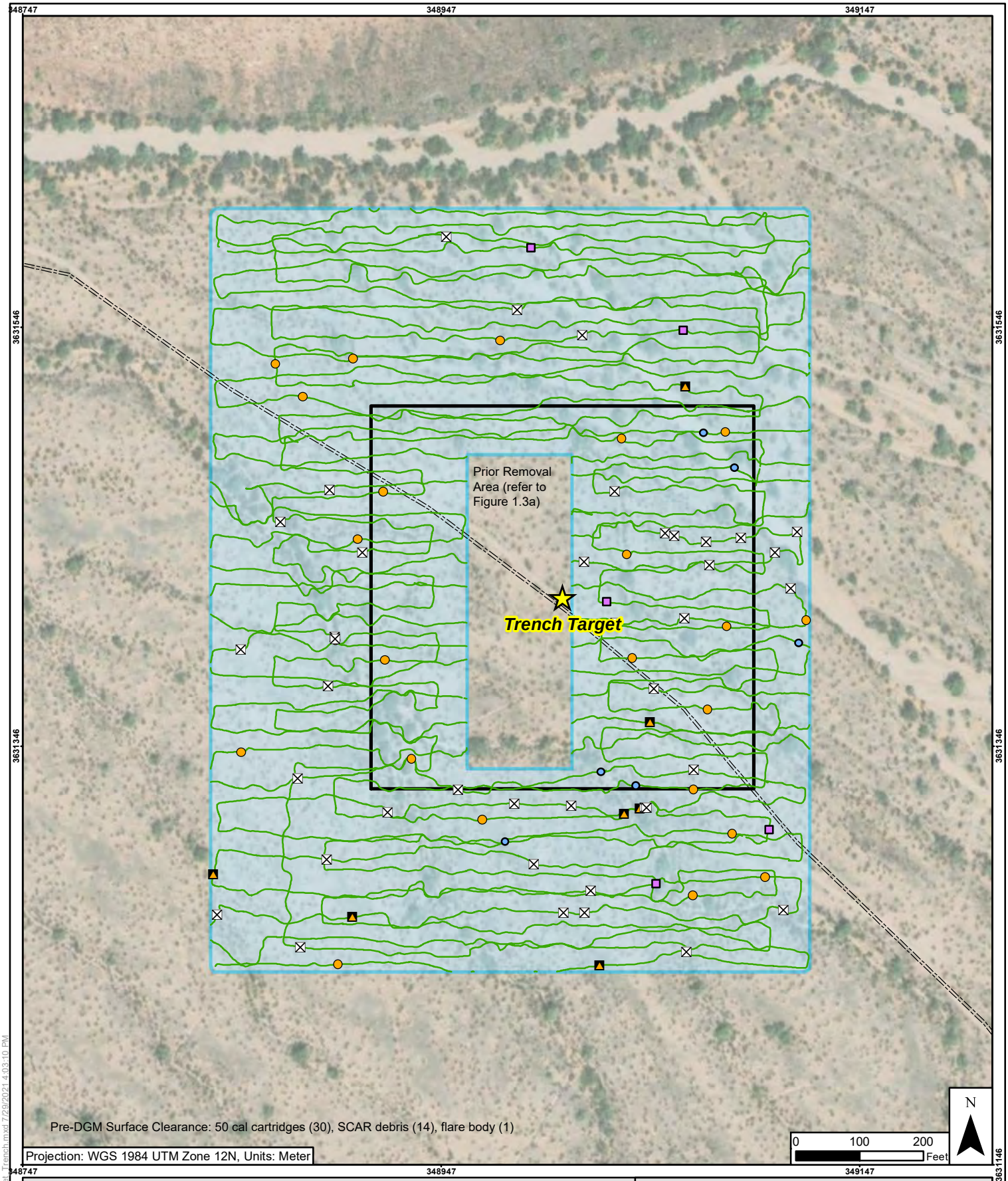
(2) Background Threshold Value is UPL or as stated in the text, the maximum background concentration.

Table 3.3 Project Action Limits and Reference Limits for Explosives in Soil (SW846 8330A and 8330B)

Analyte	CAS Number	Project Action Limits (mg/kg)	Achievable Laboratory Limits (2)		
			LOQ (1) (mg/kg)	LOD (mg/kg)	DL (mg/kg)
2-Amino-4,6-dinitrotoluene	35572-78-2	14	0.10	0.075	0.0340
4-Amino-2,6-dinitrotoluene	19406-51-0	12	0.10	0.075	0.0340
1,3-Dinitrobenzene	99-65-0	0.072	0.10	0.075	0.0220
2,4-Dinitrotoluene	121-14-2	1.7	0.10	0.075	0.0275
2,6-Dinitrotoluene	606-20-2	0.36	0.10	0.075	0.0310
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	2.3	0.10	0.075	0.0255
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	479-45-8	1.5	0.10	0.075	0.0375
Nitrobenzene	98-95-3	2.2	0.10	0.075	0.0275
Nitroglycerin	55-63-0	0.63	0.20	0.150	0.0606
2-Nitrotoluene	88-72-2	3.2	0.10	0.075	0.0375
3-Nitrotoluene	99-08-1	0.63	0.10	0.075	0.0375
4-Nitrotoluene	99-99-0	21	0.10	0.075	0.0375
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	16	0.10	0.075	0.0375
Pentaerythritol tetranitrate (PETN)	78-11-5	13	0.50	0.250	0.1080
1,3,5-Trinitrobenzene	99-35-4	10	0.10	0.075	0.0130
2,4,6-Trinitrotoluene	118-96-7	3.6	0.10	0.075	0.0310

(1) Human health screening value selected from USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, residential soil, target risk = 1E-06; Target Hazard Quotient = 0.1. Updated May 2018. Available at: https://semspub.epa.gov/work/HQ/197235.pdf as shown in Table 3.1 of the Remedial Action Work Plan (Appendix G).
Ecological screening value selected from USEPA Ecological Soil Screening Levels. Lowest value of plant, invertebrates, mammals, and avians. Various dates. Available at: https://www.epa.gov/chemical-research/interim-ecological-soil-screening-level-documents. If no value available, used ecological screening value selected from Los Alamos National Laboratory EcoRisk Database. Release 4.1, September 2017. Available at: http://www.lanl.gov/environment/protection/eco-risk-assessment.php as shown in Table 4.1 of the Remedial Action Work Plan (Appendix G). Since there are no Ecological Soil Screening Levels available for explosives, the Los Alamos National Laboratory values are used as the primary source of ecological screening values.

(2) Yellow highlighted values indicate that the value is greater than the PAL.



Legend

- Small Arms (22)
- Hot Rock
- Munitions Debris
  - SCAR debris (4), Frag (2)
- QC Seed *
- Other Debris (scrap)
- Nothing Found
- DGM Transect
- Center of Target
- Unpaved Road
- Surface Clearance Footprint
- Target Area

* QC seed was placed. Targets for investigation were randomly selected and the QC seed target was not selected for intrusive.

Figure **3.1a**
Subsurface Results
Trench Target

Barry M. Goldwater Range
Luke AFB, Arizona

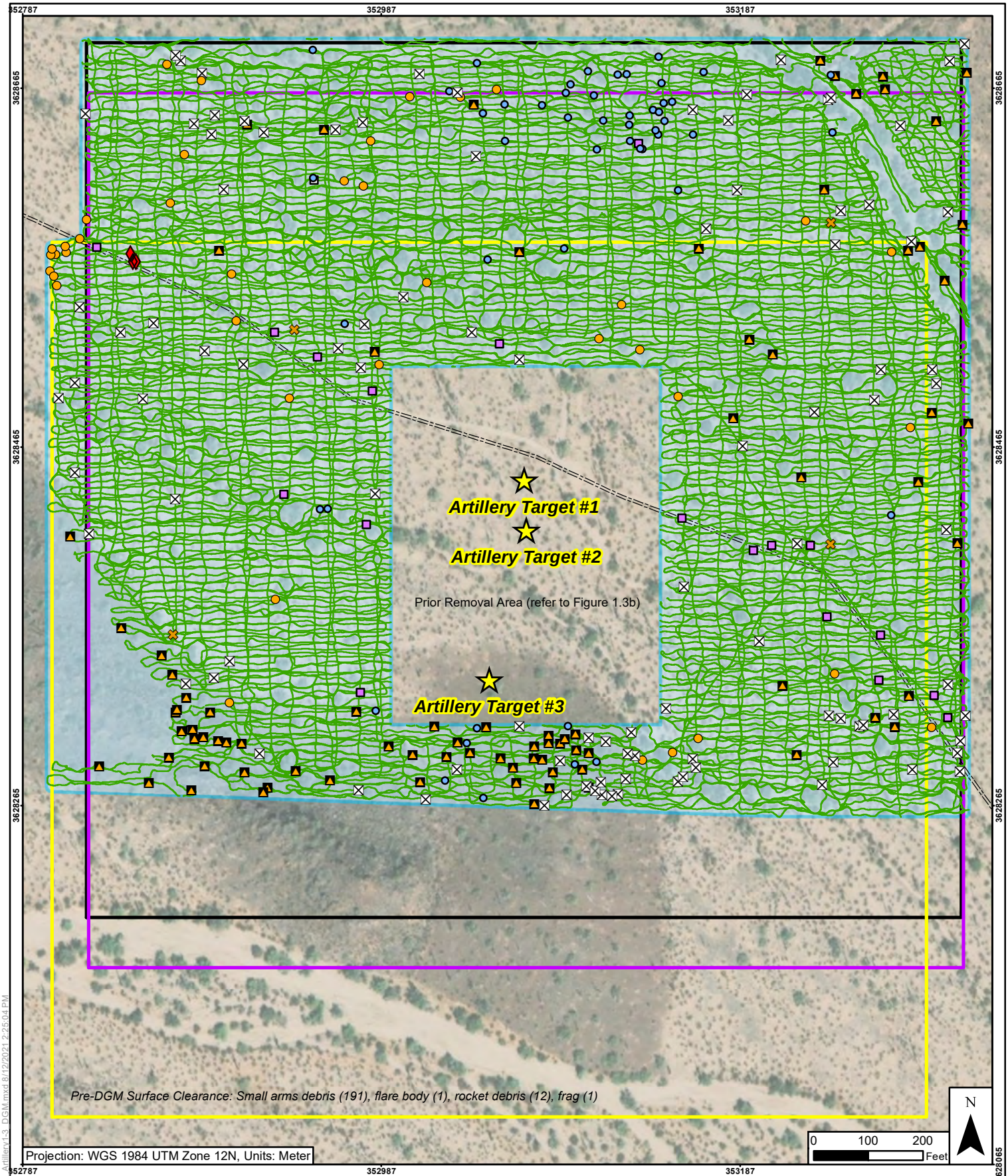
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Legend

OE Type

- MEC *(5.56mm Blanks Small Arms)*
- Small Arms
- Hot Rock
- Munitions Debris
- QC Seed
- Other
- Other Debris
- Nothing Found
- DGM Transect

Rocket debris (64), Flare (1), 20mm (3), Frag (4)

- Center of Target
- Unpaved Road
- Surface Clearance Footprint
- Artillery Target #1
- Artillery Target #2
- Artillery Target #3

Figure 3.1**b**
Subsurface Results
Artillery Targets 1,2 and 3

Barry M. Goldwater Range
Luke AFB, Arizona

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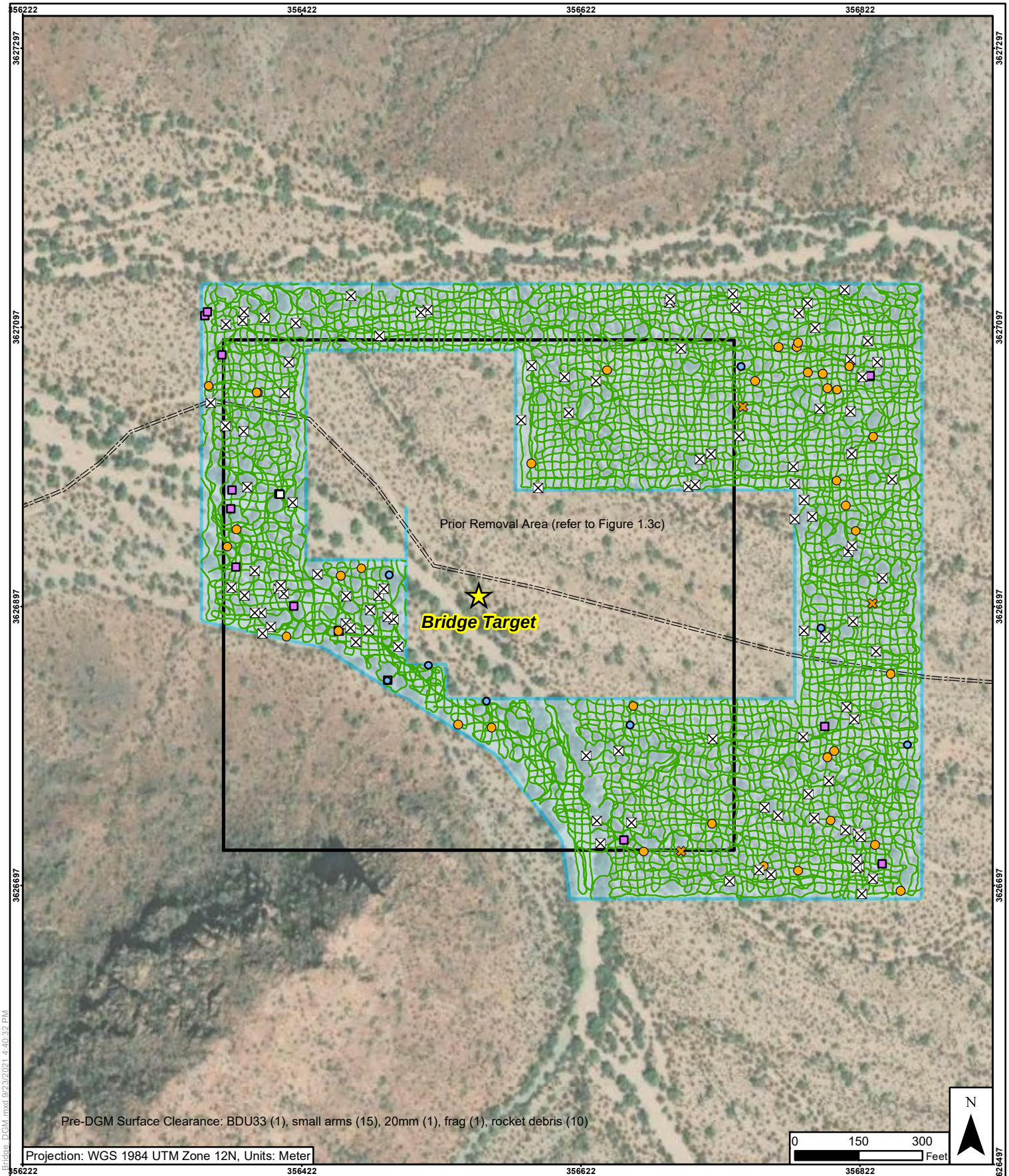
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Legend

- Small Arms (38)
- Hot Rock
- Munitions Debris
  SCAR debris (9), Flare (1)
- QC Seed
- Other Debris
- Nothing Found
- DGM Transect
- Center of Target
- Unpaved Road
- Surface Clearance Footprint
- Target Area

Figure 3.1c
Subsurface Results
Bridge Target

Barry M. Goldwater Range
Luke AFB, Arizona

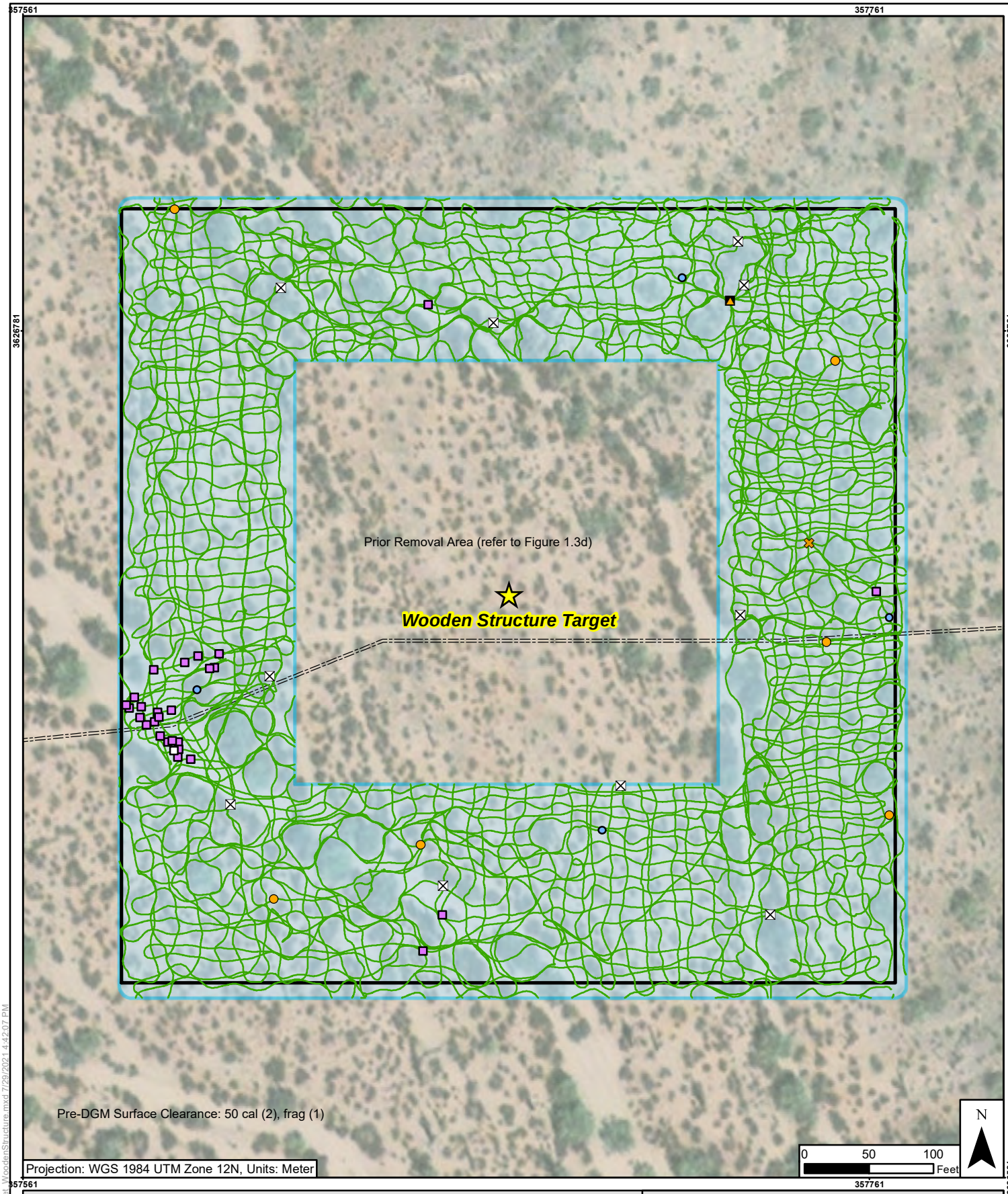
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Legend

- Small Arms (6)
- Hot Rock
- Munitions Debris
  SCAR debris (1), Frag (2), flare (1)
- QC Seed
- Other Debris (scrap)
- Nothing Found
- DGM Transect
- Center of Target
- Unpaved Road
- Surface Clearance Footprint
- Target Area

Figure **3.1d**
Subsurface Results
Wooden Structure Target

Barry M. Goldwater Range
Luke AFB, Arizona

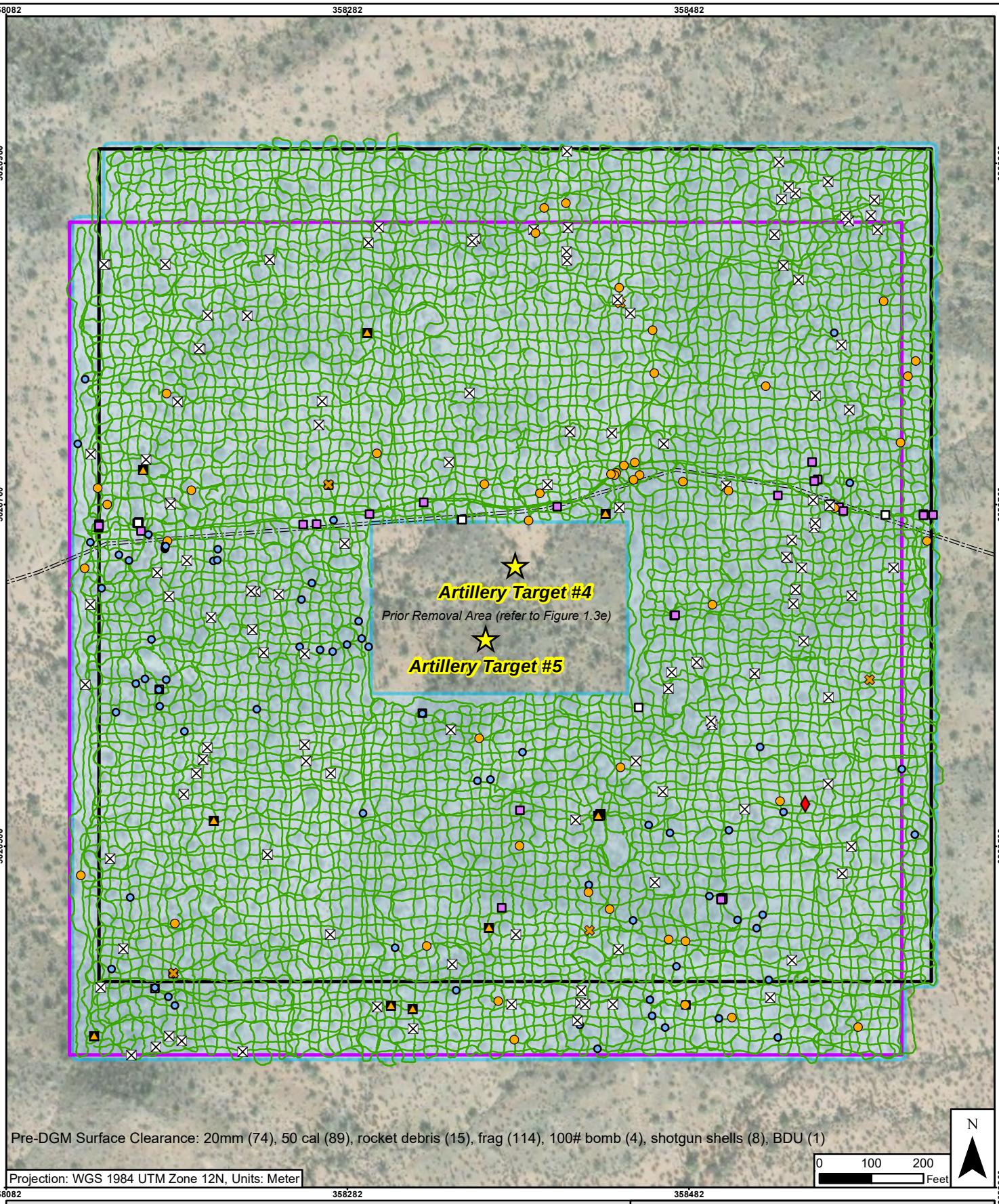
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Legend

OE Type

- MEC *(20mm TP)*
- Small Arms
- Hot Rock
- Munitions Debris
- QC Seed
- Other
- Other Debris
- Nothing Found
- DGM Transect
- Center of Target
- Unpaved Road
- Surface Clearance Footprint
- Artillery Target #4
- Artillery Target #5

20mm (13), Rocket debris (16), frag (40), 3# bomb (2), 100# bomb (1)

Figure 3.1**e**
Subsurface Results
Artillery Target 4 and 5

Barry M. Goldwater Range
Luke AFB, Arizona

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Figure 3.2
Visual Inspection Sweep Team Transects
Former Area A

Barry M. Goldwater Range
Luke AFB, Arizona

Area A
MRS

Barry M.
Goldwater
Range

Legend

- Visual Surface Transects
- Unpaved Road
- Area Found Inaccessible
- Inaccessible Areas
- Area A MRS
- Barry M. Goldwater Range Boundary

Image Source: ESRI Online



Projection: WGS 1984 UTM Zone 12N, Units: Meter

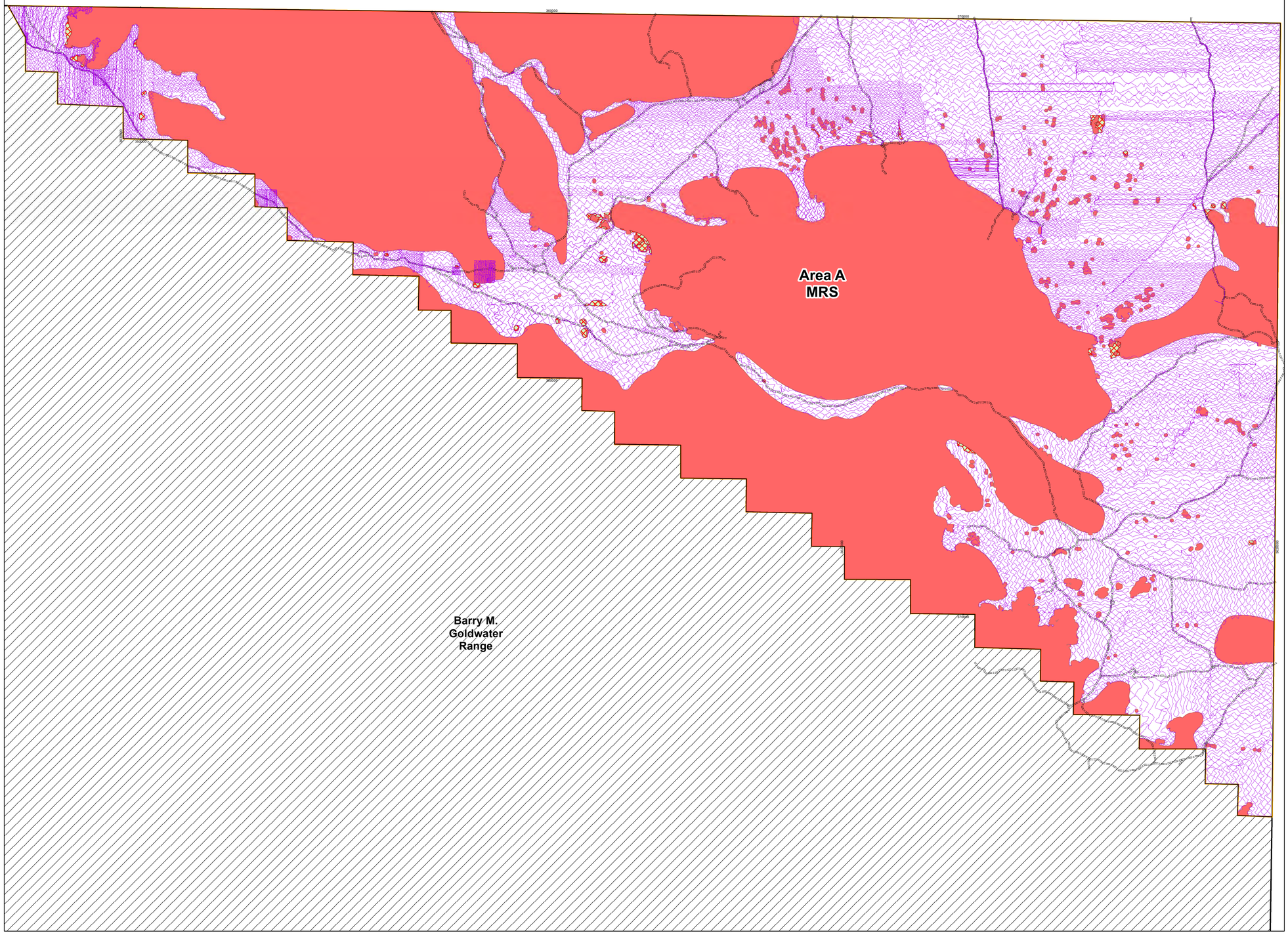
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Figure 3.3
Visual Inspection QC Transects
Former Area A

Barry M. Goldwater Range
Luke AFB, Arizona



Legend

- QC Surface Sweep Transects
- Unpaved Road
- Area Found Inaccessible
- Inaccessible Areas
- Area A MRS
- Barry M. Goldwater Range Boundary

Image Source: ESRI Online



Projection: WGS 1984 UTM Zone 12N, Units: Meter

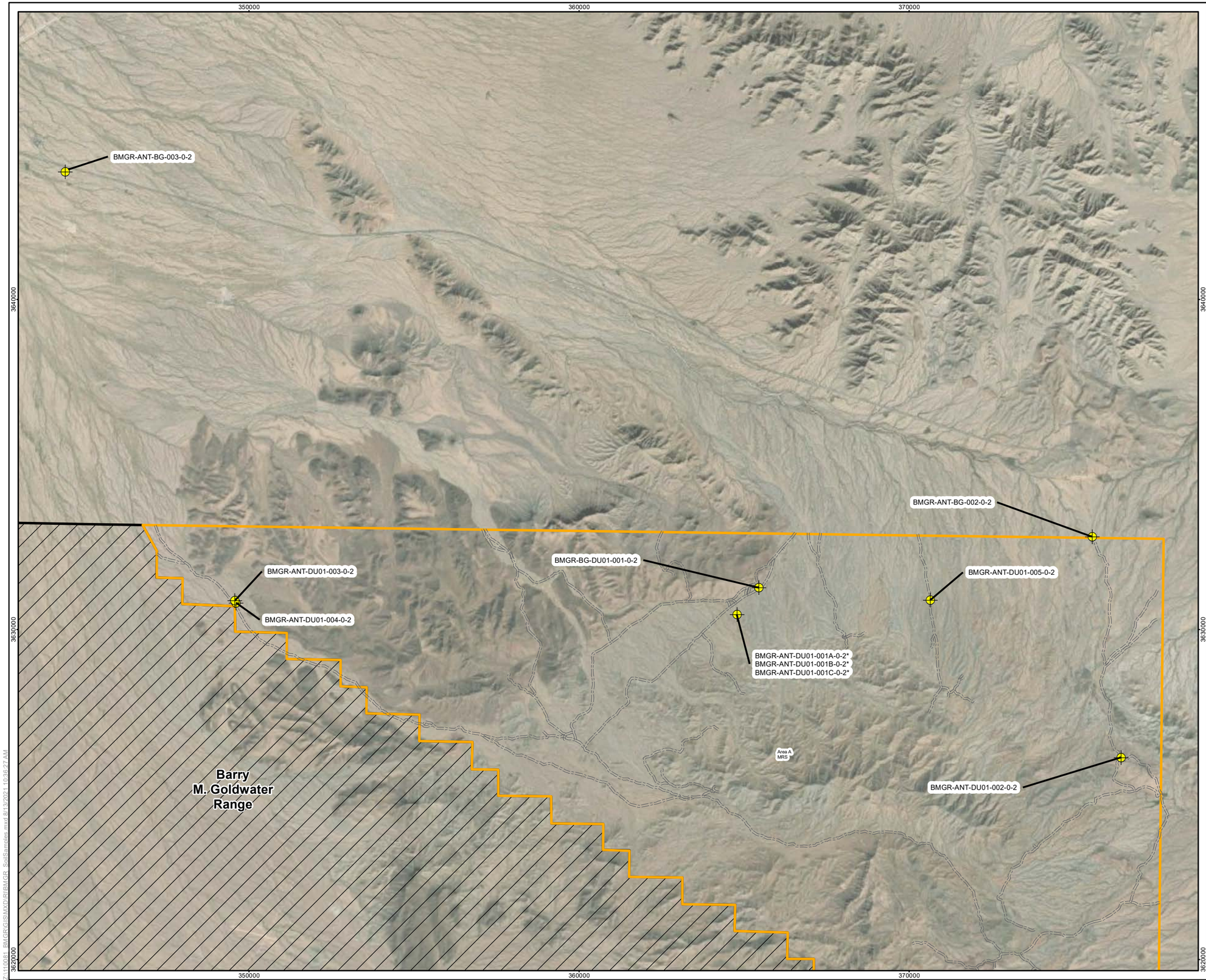
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Figure 3.4
MC Sampling and Background Locations

Barry M. Goldwater Range
Luke AFB, Arizona



Legend

- Soil Samples (8)
- Unpaved Road
- Area A MRS
- Barry M. Goldwater Range Boundary

Image Source: ESRI Online



Projection: WGS 1984 UTM Zone 12N, Units: Meter

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CHAPTER 4 REVISED CONCEPTUAL SITE MODEL AND REMEDIAL INVESTIGATION RESULTS

RI activities were conducted at Area A MRS over three separate field seasons between January 2019 and May 2021. Field season one ended in May 2019 due to increasing, unsafe temperatures in the desert. Field season two started in November 2019 but was cut short in March 2020 due to the COVID-19 outbreak. Field season three lasted from March 2021 until early May 2021. This chapter presents the results of the MEC and MC investigations and at the end, describes the estimated extent of contamination.

4.1 MUNITIONS AND EXPLOSIVES OF CONCERN CHARACTERIZATION RESULTS

As described in **Chapter 3**, MEC characterization at Area A MRS included surface removal followed by DGM around five target locations, and subsequent intrusive investigation of selected DGM subsurface anomaly sources. The MEC characterization also included visual inspection over more than 37,000 acres (e.g., non-target areas with slopes less than 20%). This subchapter describes the results of the MEC activities and investigations.

4.1.1 MEC Investigation Results

4.1.1.1 Transect-based DGM data were collected at five target areas to identify anomalies for intrusive investigation. The intrusive investigation was completed as described in the Final UFP-QAPP. The results of the DGM intrusive investigation are presented in **Table 4.1a**. A total of 901 out of 5,027 anomaly sources were intrusively investigated across the five targets. A summary of visual inspection results is presented in **Table 4.1b**. **Table 4.1c** summarizes the MD recovered during the target area surface sweep and target area intrusive investigation and observed during the visual inspection. As shown, most of the MD was associated with SAA. Other MD present within the Target Areas is consistent with prior removal actions (Weston, 2008b).

4.1.1.2 **Table 4.2** contains a complete list of the MEC recovered at the site during the RI, which includes items found during the target area surface sweep, target area intrusive investigation and during visual inspection. The locations and types of all MEC recovered during the project are shown on **Figure 4.1**.

4.1.1.3 The preliminary CSM for Area A MRS (**Table 2.1**) contained a list of munitions known or suspected to be present at the site. **Table 4.2** summarizes the MEC items confirmed during the RI intrusive investigation.

Table 4.1a DGM Anomaly Intrusive Results

Contacts	Trench Target	Artillery 1,2,3	Bridge Target	Wooden Structure	Artillery 4 and 5	Total	Percentage
QC Seed	0 (3)	4	3	1	7	**15**	**1.3%**
Hot Rock	7	85	1	1	11	**105**	**8.9%**
Other Debris (1)	5	18	21	80	131	**255**	**21.6%**
Small Arms Ammunition (expended)	23	43	40	6	56	**168**	**14.3%**
Munitions Debris	11	72	20	5	127	**235**	**19.9%**
Nothing Found	40	100	103	11	124	**378**	**32.1%**
DMM (2) Small Arms Ammunition	0	21	0	0		**21**	**1.8%**
MEC 20mmTP					1	**1**	**0.09%**
Total	**86**	**343**	**188**	**104**	**457**	**1,178**	**100%**

(1) Other Debris includes metal items such as nails, wire, cans, etc.
(2) DMM = discarded military munitions; Air Force includes small arms as MEC.
(3) QC seed was placed at the Trench Target. Targets for investigation were randomly selected and the QC seed target was not selected for intrusive investigation.
(4) The totals reported in this table represent the quantity of each item type (e.g., Hot Rock, SAA (expended), MD, etc.) that were recovered from each target area. The totals reported in this table exceed the number of DGM anomalies intrusively investigated (901 anomalies) because multiple items were recovered from any given anomaly location in several instances.

Table 4.1b Visual Inspection Results

Description	Area A
MEC (1)	34
Small Arms Ammunition DMM (2)	149
Munitions Debris	385
RRD (3)	24
Other (4)	34
Total	**624**

(1) MEC = No MEC items were identified as high explosive. One item confirmed to contain white phosphorous (2.75" rocket warhead)
(2) DMM = discarded military munitions; Air Force includes small arms as MEC.
(3) RRD = Range related debris. Primarily aerial tow target poles
(4) Other observations include identification of human remains, bales of marijuana, backpacks from migrants, etc.

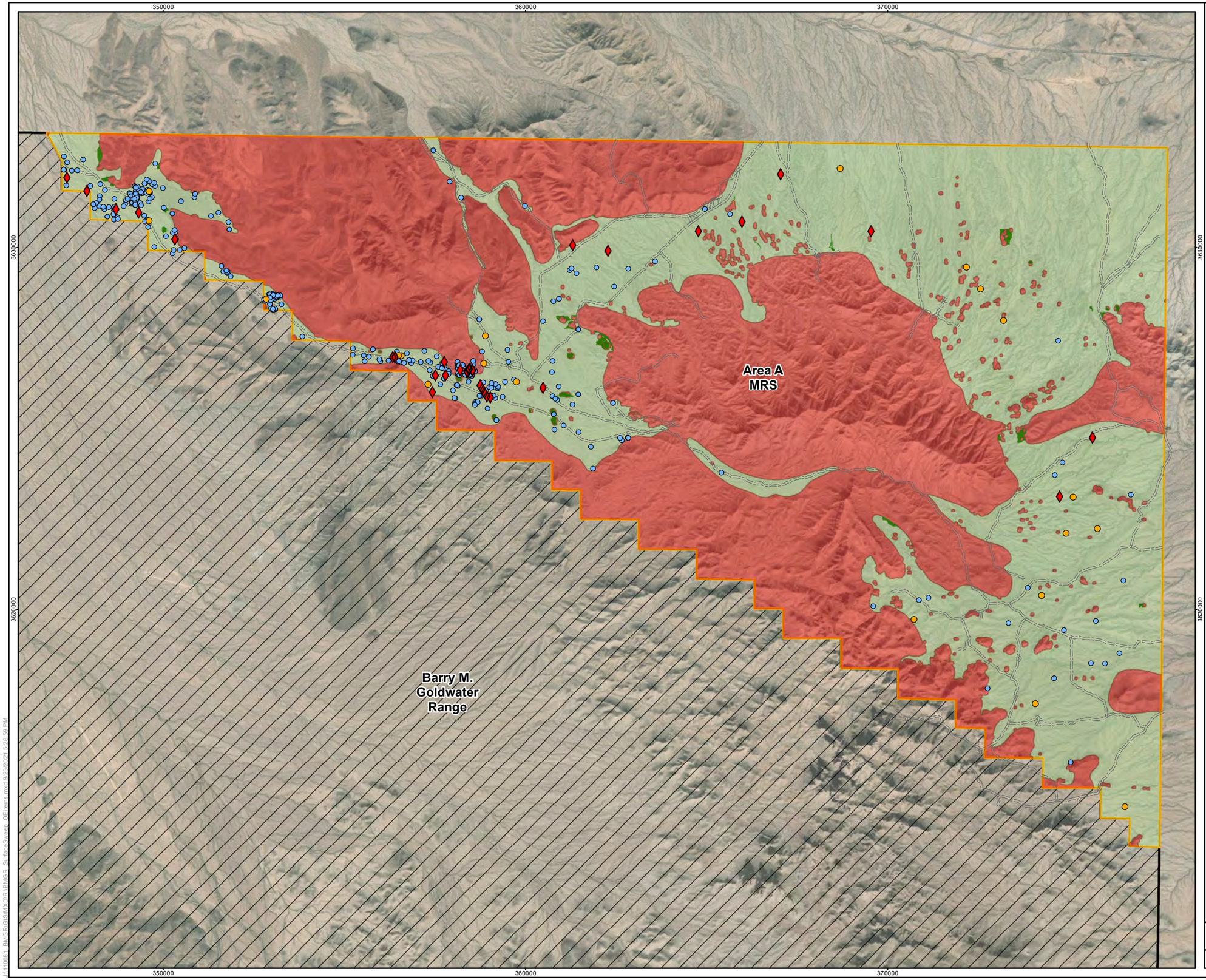
Table 4.1c Munitions Debris Recovered During the Remedial Investigation

Item Description	Artillery 4&5		Wooden Structure		Artillery 1,2&3		Bridge Target		Trench Target		Visual Inspection (non-target)
	Surface	Subsurface	Surface	Subsurface	Surface	Subsurface	Surface	Subsurface	Surface	Subsurface	Surface
Small Arms Ammunition	96	56	2	6	191	43	15	40	30	23	NR[1]
Mk 23 3lb bomb	--	9	--	--	--	--	--	--	--	--	2
Flare piece	--	--	--	1	1	1	--	1	1	--	79
20mm (Projectile or casing)	104	15	--	--	--	3	1	--	--	--	128
2.75” Rocket debris	12	40	--	--	9	39	--	--	--	--	22
2.25” SCAR debris	3	4	--	1	3	25	10	19	14	9	102
Fragmentation	130	56	1	3	1	4	1	--	--	2	19
BDU 33	1	--	--	--	--	--	1	--	--	--	2
100lb Sand-filled bomb	4	3	--	--	--	--	--	--	--	--	12
30mm	--	--	--	--	--	--	--	--	--	--	2
Grenade, smoke	--	--	--	--	--	--	--	--	--	--	5
Mk 106 Practice bomb	--	--	--	--	--	--	--	--	--	--	1
Rocket warhead, illumination, M257	--	--	--	--	--	--	--	--	--	--	11

(1) NR = Not recorded

Figure 4.1
Recovered MEC/MD Locations

Barry M. Goldwater Range
Luke AFB, Arizona



Legend

- MEC
- MEC - Small Arms
- Munitions Debris
- Unpaved Road
- Determined Inaccessible During Fieldwork
- Inaccessible Areas (Due to Slope)
- Accessible Areas
- Area A MRS
- Barry M. Goldwater Range Boundary

Image Source: ESRI Online



Projection: WGS 1984 UTM Zone 12N, Units: Meter

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Table 4.2 Munitions and Explosives of Concern Recovered During Remedial Investigation

Operation	Description	Quantity	Percent
Target Area Surface Removal	Projectile: 20mm Cartridge (DMM)	7	3.3%
Target Area Surface Removal	Flare: Countermeasure flare	1	0.5%
Target Area Intrusive Result	Small Arms: 5.56mm Blanks (DMM) [1" – 3" bgs]	21	9.9%
Target Area Intrusive Result	Projectile: 20mm TP Cartridge (DMM) [2" bgs]	1	0.5%
Visual Inspection	Rocket: 2.75in. Rocket Warhead (White Phosphorus) M156 (UXO)	1	0.5%
Visual Inspection	Rocket: 2.75in. Rocket Warhead, Practice (UXO)	1	0.5%
Visual Inspection	Bomb: M117 Bomb, Practice with spotting charge (UXO)	1	0.5%
Visual Inspection	Flare: Countermeasure flare	7	3.3%
Visual Inspection	Projectile: 20mm Cartridge (UXO)	14	6.6%
Visual Inspection	Bomb: 3lb. MK23, spotting charges intact (UXO)	3	1.4%
Visual Inspection	Bomb: BDU 33, Practice (UXO)	3	1.4%
Visual Inspection	Flare: Aircraft flare	4	1.9%
Visual Inspection	Small Arms: 7.62 Round	19	8.9%
Visual Inspection	Small Arms: 5.56mm Round	2	0.9%
Visual Inspection	Small Arms: .50 Caliber Cartridge	103	48.4%
Visual Inspection	Small Arms: .30 Caliber Cartridge	25	11.7%
	Grand Total	213	100%

(1) 79.8% of recovered MEC were small arms

4.1.2 Munitions and Explosives of Concern Handling

Two hundred and thirteen (213) MEC items were recovered from Area A during the RI (**Table 4.2**). The locations of all MEC items found are shown in **Figure 4.1**.

4.1.3 Status of Munitions and Explosives of Concern Data Quality Objectives

4.1.3.1 The overall project objective for MEC was to obtain data to sufficiently characterize the nature and extent of MEC contamination at Area A. To this end, specific DQOs were established. The MEC DQOs for this RI are described in **Table 2.3**. DGM transect coverage was completed to meet minimum planned area requirements, anomalies were selected and resolved with USACE concurrence, and clusters of MEC/MD (i.e., greater than 50 items per 200' x 200' area) were not identified (thus precluding additional data collection). This subchapter addresses the status of the MEC DQOs upon completion of the RI at Area A.

4.1.3.2 The MEC DQO was achieved by completing the following actions:

- Conducted DGM over 171.31 miles of transects across the five target areas;

- Visual Surface Inspection of 37,122 acres accessible non-targets areas;
- Intrusively investigated 901 anomaly sources along DGM transects.

Based on the summary above and the information presented elsewhere in this report, the data obtained during this RI is considered sufficient to characterize the nature and extent of MEC contamination at Area A and the MEC DQOs for this RI have been achieved.

4.2 MUNITIONS CONSTITUENT CHARACTERIZATION RESULTS

The sampling strategy and method for the RI at Area A is presented in **Section 2.1.2**. The following subchapters describe the analytical results for the samples collected during these field tasks. Laboratory analytical results are tabulated in **Appendix B**.

4.2.1 Validation of Analytical Data

Data validation for laboratory data were performed by Parsons for all sample results in accordance with the requirements contained in the approved Final UFP-QAPP. Laboratory results were assessed for compliance with required precision, accuracy, completeness, and representativeness. Field QC results were evaluated for compliance with required precision, accuracy, and representativeness. Based on this review, sample data, except chromium results, were considered usable for project decision-making. Chromium was present in elevated concentrations in the laboratory grinding blank, resulting in rejection of chromium data results. A summary of the analytical data and copies of the data validation reports are included in **Appendix B**.

4.2.2 Munitions Constituents Investigation Results

4.2.2.1 As described previously, five post-demolition and three background ISM surface soil samples were collected. The three background soil samples were collected to determine the naturally occurring concentrations of metals at the site. The locations of these samples are shown on **Figure 3.4**. Samples were analyzed for explosives, and MC metals (barium, chromium, copper, and lead). All ISM soil samples were collected in triplicate.

4.2.2.2 The complete analytical results for these samples are presented in **Appendix B**.

4.2.2.4 One explosive compound, Methyl-2,4,6-Trinitrophenylnitramine (Tetryl), was detected at an estimated value in three samples. The estimated concentrations were all below the PAL for tetryl. This compound was not retained for further evaluation in the risk assessment.

4.2.2.5 Metals were detected in each of the collected ISM soil samples. As noted previously, chromium results were rejected due to the introduction of this compound during the grinding process in the laboratory. The other metals (barium, copper, and lead) in the post-demolition soil samples were then compared to background and PALs. Upon comparison to background, it was determined that none of the metals in the post-demolition soil samples were detected at concentrations greater than the PALs and the BTV. Based on these results, no COPCs were identified, and no constituents were carried forward for further evaluation in a risk assessment.

4.2.3 Munitions Constituents Data Quality Objectives

4.2.3.1 The overall project objective for MC was to obtain data to sufficiently characterize the nature and extent of potential MC contamination at Area A. To this end, specific DQOs were

established for the site. The MC DQOs for this RI are described in Subchapter 2.5 (**Table 2.3**). This subchapter addresses the status of the MC DQOs upon completion of the RI.

4.2.3.2 Because there are no identified releases of MC contamination during prior investigations (Weston, 2005b) and no post-demolition MC contamination was noted during the RI, there are currently no complete exposure pathways identified at Area A that might result in site workers, recreational users, or site visitors being exposed to MC. The MC DQOs were achieved because no high density MEC/MD areas were identified for MC sampling, no low order munitions were identified for MC sampling, and post-demolition sample results did not identify any source of MC contamination.

4.2.3.3 Based on the summary above and the information presented elsewhere in this report, the data obtained during this RI is considered sufficient to characterize the nature and extent of MC contamination at Area A and the MC DQOs for this RI are determined to have been achieved.

4.3 EXTENT OF MUNITIONS AND EXPLOSIVES OF CONCERN AND MUNITIONS CONSTITUENT CONTAMINATION

DQOs for the RI at are described in **Section 2.5**. The overall project DQO was to obtain data to sufficiently characterize the nature and extent of MEC and MC contamination. Specific DQOs were established for both the MEC and MC investigations (**Table 2.3**). This subchapter addresses the status of each DQO upon completion of the RI.

4.3.1 Vertical Conceptual Site Model

4.3.1.1 A vertical CSM, of the target areas only, is provided as **Figure 4.2** showing the general vertical distribution for the primary MEC and MD items recovered during the RI intrusive investigation. The vertical CSM helps to illustrate that the vast majority of MEC and MD findings are located near the surface, the exception being the 2.25" SCAR which exhibits a deeper distribution. As shown on **Figure 4.2**, the depth of recovered items is well within the depth of detection for the PDM8®. The anomaly threshold for intrusive investigation was set to a count of 50 (PDM8® units of measure) but the deepest recovered items were well above the selection threshold (meaning that, if the item had been deeper, it could be detected). The detection depths for the PDM8® appear adequate given the recovery depths and the expected penetration depth for these sized items given the soil conditions at Area A (compacted silty sand and gravel).

4.3.2 Extent of Munitions and Explosives of Concern Contamination

4.3.2.1 Historical aerial bombing runs to the targets were believed to be primarily up and down the valley and MEC/munitions debris (MD) densities appear to be highest along the valley in line with the targets. It is noted that the valley floor including the targets themselves, were mostly accessible for the remedial investigation. As described previously, 213 MEC items were recovered during the RI. One hundred and eighty-three (183) were found on the surface during the 37,122-acre visual inspection. The non-target accessible areas covered by the RI resulted in a very low surface MEC density (less than 0.005 MEC per acre). It is worth noting that 149 of the 183 MEC items recovered during the visual inspection (81.4%) were intact, unfired, small arms ammunition. Similarly, the intrusive investigation around the five known target areas also resulted in a very low MEC density (0.5 MEC per acre), in which twenty-one (21) of the twenty-two (22) MEC items

recovered were intact, unfired, small arms ammunition. Except for the white phosphorous 2.75-inch warhead, the non-small arms MEC items included 20mm projectile cartridges and a variety of (generally not high hazard) practice/training items and pyrotechnic flares/devices.

4.3.2.2 The DGM investigation focused on the areas surrounding the target centers. A removal action has previously been conducted at each of the five target centers, thus greatly reducing MEC risk associated with the central target areas. As described above, neither the five known target areas nor the surrounding accessible terrain within Area A exhibits an elevated MEC density (0.5 and 0.005 MEC per acre, respectively). Due to the fact that there has been no investigation in the inaccessible areas it would be difficult to come up with an assumption of MEC density, but it could be assumed that the subsurface would be minimal due to the rocky terrain and thinner soil profile and the surface would be the same if not higher than the surrounding areas due to the same rocky terrain and thinner soil profile. **Table 4.1c** summarizes the MD observed during the target area surface sweep, target area intrusive investigation, and the visual inspection. As shown, most of the MD was associated with SAA. Other MD present within the Target Areas is consistent with prior removal actions (Weston, 2008b).

4.3.3 Extent of Munitions Constituents Contamination

As described previously, there are no identified sources of MC contamination, therefore, there are currently no complete exposure pathways identified at Area A that might result in site workers, recreational users, or site visitors being exposed to MC.

4.4 REVISED CONCEPTUAL SITE MODEL

The preliminary CSM (**Section 2.1**) indicated potentially complete MEC, and MC exposure pathways were present for receptors at the site, including site workers (BLM employees), recreational users, and site visitors. This subchapter describes the revised CSM as modified based on the results of this RI.

4.4.1 Known Contamination Areas and Source Media for Munitions and Explosives of Concern

4.4.1.1 Based on the results of the RI described, MEC is potentially present in very low concentrations across Area A. None of Area A is considered a high use area (meaning there is no evidence of high munitions use). As a result, Area A is determined to be a low use area (the anomaly density has been determined to be less than critical density, but given the past use as a buffer area, the potential presence of munitions cannot be ruled out). The types of MEC potentially present cover a range of items as summarized in **Table 4.2**.

4.4.2 Known Contamination Areas and Source Media for Munitions Constituents

No MC contamination sources have been identified.

4.4.3 Human and Ecological Receptors

Potential current and future receptors at Area A include site workers (BLM employees), recreational users, trespassers, and site visitors. Future land use in Area A is anticipated to be similar to current use (i.e., permitted access to Sonoran Desert National Monument). Ecological

receptors are not considered receptors for MEC. Activities and their depth of penetration/interaction that occur at Area A are:

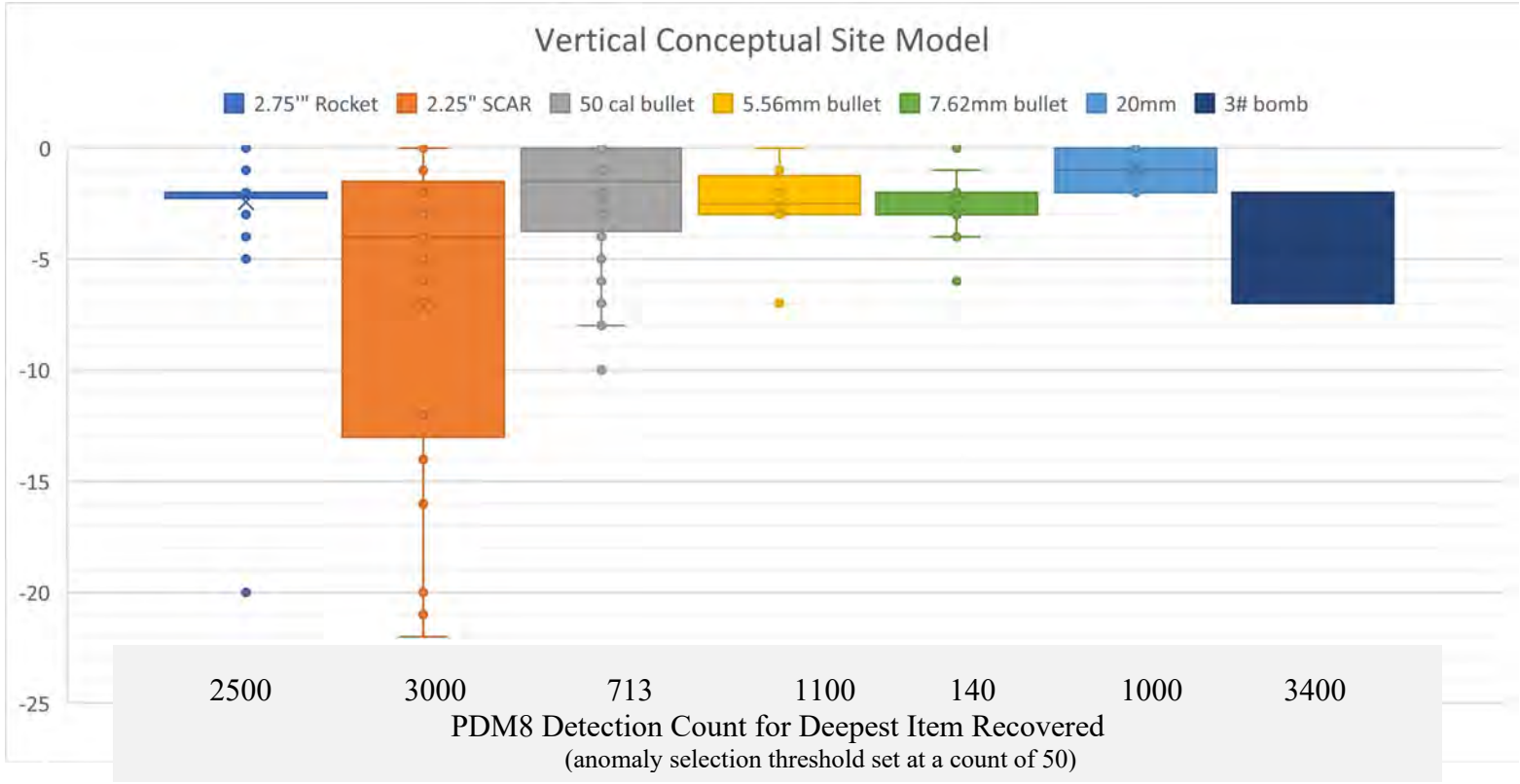
- Hiking/walking (0-2 inches bgs)
- Camping (0-6 inches bgs)
- Hunting (0-2 inches bgs)
- Target practice (0-2 inches bgs)
- Off-highway vehicle use (on designated roads only) (0-2 inches bgs)
- Sign and road maintenance (0-18 inches bgs)

4.4.4 Exposure Pathways

4.4.4.1 MEC Exposure Pathways – Surface and Subsurface Soil

For this pathway, "surface MEC" are MEC items fully or partially visible above the soil surface, while "subsurface MEC" are MEC items not visible above the soil surface (i.e., fully covered by soil). MEC covered by brush or detritus are not considered subsurface MEC. Exposure to MEC at the surface or in subsurface soil can occur if a receptor encounters or comes close to a MEC item and interacts with it in a manner that might result in its detonation. Exposure to subsurface MEC will only result when receptors perform intrusive activity, though natural processes such as soil erosion can result in subsurface MEC being uncovered, thus becoming surface MEC. As described previously, MEC contamination has been confirmed on the surface as well as in the subsurface. As described above, various current and future human receptors have been identified that could be exposed to MEC. Ecological receptors are not considered receptors for MEC. Based on the presence of MEC contamination, potential receptors, and a potential point of exposure, the MEC exposure pathway is potentially complete for surface and subsurface exposure at accessible portions of Area A. The MEC exposure pathway is also considered potentially complete for surface and subsurface exposure within the rugged-steep terrain of Area A, but with far fewer receptors. These complete exposure pathways are shown in **Tables 4.3a and 4.3b**.

Figure 4.2 Vertical Conceptual Site Model



Notes: The box and whisker chart shows distribution of data into quartiles, highlighting the mean and outliers. The boxes may have lines extending vertically called "whiskers". These lines indicate variability outside the upper and lower quartiles, and any point outside those lines or whiskers is considered an outlier. The PDM8® selection threshold for the RI was set at a count of 50; the counts identified above for the deepest recovered item for each munition were well above the selection threshold and indicates that the PDM8® can effectively detect each munition to the greatest depth identified during the RI.

Table 4.3a Results of Remedial Investigation and Revised Conceptual Site Model Summary, Target Areas

MUNITIONS RESPONSE SITE DETAILS	DETAILS AND RESULTS OF REMEDIAL INVESTIGATION						REVISED CONCEPTUAL SITE MODEL SUMMARY				
	Known or Suspected Contamination Source(s)	**Potential/Suspected Location and Distribution**	**Investigation Method**	**Investigation Location(s)**	**Investigation Acreage / Number of Samples**	**Investigation Results**	**Confirmed or Suspected Contamination Source(s)**	**Confirmed Location and Distribution**	**Source or Exposure Media**	**Current and Future Receptors**	**Complete Exposure Pathway**
NAME: Target areas **Acreage**: 174 **Suspected Past DoD Activities (*release mechanisms*)**: Evidence of past use as munitions practice target; **Current and Future Land Use**: Managed by BLM as a permit-only access area of the Sonoran Desert National Monument.	**Munitions and Explosives of Concern**: Prior removal action at the target center and step-out grids (Weston 2008) did not recover MEC items. MD identified during prior removal action included 2.25" SCAR, 20mm projectiles, BDU-33. MEC recovered during the RI was limited to discarded military munitions associated with small arms. MD recovered during the RI included 2.25" SCAR, 2.75" rockets, 3-pound bomb, 20mm projectiles	Removal action previously completed in target center area. Very low concentrations of MD and MEC identified during the RI in surrounding area.	Geophysical surveys using DGM, and intrusive investigation	Transects around target centers where prior removals completed (**Figures 3.1a through 3.1e**)	171.31 miles of DGM transects and 901anomaly sources intrusively investigated.	Total of 22 DMM items recovered from 3 intrusive locations (up to a maximum of 3" depth). 21 of the items were 5.56mm blank ammunition and one 20mm TP cartridge.	Munitions and Explosives of Concern: DMM associated with small arms ammunition and 20mm TP cartridge.	In the area surrounding the target centers (prior removal actions removed items in target centers). MEC in the subsurface to a maximum depth of 3 inches bgs. MD in the subsurface to a maximum depth of (22 inches) bgs. See Figure 3.1a through Figure 3.1e and Figure 4.2	Subsurface soil during intrusive activities. Surface removal completed in the area (limited potential for exposure due to erosion)	Site workers (BLM employees), recreational users, and site visitors. Drug smugglers and illegal immigrants are known to travel through Area A.	**YES** Limited exposure to subsurface MEC if intrusive activities conducted.
	Munitions Constituents in Soil No source identified in prior sampling conducted in target areas.	Potentially present in soil in high density MEC/MD areas only; not expected in low to zero MEC/MD density areas. No high-density areas identified.	Collection of surface soil samples using ISM if high density areas identified. None identified.	NA. No high-density areas identified.	NA	No MC source identified.	*None*	NA	No source	NA	**NO** MC source not detected.

Table 4.3b Results of Remedial Investigation and Revised Conceptual Site Model Summary, Non-Target Accessible Areas

MUNITIONS RESPONSE SITE DETAILS	DETAILS AND RESULTS OF REMEDIAL INVESTIGATION						REVISED CONCEPTUAL SITE MODEL SUMMARY				
	Known or Suspected Contamination Source(s)	**Potential/Suspected Location and Distribution**	**Investigation Method**	**Investigation Location(s)**	**Investigation Acreage / Number of Samples**	**Investigation Results**	**Confirmed or Suspected Contamination Source(s)**	**Confirmed Location and Distribution**	**Source or Exposure Media**	**Current and Future Receptors**	**Complete Exposure Pathway**
NAME: Accessible Non-Target Areas Acreage: 37,122 **Suspected Past DoD Activities (*release mechanisms*)**: Evidence of past buffer area for munitions target practice target. **Current and Future Land Use**: Managed by BLM as a permit-only access area of the Sonoran Desert National Monument.	***Munitions and Explosives of Concern:*** Known or suspected munitions include 2.75in. Rocket Warhead (White Phosphorus) M156, 2.75in. Rocket Warhead (Practice), M117 Bomb (750# bomb), Countermeasure flare, 20mm Cartridge, 3lb. MK23, BDU 33 (Practice), Aircraft flare, Small Arms (7.62mm, 5.56mm, .50 caliber, .30 caliber)	Very low distribution of MEC identified throughout site. RI activities removed surface MEC from accessible areas (37,122 acres). Potential for very low distribution of MEC in rugged, steep terrain	Visual inspection and MEC removal/disposal over 37,122 acres of Area A	37,122 acres of Area A (**Figure 1.2**)	37,122 acres of Area A.	Total of 184 MEC items recovered. All MEC findings were non-intrusive surface findings.	Munitions and Explosives of Concern: MEC types as listed in *Known or Suspected Contamination Source(s)* column of this table	Throughout the site in areas accessible to the field team (generally in areas with sloped less than 20%); MEC and MD confirmed on the surface and MD. Subsurface MEC could be present (no RI intrusive investigations within this area).	Surface soil; or subsurface soil during intrusive activities.	Site workers (BLM employees), recreational users, and site visitors. Drug smugglers and illegal immigrants are known to travel through Area A.	**YES** Exposure to surface and/or subsurface MEC in accessible areas.
	Munitions Constituents in Soil No source identified in prior sampling conducted in target areas.	Potentially present in soil in high density MEC/MD areas only; not expected in low to zero MEC/MD density areas. No high-density areas identified.	Collection of surface soil samples using ISM if high density areas identified. None identified.	NA. No high-density areas identified.	NA	No MC source identified.	*None*	NA	No source	NA	**NO** No MC source detected.

Table 4.3c Results of Remedial Investigation and Revised Conceptual Site Model Summary, Non-Target Accessible Areas (continued)

MUNITIONS RESPONSE SITE DETAILS	DETAILS AND RESULTS OF REMEDIAL INVESTIGATION						REVISED CONCEPTUAL SITE MODEL SUMMARY				
	Known or Suspected Contamination Source(s)	**Potential/Suspected Location and Distribution**	**Investigation Method**	**Investigation Location(s)**	**Investigation Acreage / Number of Samples**	**Investigation Results**	**Confirmed or Suspected Contamination Source(s)**	**Confirmed Location and Distribution**	**Source or Exposure Media**	**Current and Future Receptors**	**Complete Exposure Pathway**
NAME: Steep, rugged Terrain Areas Acreage: 40,500 (approx.) **Suspected Past DoD Activities (release mechanisms):** Evidence of past buffer area for munitions target practice target. **Current and Future Land Use:** Managed by BLM as a permit-only access area of the Sonoran Desert National Monument.	***MEC:*** Bomb, 750-lb., Practice, M117 Bomb, 25-lb., Practice, BDU-33 Rocket, 5-in., HE, Zuni (1) Rocket, 5-in., Practice, Zuni Rocket, 2.25-in., Practice, SCAR Projectile, 20mm, HE (1) Projectile, 20mm, TP Grenade, Hand, Smoke Signal, Flare, MK 13 Spotting Charge, MK4 (1). Potentially but not Suspected.	Scattered MEC potentially present resulting from overshoots, with likelihood decreasing farther away from the target areas. Refer to Figure ES-2 for location of targets relative to steep/rugged, non-accessible areas. Very thin soil profiles over rock may limit subsurface presence MEC in much of the steep, rugged areas	No investigation took place in very steep, rugged terrain.	NA	NA	NA	Munitions and Explosives of Concern: MEC types as listed in *Known or Suspected Contamination Source(s)* column of this table	Scattered MEC potentially present resulting from overshoots, with likelihood decreasing farther away from the target areas.	Surface soil in rugged, steep areas; or subsurface soil during intrusive activities. Very thin soil profiles within the in steep rugged areas.	Site workers (BLM employees). Drug smugglers and illegal immigrants are suspected to travel through Area A. Recreational site visitors not anticipated.	**YES** Exposure to surface and/or subsurface MEC in rugged, steep terrain.
	Munitions Constituents: MC metals (Barium, Chromium, Copper, and Lead) and explosives	Potentially present in soil in high density MEC/MD areas only; not expected in low to zero MEC/MD density areas. No high-density areas are anticipated in the rugged steep areas (based on results from accessible areas).	No investigation took place in non-accessible areas.	NA	NA	NA	No high-density areas anticipated in non-accessible areas therefore no MC contamination is expected	NA	No source identified in accessible high-density areas therefore no source anticipated in non-accessible areas	NA	**NO** No MC source

CHAPTER 5 CONTAMINANT FATE AND TRANSPORT FOR MUNITIONS AND EXPLOSIVES OF CONCERN

Understanding the fate of the MEC present in or released to the environment is important to evaluate the potential hazards or risk posed to human health and/or the environment. For example, MEC may be present on the ground surface or be buried in the subsurface; however, it is possible for natural processes to result in the movement, relocation, or unearthing of the MEC, thereby increasing the chance of its subsequent exposure to human receptors. The following paragraphs discuss potential migration processes for and the potential migration routes of MEC at the site. No source for MC was identified within Area A; therefore, fate and transport of MC is not included herein.

5.1 FATE AND TRANSPORT PROCESSES FOR MUNITIONS AND EXPLOSIVES OF CONCERN

5.1.1 The two primary natural processes that can result in the migration or exposure of MEC items at a site are erosion and frost heave. Frost heave is not a consideration in this part of Arizona, therefore no further discussion of this process is warranted. Natural erosion over time of soil by the wind or by water (precipitation runoff) can result in the exposure of buried MEC by the removal of the overlying soil. In some cases, if soil is unstable and the erosive force is sufficient to act on the size of MEC item(s) present, this process can also result in the movement of MEC from its original position to another location (typically somewhere downstream of the wash).

5.1.2 MEC transport by human interaction may also take place at the site. This process is most likely for lightweight munitions exposed at the surface.

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CHAPTER 6 BASELINE HAZARD ASSESSMENT FOR MUNITIONS AND EXPLOSIVES OF CONCERN

6.1 INTRODUCTION

6.1.1 The purpose of a baseline hazard or risk assessment is to evaluate the potential current and future adverse health effects resulting from hazards at a site. The hazard/risk assessment evaluates the magnitude of the potential baseline hazard/risk at the site and identifies the sources of the greatest risk. The baseline hazard/risk does not consider actions to control or mitigate releases. Results of the hazard/risk assessments are used to justify no further action or to aid in the development, evaluation, and selection of appropriate response alternatives.

6.1.2 Hazard/risk assessments are site-specific evaluations, which consider current and future land use and activities, and may vary in both detail and extent to which qualitative and quantitative inputs are used. Generally, hazard/risk assessments follow a phased approach, starting with generic assumptions, moving toward a more complex Site-specific evaluation as necessary. The complexity of the hazard/risk assessment depends on the circumstances of the site.

6.2 MUNITIONS AND EXPLOSIVES OF CONCERN HAZARD ASSESSMENT

6.2.1 Background

6.2.1.1 A qualitative hazard assessment was conducted to evaluate the potential explosive hazards to human receptors. An explosive hazard exists at an MRS if there is a complete MEC exposure pathway, consisting of a receptor that can come near or into contact with MEC and interact with the item in a manner that might result in its detonation. For this reason, the potential for an explosive hazard depends upon the presence of three critical elements, all of which must be present for an explosive hazard to exist (i.e., there is no explosive hazard if any one of these three elements is absent). These three critical elements are:

(1) A *source* of MEC (i.e., an explosively hazardous item);

(2) A *receptor* (i.e., a person); and

(3) The *potential for interaction between the MEC source and the receptor* (i.e., the possibility the item might be touched, moved, or otherwise disturbed by the receptor).

6.2.1.2 The qualitative risk assessment technique conducted follows the MEC Hazard Assessment Tool (MHAT), evaluating the potential explosive hazards presented to human receptors associated with complete MEC exposure pathways at Barry M Goldwater Range, Area A MRS. MHAT, provides an assessment of the acute explosive hazards associated with remaining MEC by analyzing site-specific conditions and human issues that affect the likelihood that a MEC accident will occur. The MHAT focuses on hazards to human receptors and does not directly address environmental or ecological concerns that might be associated with MEC. The process for conducting the MHAT is described in the MHAT worksheets developed by the US Air Force (USAF, 2011), based on the methods described in the MEC Hazard Assessment (MEC HA) interim guidance document (USEPA 2008a). The MHAT uses input data based on historical documentation, field observations, and the results of previous studies and removal actions. The MEC HA interim guidance was developed by the Technical Working Group for Hazard

Assessment, which included representatives from the Department of Defense (DoD), the U.S. Department of the Interior, the USEPA, and various states and tribes.

6.2.1.3 The MHAT reflects the basic difference between assessing acute hazards from exposure to MEC and assessing chronic environmental risks from exposure to potential contaminants, such as munitions constituents (MC). An explosive hazard can result in immediate injury or death and, therefore, risks from explosive hazards are evaluated as either being present or not present. If the potential for an encounter with MEC exists, then the potential that the encounter may result in injury or death also exists. Conversely, if the potential presence of MEC contamination at an MRS can be ruled out because of field investigations, then no explosive hazards will be considered to be present and no MEC hazard assessment will be necessary.

6.2.1.4 The MHAT is used to evaluate the baseline conditions for the site with regard to explosive hazards. These baseline evaluations may be referenced in a subsequent feasibility study (FS) where they may be used to provide the basis for the evaluation and implementation of effective management response alternatives. The MHAT does not provide a quantitative assessment of MEC hazards and is not used to determine whether or not further action is necessary at a site.

6.3 OVERVIEW OF MHAT INPUT FACTORS

Using the MHAT, the potential hazards posed by MEC are evaluated qualitatively for each assessment area by evaluating three primary factors. These primary factors are related to the three critical elements and are:

- *Severity*: the potential consequences of the effect on a human receptor should a MEC item detonate;
- *Accessibility*: the likelihood that a human receptor will be able to come into contact with a MEC item; and
- *Sensitivity*: the likelihood that a MEC item will detonate if a human receptor interacts with it.

To complete the baseline hazard assessment for each assessment area, the various input factors are reviewed, and suitable categories are selected based on historical documentation and field observations made during the remedial investigation (RI) and previous studies. The various input factors for the MHAT are explained in detail in the MEC Hazard Assessment interim guidance document (USEPA 2008a). However, the following paragraphs provide an overview of these factors and their associated categories.

Energetic Material Type: This factor describes the general type of energetic material associated with the munition(s) known or suspected to be present within the assessment area. The six possible categories for this factor, ranging from the most to least potentially hazardous, are “high explosives and low explosive fillers in fragmenting rounds,” “white phosphorus,” “pyrotechnics,” “propellants,” “spotting charges,” and “incendiaries.” The selection of a category for each assessment area is made using the energetic material with the greatest potential explosive hazard

known or suspected to be present. As noted in the CSM, the presence of 5-in. HE rockets and 20mm HE projectiles is conservatively assumed to be potentially present in Area A.

Location of Additional Human Receptors: It is possible that human receptors other than the individual who causes a detonation may be exposed to overpressure and/or fragmentation hazards from the detonation of MEC. This factor describes whether there are additional human receptors located within the assessment area or within the explosive safety quantity-distance (ESQD) arc surrounding the assessment area. The two possible categories for this factor are "inside the assessment area or inside the ESQD arc surrounding the assessment area" and "outside the ESQD arc." In Area A, there are no additional human receptors present.

Site Accessibility: The site accessibility factor describes how easily human receptors can gain access to the assessment area and takes into account the various barriers to entry that might be present. The four possible categories of site accessibility range from "full accessibility" (i.e., a site with no barriers to entry) to "very limited accessibility" (i.e., a site with guarded chain link fences or terrain that requires special skills and equipment to access). Note that this factor differs from the potential contact hours factor (see below) and does not include or account for land use controls (LUCs) that might restrict site access. The effects of LUCs are assessed using the alternatives assessment component of the MHAT that is conducted during the FS. To access Area A, a permit is required from BLM and 4-wheel drive vehicles are necessary (or alternatively, horse, dirt bike, mountain bike, or foot traffic). The steeper, rugged terrain is only accessible by foot and necessitates fitness and determination.

Potential Contact Hours: This factor accounts for time receptors spend in the assessment area during which they might come into contact with MEC and intentionally or unintentionally cause a detonation. Both the number of receptors and the amount of time each receptor spends in the assessment area are used to calculate the total "receptor-hours/year." This total is calculated for all activities that might result in potential MEC interaction, and there are four possible categories, ranging from "many hours" ($\geq$ 1,000,000 receptor-hours/year) to "minimal hours" ($<$ 1,000 receptor-hours/year). Due to the accessibility limitations noted above, potential contact hours are "very few" or "limited"

Amount of MEC: This input factor describes the relative quantity of MEC that is anticipated to remain within the assessment area as a result of past munitions-related activities. For example, a greater quantity of MEC would be expected to be present in a former target area than at a former firing point. The nine possible categories for this factor, from the largest to the least anticipated amount of MEC, range from "target area" and "Open Burn/Open Detonation area," through "burial pit" and "firing point," to "storage" and "explosives-related industrial facility." All of Area A is considered a safety buffer area (removal completed at the former target areas).

Minimum MEC Depth Relative to the Maximum Receptor Intrusive Depth: This factor indicates whether the MEC in the assessment area are at depths that might be reached by the anticipated human receptor activities. For the baseline MEC hazard assessment, the four possible categories concern whether MEC are at the surface and in the subsurface within the assessment area, or whether MEC are present in the subsurface only, and whether the receptor intrusive depth overlaps with this MEC location. MEC has been recovered on the surface and intrusive activities include camping and BLM workers installing fencing.

Migration Potential: The migration potential factor addresses the likelihood that MEC in the assessment area might be moved by natural processes (e.g., erosion or frost heave) that could increase the chance of subsequent exposure to potential human receptors. The two possible categories for this factor are "possible" and "unlikely." Area A is prone to extreme weather (e.g., monsoons and flooding) that may result in increased possibility of erosion or tree upheaval resulting in exposure of subsurface items

MEC Classification: This factor accounts for how easily a human receptor might cause a detonation of the MEC and relates directly to the MEC sensitivity. The six possible categories for this factor, ranging from the highest to lowest sensitivity (and explosive hazard) are "sensitive unexploded ordnance (UXO)," "other UXO," fuzed sensitive discarded military munitions (DMM)," "fuzed DMM," "unfuzed DMM," and "bulk explosives." The selection of category for each assessment area is made using the MEC with the highest potential sensitivity known or suspected to be present, and where uncertainty exists, conservative assumptions will be made and documented. For example, UXO is always assumed to be present within a known target area, whether or not the investigation uncovers UXO at the site. However, this does not mean MEC contamination will always be assumed in a known target area regardless of RI results. Conclusions regarding the presence of MEC contamination at the investigation areas will be made based on the results of the intrusive investigation. A white-phosphorous rocket warhead was recovered during the RI.

MEC Size: This factor indicates how easy it is for a typical human receptor to move the MEC item(s) present within the assessment area. For example, an individual is considerably more likely to pick up or accidentally kick a hand grenade than a 200-pound bomb. The basic assumption used in this category is that MEC weighing 90 pounds, or more are unlikely to be moved without the use of special equipment. Based on this, the two possible categories for this factor are "small" (i.e., items weighing less than 90 pounds) and "large" (items weighing 90 pounds or more). The selection of category for each assessment area is made using the MEC known or suspected to be present with the highest potential to be moved (i.e., the smallest item).

Each category for each of the MHAT input factors has an assigned score that relates to the relative contributions of the different input factors to the overall MEC hazard. These scores are part of the MHAT and were developed by the Technical Working Group for Hazard Assessment. These factors and their associated scores for the baseline condition are provided in **Table 6.1** while the detailed technical basis for the scores assigned is provided in the MEC Hazard Assessment interim guidance document (USEPA 2008a). Scores for the categories are in multiples of five, with a total maximum possible score for all factors of 1,000 and a minimum possible score of 125. These MHAT scores are *qualitative references only* and should *not* be interpreted as quantitative measures of explosive hazard. A summary of the scores for each MHAT input factor and their related weights with regard to the overall MHAT score are shown in Table 6.2.

Table 6.1
Summary of MHAT Input Factors and Associated Baseline Scores

Input Factor	Input Factor Category	Baseline Score - Accessible	Baseline Score – Steep/Rugged
Energetic Material Type	HE and Low Explosive Fillers in Fragmenting Rounds	100	100
	White Phosphorus	70	70
	Pyrotechnic	60	60
	Propellant	50	50
	Spotting Charge	40	40
	Incendiary	30	30
Location of Additional Human Receptors	Inside the assessment area or inside the ESQD arc surrounding the assessment area	30	30
	Outside of the ESQD arc	0	0
Site Accessibility	Full Accessibility	80	80
	Moderate Accessibility	55	55
	Limited Accessibility	15	15
	Very Limited Accessibility	5	5
Potential Contact Hours	Many Hours	120	120
	Some Hours	70	70
	Few Hours	40	40
	Very Few Hours	15	15
	Minimal Hours	5	5
Amount of MEC	Target Area	180	180
	Open Burning/Open Detonation (OB/OD) Area	180	180
	Function Test Range	165	165
	Burial Pit	140	140
	Maneuver Areas	115	115
	Firing Points	75	75
	Safety Buffer Areas	30	30
	Storage	25	25
	Explosive-Related Industrial Facility	10	10
Minimum MEC Depth vs. Maximum Intrusive Depth	MEC located on surface and in subsurface	240	240
	MEC located only in subsurface; intrusive depth overlaps with minimum MEC depth	150	150
	MEC located only in subsurface; intrusive depth *does not* overlap with minimum MEC depth	50	50

Table 6.1 (Continued)
Summary of MHAT Input Factors and Associated Baseline Scores

Input Factor	Input Factor Category	Baseline Score - Accessible	Baseline Score – Steep/Rugged
Migration Potential	Possible	30	30
	Unlikely	10	10
MEC Classification	UXO, Special Case	180	180
	UXO	110	110
	DMM with Category 1 Fuzes	105	105
	DMM with Category 2 Fuzes	55	55
	Unfuzed DMM	45	45
	Bulk Explosives	45	45
MEC Size	Small	40	40
	Large	0	0

Source: Based on the MHAT Automated Workbook (USAF, 2011)
Scores for Area A areas are highlighted in the table.

Table 6.2
Summary of MHAT Scores and Weights

Explosive Hazard Component	Input Factor	Accessible Area Scores	Weights	Rugged Terrain Scores	Weights
Severity	Energetic Material Type	100	15%	100	16%
	Location of Additional Human Receptors	0	0%	0	0%
	Component Total	*100*	*15%*	*100*	*16%*
Accessibility	Site Accessibility	15	2%	5	<1%
	Total Contact Hours	15	2%	5	<1%
	Amount of MEC	30	5%	30	5%
	Minimum MEC Depth vs. Maximum Intrusive Depth	240	37%	240	38%
	Migration Potential	30	5%	30	5%
	Component Total	*330*	*51%*	*310*	*49%*
Sensitivity	MEC Classification	180	28%	180	29%
	MEC Size	40	6%	40	6%
	Component Total	*220*	*34%*	*220*	*35%*
	Maximum Total Score	**650**	**100%**	**630**	**100%**

Source: Based on the MHAT Automated Workbook (USAF, 2011)

6.4 OVERVIEW OF MHAT OUTPUT FACTORS

The categories and scores for input factors are provided above and are totaled to calculate an overall MHAT score for the Area A MRS (i.e., 650 and 630). The total maximum possible MHAT score for an assessment area is 1,000, while the minimum possible score is 125. The MHAT describes associated hazard levels for these scores, which describe the relative explosive hazard and range from 1 to 4, with a Hazard Level of 1 indicating the highest potential explosive hazard conditions and 4 indicating low potential explosive hazard conditions. The basis for these hazard levels is provided in the MHAT interim guidance document (USEPA 2008a). Again, the total MHAT scores and associated hazard levels are *qualitative references only* and should *not* be interpreted as quantitative measures of explosive hazard. Neither should they be used to determine whether further action is necessary at a site. A summary of the hazard levels and their related MHAT scores is in Table 6.3. As shown in Table 6.3, the hazard level for Area A is "3" or "moderate potential explosive hazard conditions".

Table 6.3
Hazard Level Scoring Rankings Table

Hazard Level	Maximum MEC HA Score	Minimum MEC HA Score	Associated Relative Explosive Hazard
1	1,000	840	Highest potential explosive hazard conditions
2	835	725	High potential explosive hazard conditions
3	720	530	Moderate potential explosive hazard conditions
4	525	125	Low potential explosive hazard conditions

Source: Based on MEC HA interim guidance document (USEPA 2008a)

CHAPTER 7 SUMMARY OF REMEDIAL INVESTIGATION RESULTS

7.1 NATURE AND EXTENT OF CONTAMINATION

7.1.1 Munitions and Explosives of Concern

7.1.1.1 Subsurface removal actions (DGM and analog) were completed in 2008 in the central areas of the five known target areas and no MEC was recovered (it is noted that SAA was not considered MEC by the Air Force at the time of the 2008 removal). **Table 7.1** summarizes the MD recovered during the 2008 subsurface removal actions. As noted in the Final Area A Targets Investigation Report, due to the limited number of MD items recovered at the target sites, additional clearance activities in these areas are not warranted. UXO items were not identified in the 40-plus acres included in Phase II clearance activities; only non-hazardous MD items were recovered (Weston, 2008b).

Table 7.1
Summary of MD Recovered/Disposed During the 2008 Target Investigations (Weston, 2008b)

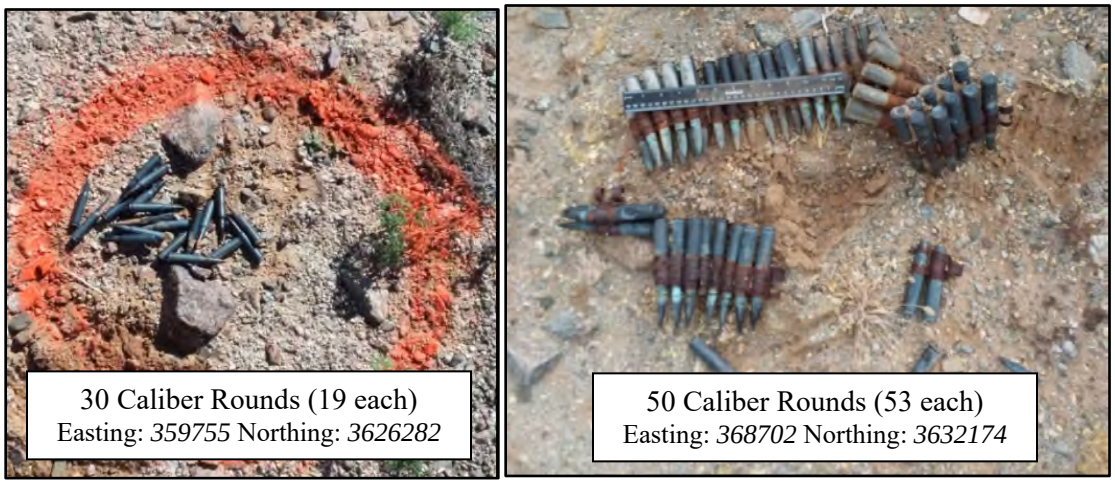
Item Description	Number of Items Recovered
BDU-33 B/B practice bomb	3
5-in Zuni rocket warhead	1
Frag	347
Grenade spoon	5
M117 demolition bomb	1
20mm	5
2.25-in SCAR rocket	4
Rocket (undifferentiated)	48
Smoke grenade	4
TOTAL	**418**

The scope of the RI was focused on the areas immediately surrounding these prior removal areas. As part of the RI, a surface removal was completed in the areas surrounding the targets identified for DGM data collection. The objective of the surface removal was to remove metallic items (including potential MEC) that could interfere with the DGM data. The surface removal recovered approximately 300-pounds of metallic items, including seven each 20mm Projectile Cartridges (intact, unfired and tracked as DMM – discarded military munition) from Artillery Targets 4 and 5, and a countermeasure flare from the Bridge Target.

7.1.1.2 DGM surveys in areas surrounding the five known target areas, combined with the intrusive investigation of 901 anomaly locations, resulted in recovery of 22 MEC items and 235 MD items (see **Tables 4.1a**, **4.1c**, and **4.2)**. Each MEC item was DMM and included 21 each 5.56mm blank rounds (recovered from 3 locations) and 1 each 20mm TP projectile cartridge. The DMM was recovered from very shallow subsurface (maximum depth 3-inches bgs). Based on the RI results and the prior removals, the potential for MEC in the subsurface in and around the target areas is considered unlikely but can't be ruled out entirely.

7.1.1.3 A visual inspection was completed during the RI over 37,122 acres of accessible land within Area A (i.e., slopes generally less than 20%). The RI visual inspection resulted in the identification of 385 MD items and 183 MEC items recovered from 54 separate locations (see **Tables 4.1b**, **4.1c**, and **4.2**). Five locations recorded multiple small arms ammunition (SAA) that accounted for 133 of the 183 individual MEC items. Below are two examples of locations with multiple SAA (intact, unfired SAA as DMM).

Locations with Multiple Small Arms Ammunition as DMM



7.1.1.4 During the visual inspection MEC and MD was recovered from most areas of the site except the far northeast portion of the site (an area greater than 7,500 acres). As expected, more surface MEC and MD was recovered along the valley area where the former target areas were located (**Figure 4.1**). Residual MEC within the MRS is consistent with distributions seen in a buffer area. MEC found during the RI was removed and appropriately destroyed. MEC potentially remains in the subsurface of the accessible areas covered by the RI. Additionally, MEC potentially remains on the surface and subsurface in the rugged, steeper terrain of the MRS. Given the low concentration of recovered surface MEC within the accessible areas (less than 0.005 MEC per acre), however, the potential for MEC is limited.

7.1.1.5 Access to Area A is limited to permit-only visitation issued by the BLM via a Luke AFB administered online permitting system (i.e., iSportsman) and monitored by Arizona Game and Fish. Most users participate in non-intrusive activities such as hiking and hunting. Given the limited potential for persons accessing steep, rugged terrain in Area A, and limited potential for intrusive activities (BLM workers and possible camping activities), combined with very low MEC density, the potential for encountering MEC is considered minimal. The MEC Hazard Assessment Tool (MHAT) quantifies the hazard as level "3" with "moderate potential explosive hazard conditions".

7.2 HAZARD AND RISK ASSESSMENT

7.2.1 Munitions and Explosives of Concern

7.2.1.1 Although there is low potential for explosive hazard conditions, an explosive hazard can't be ruled out. Based on the confirmed presence of surface and subsurface MEC, combined with the current land use and accessibility of the project site, there is potentially an unacceptable risk for human receptors to be exposed to explosive hazards at Barry M. Goldwater Range, Area A MRS. A qualitative MEC hazard assessment was conducted using the MHAT to evaluate the baseline explosive hazard conditions at the site. Based on the results of the RI characterization, and the nature and estimated extent of MEC contamination, a feasibility study is recommended. The RI information will provide the baseline for the assessment of response alternatives to be conducted in the FS.

7.2.2 Munitions Constituents

No MC source greater than PALs were identified; therefore, there is no unacceptable risk to human health and the environment associated with MC. A FS is not recommended for MC at this site.

7.3 CONCLUSIONS AND RECOMMENDATIONS

7.3.1 As described above, the results of this RI and the assessments of MEC hazards and MC risks summarized indicate that the MEC contamination may pose unacceptable explosive hazards to current and future site workers (BLM employees), recreational users, and site visitors. There are no unacceptable risks and hazards to human health or ecological receptors resulting from exposure to MC in soil under the current or potential future exposure scenarios.

7.3.2 The presence of MEC hazards negates the potential acceptability of the "no-action" response alternative. Therefore, conduct of an FS is recommended to evaluate viable response actions that could be implemented to address the MEC and associated hazards/risks that have been identified at Area A MRS. The MEC data collected during the RI was determined to be sufficient to fully characterize Area A, to identify and evaluate any associated potential MEC hazards, and to fully support the recommended FS.

7.3.3 It should be noted that the RI was limited in scope to the extent of Area A MRS. A review of the target range fans, however, (**Figure 1.2**) shows that the buffer areas for the various targets extend beyond the MRS boundary. There is a possibility that munitions are present within the range fan area beyond the current MRS boundary.

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Appendix A – Disposal Documentation

AREA A MUNITIONS RESPONSE SITE

BARRY M. GOLDWATER RANGE/ LUKE AIR FORCE BASE, ARIZONA

Prepared for:

U.S. Air Force Civil Engineer Center
485 Quentin Roosevelt Rd.,
San Antonio, TX 78226

Luke Air Force Base
14185 Falcon St.,
Luke AFB, AZ 85309

Prepared by:

U.S. Army Corps of Engineers,
Omaha District
1616 Capitol Ave., Ste. 9000
Omaha, NE 68102

Parsons
1776 Lincoln St., Ste. 600
Denver, Colorado

Contract No. W912DY-16-D-0024
Task Order No. W9128F17F0255

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APPENDIX A: Disposal Documentation

- The Disposal Documentation attachments are:
  - Attachment 1: MDAS Certificate of Disposal
  - Attachment 2: DD Form 1348-1A

Demil Metals, Inc.

601 N. Skokie Blvd. #302
Northbrook, IL. 60062
847-929-9650 fax 847-266-0119

Invoice No. ms060321

INVOICE

Customer

Name	Parsons Government Services, Inc. ATT:Linda Taylor		
Address	401 Diamond Drive		
City	Huntsville	State AL	ZIP 35806
Phone	256-217-2503		

Date	6/3/2021
Order No.	
Rep	
FOB	

Qty	Description	Unit Price	TOTAL
1	Freight Transportation for MDAS	$ 1,360.00	$ 1,360.00
1	MDAS Processing 575.00/Ton (1 Ton Min)	$ 550.00	$ 550.00
1	Project Management, Doc, & Insurance fee	$ 1,750.00	$ 1,750.00
	Barry Goldwater, AZ		
	Net 30 Days		

	SubTotal	$ 3,660.00
	Shipping & Handling	$ -
Taxes	State	
	TOTAL	$ 3,660.00

Payment Details

- ○ Cash
- ◉ Check
- ○ Credit Card

Name
CC #
Expires

Office Use Only

DEMIL METALS, INC.

601 N. SKOKIE BLVD.
NORTHBROOK, IL 60062
www.demilmetals.com

Date: *06/03/21*

From: Mike Schaffer
Demil Metals, Inc.
601 N Skokie Blvd. #302
Northbrook, Il. 60062

To: Parsons Government Services, Inc.
ATTN: James Coon
401 Diamond Drive
Huntsville, AL. 35806

SUBJECT: Certification of Destruction

I certify that the contents of sealed container/s listed below received on *04/27/21* from Parsons Government Services Inc., Barry Goldwater, Arizona project site, were demilitarized in accordance with guidelines in DoD 4160.21-lVI-l and have been smelted and are only identifiable by their basic content.

Seal#'s 201098

DEMIL METALS, INC
601 SKOKIE BLVD #302
NORTHBROOK, IL 60062

Signed:

Name: Michael Schaffer

Point of Contact Information: mike@demilmetals.com 847-929-9650

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

DOC IDENT	RI FROM	M&S	UNIT	ISS	QUANTITY	REQ	SUPPLEMENTARY ADDRESS	SIG	FUND	DISTRIBUTION	PROJECT	PRI	REQD	DEL DATE	ADV	RI	O/P	COND	MGT	UNIT PRICE DOLLARS	UNIT PRICE CTS	DOLLARS	CTS

1. TOTAL PRICE

2. SHIP FROM
Parsons PGS
Barry Goldwater AZ
Chris TenBraak
702-652-9365

3. SHIP TO
Bonetti Explosives
Matt Barnett
1618Smith RauRd.
ColumbusTx78934

4. MARK FOR

5. DOC DATE	6. NMFC	7. FRT RATE	8. TYPE CARGO	9. PS

10. QTY. REC'D	11. UP	12. UNIT WEIGHT	13. UNIT CUBE	14. UFC	15. SL

16. FREIGHT CLASSIFICATION NOMENCLATURE

17. ITEM NOMENCLATURE

18. TY CONT	19. NO CONT	20. TOTAL WEIGHT	21. TOTAL CUBE
		499 lbs	

22. RECEIVED BY
DEMIL METALS, INC
601 SKOKIE BLVD #302
NORTHBROOK, IL 60062

23. DATE RECEIVED
5/27/19

PREVIOUS EDITION MAY BE USED

24. DOCUMENT NUMBER & SUFFIX (30-44)

Munitions Debris (MD) - Material documented as safe (MDAS)

25. NATIONAL STOCK NO. & ADD (8-22)

Material Documented as Safe (MDAS) containerized in 55 Gallon Drums - weights to be confirmed at receivers location.

MDAS #1: Seal # - 201098 - Mixed Metals - 499 LBS

26. RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (65-66) UP (74-80)

27. ADDITIONAL DATA

This certifies and verifies that the material listed has been 100% inspected and to the best of our knowledge and belief, is inert and/or free of explosives or related materials.

UXOQCS - Parsons Government Services (808-292-2201 - First and Last Name: Richard Endress : Date 23 MAY 19

SUXOS - Parsons Government Services (682-990-2717) - First and Last Name: Scott Phillips : Date: 23 MAY 19

Adobe Designer 8.0

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

1	2	3	4	5	6	7	23	24	25	26	27	28	29	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
DOC	IDENT		RI FROM			M&S	UNIT	ISS	QUANTITY					SER	SUPPLEMENTARY ADDRESS					SIG	FUND		DISTRIBUTION			PROJECT			PRI		REQD	DEL	DATE		ADV			RI			O/P	COND	MGT							

UNIT PRICE DOLLARS	UNIT PRICE CTS	DOLLARS	CTS

1. TOTAL PRICE

2. SHIP FROM	3. SHIP TO
Parsons PGS Barry Goldwater AZ Chris TenBraak 702-652-9365	Bonetti Explosives Matt Barnett 1618Smith RauRd. ColumbusTx78934

4. MARK FOR

5. DOC DATE	6. NMFC	7. FRT RATE	8. TYPE CARGO	9. PS

10. QTY. REC'D	11.UP	12. UNIT WEIGHT	13. UNIT CUBE	14. UFC	15. SL

16. FREIGHT CLASSIFICATION NOMENCLATURE

17. ITEM NOMENCLATURE

18. TY CONT	19. NO CONT	20. TOTAL WEIGHT	21. TOTAL CUBE
		499 lbs	

22. RECEIVED BY	23. DATE RECEIVED

PREVIOUS EDITION MAY BE USED

24. DOCUMENT NUMBER & SUFFIX (30-44)

Munitions Debris (MD) - Material documented as safe (MDAS)

25. NATIONAL STOCK NO. & ADD (8-22)

Material Documented as Safe (MDAS) containerized in 55 Gallon Drums - weights to be confirmed at receivers location.

MDAS #1: Seal # - 201098 - Mixed Metals - 499 LBS

26. RIC (4-5) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)

27. ADDITIONAL DATA

This certifies and verifies that the material listed has been 100% inspected and to the best of our knowledge and belief, is inert and/or free of explosives or related materials.

UXOQCS - Parsons Government Services (808-292-2201 - First and Last Name: Richard Endress _____ : Date 23 MAY 19

SUXOS - Parsons Government Services (682-990-2717) - First and Last Name: Scott Phillips _____ : Date: 23 MAY 19

Adobe Designer 8.0

Pick-up Darren

Forward Air

WAYBILL
ICC-MC249708

NUMBER: 77131481

ORIGIN AIRPORT	DESTINATION AIRPORT
OKC	ORD

Forward Air COMPLETE

PICK UP

NAME: PARSONS
STREET ADDRESS: 9403 BEAVERS BEND
CITY: EDMOND
STATE/ZIP: OK 73034
CONTACT: TERRY WILLIS
TELEPHONE NO.: 4054797123
FROM TIME: 12:00
TO TIME: 16:30
ACCOUNT NO.: 2414416

DELIVER TO

NAME: DEMIL METALS C/O MIMC
STREET ADDRESS: 615 NORTHWEST HWY
CITY: NORTHLAKE
STATE/ZIP: IL 60164
CONTACT: MELINDA
TELEPHONE NO.: 7732028202
FROM TIME: 09:00
TO TIME: 17:00

BILL TO: WORLDWIDE EXPRES
STREET ADDRESS: 2323 VICTORY AVE 16TH
CITY: DALLAS
STATE/ZIP: TX 75219
ACCOUNT NO.: 2414416

NO. PCS.	DESCRIPTION	FREIGHT CLASS	ACTUAL GROSS WEIGHT	FORWARD AIR TOTAL DIM WEIGHT	FORWARD AIR DIMS
1	steel scrap	50	500.0 L		

SHIPMENT INFORMATION PROVIDED BY SHIPPER

REF NBRS: 154978118;

CUSTOMER BOOKED WEIGHT: 500.0 L
DIMS: 1@48x48x40in

ACCESSORIALS: Liftgate Pickup

INSTRUCTIONS: PICKUP: PU:DIMS: 48 48 40;DEL:Please call when on the way 4054797123;48x48x40in. DELIVERY:.
Documents Required: BOL/HAWB

THE GOODS DESCRIBED HAVE BEEN RECEIVED IN APPARENT GOOD ORDER AND ALL SERVICES WERE PERFORMED EXCEPT AS FOLLOWS:
TND:

Willis
PRINTED LAST NAME

X _____
CONSIGNEE

DATE: 5/20/21 TIME: 1100

VALUATION STATEMENT

NOTICE: UNLESS A HIGHER VALUE IS DECLARED, THE SHIPPER HEREBY RELEASES THE PROPERTY TO A VALUE OF $0.50 PER POUND, SUBJECT TO A $50 MINIMUM. SEE THE TRANSPORTATION CONTRACT AND SERVICE CONDITIONS AT WWW.FORWARDAIR.COM FOR LIMITATIONS AND DECLARED SURCHARGES.

DECLARED VALUE $ 0.00

X _____
SHIPPER

RECEIVED BY:
BY:
AT: ☐ SHIPPER'S ADDRESS ☐ HAZMAT
☐ FORWARD AIR TERMINAL ☐ INBOND
DATE: TIME:

SERVICE SUBJECT TO BROKER'S RATE CIRCULARS AND RULES IN EFFECT ON DATE OF SHIPMENT AND TO CONDITIONS OF APPLICABLE CONTRACT

FA-AB0404a

77131481

AGENT PRINTED 05/19/2021 18:29 ET

Date: 05/19/2021

BILL OF LADING

SHIP FROM

Name: Parsons
Address: 9403 Beavers Bend

City/State/Zip: EDMOND,OK 73034
Ph: 405-479-7123 Contact: Terry Willis

FOB: ☐

Bill of Lading Number : 154978118

Carrier Name: Forward Air

SCAC: FWDN
Pro number:

SHIP TO

Name: Demil Metals c/o mimc Location#
Address: 615 Northwest Hwy

City/State/Zip: NORTHLAKE,IL 60164
Ph: 773-202-8202 Contact: Melinda

FOB: ☐

Freight Charge Terms: (*freight charges are prepaid by Worldwide Express unless indicated otherwise*)

FREIGHT CHARGES BILL TO

Name: Worldwide Express
Address: 2323 Victory Avenue Ste 1600
City/State/Zip: Dallas, TX 75219

☐ Master Bill of Lading: with attached underlying Bill Of Lading

WWE Number: W826299348

SPECIAL INSTRUCTIONS: For assistance, please call 833-6WE-SHIP

Handling Instructions: Please call when on the way 405-479-7123

Pickup Instructions:

Delivery Instructions:

Pickup Service(s): Liftgate Pickup, Military Pickup

REFERENCE NUMBER INFORMATION

REFERENCE	# PKGS	REFERENCE	# PKGS	Total # of Pkgs

CARRIER INFORMATION

HANDLING UNITS		PIECES		WEIGHT	H.M.	COMMODITY DESCRIPTION Commodities requiring special or additional care or attention in handling or stowing must be so marked and packaged to ensure safe transportation with ordinary care. See section 2(e) of NMFC Item 360	LTL ONLY	
QTY	TYPE	QTY	TYPE	LBS	X		NMFC#	CLASS
1	PLT			500		steel scrap, 48(L) x 48(W) x 40(H) DO NOT STACK		50
1				500		**Grand Total**		

Where the rate is dependent on value , shippers are required to state specifically in writing the agreed or declared value of property as follows: The agreed or declared value of the property is specifically stated by the shipper to be not exceeding _____ per _____

Note: Liability limitation for loss or damage in this shipment may be applicable. See 49 U.S.C. 14706(c)(1)(A) and (B)

COD Amount: $
Fee Terms: 3rd Party WWE
Remit Address:

Acceptable Forms of Payment:
- Bank Certified Check ☐
- Company Check ☐
- Personal Check ☐
- Money Order ☐

RECEIVED, subject to individually determined rates or contracts that have been agreed upon in writing between the carried and Worldwide Express Operations, LLC. a registered motor carried broker, pursuant to 49 USC 14101(b) and all applicable state and federal regulations.

SHIPPER'S SIGNATURE / DATE
This is to certify that the above-named materials are properly classified, described, packaged marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

5/19/21
(Signature) (Date)

Trailer Loaded:
- ☐ By Shipper
- ☐ By Driver

Freight Counted:
- ☐ By Shipper
- ☐ By Driver/pallet said to contain
- ☐ By Driver/Pieces

CARRIER SIGNATURE /PICKUP DATE

Carrier acknowledges receipt of packages and required placards. Carrier certifies emergency response information was made available and /or carrier has DOT emergency response guidebook or equivalent documentation in vehicle. Property described above is received in good order, except as noted.

5-21-21
(Signature) (Date)

Appendix B – Analytical Data

AREA A MUNITIONS RESPONSE SITE

BARRY M. GOLDWATER RANGE/ LUKE AIR FORCE BASE, ARIZONA

Prepared for:

U.S. Air Force Civil Engineer Center
485 Quentin Roosevelt Rd.,
San Antonio, TX 78226

Luke Air Force Base
14185 Falcon St.,
Luke AFB, AZ 85309

Prepared by:

U.S. Army Corps of Engineers,
Omaha District
1616 Capitol Ave., Ste. 9000
Omaha, NE 68102

Parsons
1776 Lincoln St., Ste. 600
Denver, Colorado

Contract No. W912DY-16-D-0024
Task Order No. W9128F17F0255

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APPENDIX B: ANALYTICAL DATA

Some attachments will be provided separately in electronic format. Analytical Data attachments are:

- Attachment 1: Analytical Data Tables
- Attachment 2: Data Validation Reports
- Attachment 3: Laboratory Electronic Data Deliverable (Separate Electronic Delivery Only)

Barry M. Goldwater Range
Luke Air Force Base, Arizona
Area A Munitions Response Site
Validated Data Summary for Soil Samples Collected April - May 2021

SAMPLE ID:		PROJECT ACTION LIMIT[1]	BMGR-BG-DU01-001-0-2		BMGR-ANT-BG-002-0-2		BMGR-ANT-BG-003-0-2		BMGR-ANT-DU01-001A-0-2**		BMGR-ANT-DU01-001B-0-2**		BMGR-ANT-DU01-001C-0-2**		BMGR-ANT-DU01-002-0-2		BMGR-ANT-DU01-003-0-2		BMGR-ANT-DU01-004-0-2		BMGR-ANT-DU01-005-0-2	
DATE SAMPLED:			04/02/2021		04/07/2021		04/07/2021		04/02/2021		04/02/2021		04/02/2021		04/07/2021		04/07/2021		04/07/2021		05/04/2021	
LAB SAMPLE ID:			BA29867		BA30104		BA30105		BA29864		BA29865		BA29866		BA30101		BA30102		BA30103		BA31981	
SAMPLE DEPTH (ft bgs):			0 - 0.17		0 - 0.17		0 - 0.17		0 - 0.17		0 - 0.17		0 - 0.17		0 - 0.17		0 - 0.17		0 - 0.17		0 - 0.17	
	Unit																					
Metals - SWSW6020A																						
Barium	mg/kg	330	128		61.4		65.1		66.7	J+	69.9	J+	68.4	J+	161		37.1		42.2		63.1	J
Chromium	mg/kg	26	134	R	156	R	127	R	142	R	85.1	R	147	R	90.2	R	105	R	109	R	24.8	J
Copper	mg/kg	28	13.0	J+	13.4	J+	10.2	J+	20.0	J	15.3	J	15.9	J	20.7	J+	13.0	J+	10.9	J+	17.9	J
Lead	mg/kg	11	8.2		36.3		26.5		9.7	J-	9.3	J-	8.9	J-	6.9		4.9		4.7	J+	6.0	J
Explosives - SW8330B																						
1,3,5-Trinitrobenzene	mg/kg	10	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U
1,3-Dinitrobenzene	mg/kg	0.072	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U
2,4,6-Trinitrotoluene (TNT)	mg/kg	3.6	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U
2,4-Dinitrotoluene	mg/kg	1.7	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U
2,6-Dinitrotoluene	mg/kg	0.36	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U
2-Amino-4,6-dinitrotoluene	mg/kg	14	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U
2-Nitrotoluene	mg/kg	3.2	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U
3-Nitrotoluene	mg/kg	0.63	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U
4-Amino-2,6-dinitrotoluene	mg/kg	12	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U
4-Nitrotoluene	mg/kg	21	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	mg/kg	2.3	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U
Methyl-2,4,6-Trinitrophenylnitramine (Tetryl)	mg/kg	1.5	0.075	U	0.075	U	0.075	U	0.51	J	0.16	J	0.32	J	0.075	U	0.075	U	0.075	U	0.075	U
Nitrobenzene	mg/kg	2.2	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U
Nitroglycerin	mg/kg	0.63	0.150	U	0.150	U	0.150	U	0.150	U	0.150	U	0.150	U	0.150	U	0.150	U	0.150	U	0.150	U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	mg/kg	16	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U
Pentaerythritol Tetranitrate (PETN)	mg/kg	13	0.250	U	0.250	U	0.250	U	0.250	U	0.250	U	0.250	U	0.250	U	0.250	U	0.250	U	0.250	U
Percent Moisture - D2216																						
Percent Moisture	%		--		--		--		--		--		--		--		--		--		--	

QA NOTES AND DATA VALIDATION QUALIFIERS:

* - Field duplicate of sample on left
** - Field triplicate sample.
-- - not applicable, parameter not analyzed.
(NO CODE) - Confirmed identification.
U - Analyte was analyzed for but not detected above the reported limit of detection (LOD).
UJ - Analyte not detected, reported LOD may be inaccurate or imprecise.
J - Analyte detected, estimated concentration.
J- - Analyte detected, estimated concentration with potential low bias.
J+ - Analyte detected, estimated concentration with potential high bias.
R - Rejected result due to serious deficiencies in meeting quality control criteria

Detections above the PAL are highlighted.

NOTES:

[1] Project Action Limit values are the lesser of the human health screening value and ecological screening level. Human health screening value selected from USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, residential soil, target risk = 1E-06; Target Hazard Quotient = 0.1. Updated May 2018. Available at: https://semspub.epa.gov/work/HQ/197235.pdf.
Ecological screening value selected from USEPA Ecological Soil Screening Levels, lowest value of plant, invertebrates, mammals, and avians; various dates. Available at: https://www.epa.gov/chemical-research/interim-ecological-soil-screening-level-documents. If no value available, ecological screening value was selected from Los Alamos National Laboratory EcoRisk Database. Release 4.1, September 2017.

Sample IDs in "BLUE" text denotes background samples.

ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.

DATA VALIDATION SUMMARY REPORT

for samples collected from

BARRY M GOLDWATER RANGE

FORMER AREA A MUNITIONS RESPONSE SITE (MRS)

Data Validation by: Beth Driskill

Project Manager: Chris ten Braak

Report Date: June 21, 2021

Parsons - Austin

INTRODUCTION

The following data validation summary report covers four (4) incremental soil samples. The samples were collected from Former Area A, Barry M. Goldwater Range at Luke Airforce Base, Arizona on April 2, 2021. The samples were logged under the following Sample Delivery Group (SDG):

95693

The samples in this SDG were analyzed for explosives by U.S. EPA Method SW8330B and select metals (barium, chromium, copper, and lead) by U.S. EPA Method SW6020A. The tables below detail the sample IDs and requested parameters. The field quality control (QC) samples associated with this SDG included one matrix spike / matrix spike duplicate (MS/MSD) pair and one sample that was collected in triplicate.

The samples in this SDG were collected using disposable equipment. Therefore, no equipment blanks or source blanks were associated with the samples in this SDG.

All samples were collected by Parsons, placed on ice and were shipped overnight to Agriculture and Priority Pollutants Laboratories (APPL), Inc. in Clovis, California. The samples were received by APPL, Inc. in good condition at an acceptable temperature of 2.0 degrees Celsius.

All samples were prepared and analyzed following the procedures outlined in the project-specific Uniform Federal Policy - Quality Assurance Project Plan (UFP-QAPP) (Parsons, 2018a) and the Department of Defense (DoD) Quality Systems Manual (QSM) Version 5.1.

SAMPLE IDs AND REQUESTED PARAMETERS

Client Sample ID	Laboratory Sample ID	Matrix	COMMENTS
BMGR-ANT-DU01-001A-0-2”	BA29864	Solid	Triplicate
BMGR-ANT-DU01-001B-0-2”	BA29865	Solid	Triplicate
BMGR-ANT-DU01-001C-0-2”	BA29866	Solid	Triplicate, MS/MSD
BMGR-BG-DU01-001-0-2”	BA29867	Solid	

Note: All samples listed above were analyzed for the parameters listed in the table below and all samples had Stage 4 manual validation performed.

EXTRACTION, ANALYTICAL, AND REPORTING DETAILS

Parameter	Matrix	Prep Method	Analytical Method	Units
Explosives	Solid	SW8330B	SW8330B	mg/Kg
Metals	Solid	SW3050B	SW6020A	mg/Kg

EVALUATION CRITERIA

The Stage IV data package submitted by the laboratory has been reviewed and verified following the guidelines outlined in the project-specific UFP-QAPP, DoD General Data Validation Guideline, 2021, and National Functional Guidelines (NFG) for both organic and inorganic methods, November 2020. Information reviewed in the data packages included sample results; field and laboratory quality control results; instrument calibration; calibration verifications; case narratives; sample receipt forms, chain-of-custody (COC) forms, and a recalculation of one QC (ICAL, LCS, MS/MSD, surrogate) and/or one sample result for each parameter. The calculations can be found in Attachment A of this report. The analyses and findings presented in this report are based on the reviewed information, and whether guidelines in the associated analytical method, DoD QSM and QAPP were met.

A table detailing all data qualifiers applied for the samples in this SDG as a result of the data validation process is included as Attachment B to this report. Data validation checklists for each analytical method listed in the table above are also included as Attachment C.

EXPLOSIVES

General

The explosives portion of this SDG consisted of four (4) incremental soil samples, which includes three samples that were collected in triplicate. The samples were collected on April 2, 2021 and were analyzed for explosives as specified in the project-specific UFP-QAPP.

The explosives samples were dried, sieved, mechanically ground for 60 seconds, incrementally sampled, and then extracted and analyzed in accordance with U.S. EPA Method SW8330B. All samples in this SDG were analyzed following the procedures outlined in the DoD QSM, version 5.1 and the project-specific UFP-QAPP.

The samples were prepared and analyzed within the holding time required by the method. The samples were prepared and analyzed in one batch. The samples were analyzed on one primary instrument under a single initial calibration (ICAL) and detected results were confirmed on a secondary column. All analyses were performed undiluted.

Accuracy

Accuracy was evaluated using the percent recovery obtained from the Laboratory Control Sample (LCS), Laboratory Control Sample Duplicate (LCSD), MS/MSD, and the surrogate spikes. Sample BMGR-ANT-DU01-001C-0-2" was designated for MS/MSD analysis on the COC.

All LCS, LCSD, and surrogate spike recoveries were within acceptance criteria.

All MS/MSD recoveries were within acceptance criteria except as follows.

BMGR-ANT-DU01-001C-0-2"

Analyte	MS %R	MSD %R	Criteria
PETN	157	175	72-128%

PETN was non-detect in the triplicate samples; therefore, data was not affected by the high recovery and results were not qualified.

Accuracy was further evaluated with the use of a LCS Standard Reference Material (SRM) which consisted of a pre-spiked solid matrix purchased by the laboratory that was put through the grinding process and prepared and analyzed along with the field samples. The LCS SRM spike recoveries were within acceptance criteria.

Precision

Precision was evaluated using the relative percent difference (RPD) obtained from the LCS/LCSD and MS/MSD analyte results. Precision was further evaluated by comparing the field triplicate analyte results. A lab triplicate was also prepared and analyzed but was performed on a non-project sample; therefore, the lab triplicate data was not discussed in this report.

All LCS/LCSD and MS/MSD RPDs were within acceptance criteria.

Relative standard deviation (RSD) was only calculated for detected results in the triplicate samples. All results were non-detect in the triplicate samples except as follows.

Analyte	BMGR-ANT-DU01-001A-0-2"	BMGR-ANT-DU01-001B-0-2"	BMGR-ANT-DU01-001C-0-2"	RSD	Criteria
Tetryl	0.51	0.16	0.32	53.1	RSD ≤ 50

The RSD was exceeded for tetryl; therefore, the results for tetryl in the triplicate samples were qualified "J" as estimated.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the COC procedures to those described in the DoD QSM and project QAPP;
- Comparing actual analytical procedures to those described in the DoD QSM and project-specific UFP-QAPP;
- Evaluating holding times; and

- Examining laboratory blanks for cross contamination of samples during analysis.

The samples in this SDG were analyzed following the COC and the analytical procedures described in the DoD QSM and project-specific UFP-QAPP. All samples were prepared and analyzed within the holding time required by the method. The following QC elements were also evaluated:

- All ICAL criteria were met.
- The initial calibration verification (ICV) samples were prepared from a second source standard. All ICV criteria were met.
- All continuing calibration verification (CCV) criteria were met.
- Column confirmation criteria for detected results met criteria except as follows.

Sample ID	Analyte	RPD	Criteria
BMGR-ANT-DU01-001B-0-2”	Tetryl	62.3	RPD ≤ 40
BMGR-ANT-DU01-001C-0-2”	Tetryl	53.6	

  The tetryl result in the two samples listed above were qualified “J” as estimated.

- Raw data was reviewed for qualitative and quantitative accuracy.

One laboratory method blank, which was also the grinding blank, was associated with the explosives analyses in this SDG. The laboratory method/grinding blank was non-detect for all target explosives.

Completeness

Completeness has been evaluated by comparing the total number of samples collected with the total number of samples with valid analytical data.

All results for explosives for the samples in this SDG were considered usable. Therefore, the completeness for the explosives portion of this SDG is 100%, which meets the minimum acceptance criteria of 90%.

METALS

General

The metals portion of this SDG consisted of four (4) incremental soil samples, which includes three samples that were collected in triplicate. The samples were collected on April 2, 2021 and were analyzed for metals as specified in the project-specific UFP-QAPP.

The metals samples were dried, sieved, mechanically ground for 60 seconds, incrementally sampled, digested, and then analyzed in accordance with U.S. EPA Method SW6020A. All samples in this SDG were analyzed following the procedures outlined in the DoD QSM, version 5.1 and the project-specific UFP-QAPP.

All samples were prepared and analyzed within the holding time required by the method. The samples were digested and analyzed in one batch under one ICAL. All analyses were performed undiluted.

Accuracy

Accuracy was evaluated using the percent recovery obtained from the LCS, LCSD, MS, and MSD. Sample BMGR-ANT-DU01-001C-0-2" was designated for MS/MSD analysis on the COC.

All LCS recoveries were within acceptance criteria.

All MS/MSD recoveries were within acceptance criteria, except for the following:

BMGR-ANT-DU01-001C-0-2"

Analyte	MS %R	MSD %R	Criteria
Barium	152	163	86-116%
Chromium	150	195	83-119%
Copper	66.5	(92)	84-119%
Lead	79	(84)	84-118%

( ) indicates that the recovery was within criteria.

The parent sample result for chromium was greater than 4 times the concentration spiked, resulting in the anomalous recoveries. Therefore, no corrective action was necessary for chromium. Barium was qualified "J+" as estimated with potential high bias in all three triplicate samples. Lead was qualified "J-" as estimated with potential low bias in all three triplicate samples. Copper recovered low in the MS but was also found at similar levels in the grinding blank, as discussed below. All three triplicate results for copper were qualified "J" as estimated with unknown bias due to the combination of QC issues.

Precision

Precision was evaluated using the RPD obtained from the LCS/LCSD and MS/MSD concentrations. Precision was further evaluated by comparing the field triplicate analyte results.

All LCS/LCSD and MS/MSD RPDs were within acceptance criteria.

RSD was calculated for detected results in the triplicate samples as follows. The RSDs were within acceptance criteria for all metals.

Analyte	BMGR-ANT-DU01-001A-0-2"	BMGR-ANT-DU01-001B-0-2"	BMGR-ANT-DU01-001C-0-2"	RSD	Criteria
Barium	66.7	69.9	68.4	2.3	RSD ≤ 50
Chromium	142	85.1	147	27.6	
Copper	20	15.3	15.9	15	
Lead	9.7	9.3	8.9	4.3	

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the COC procedures to those described in the DoD QSM and project-specific UFP-QAPP;

- Comparing actual analytical procedures to those described in the DoD QSM and project-specific UFP-QAPP;
- Evaluating holding times; and
- Examining laboratory blanks for cross contamination of samples during analysis.

The samples in this SDG were analyzed following the COC and the analytical procedures described in the DoD QSM and project-specific UFP-QAPP. All samples were prepared and analyzed within the holding time required by the method. The following QC elements were also evaluated:

- All instrument tune criteria were met.
- All initial calibration criteria were met.
- The ICV was prepared from a second source standard. All ICV criteria were met.
- All CCV criteria were met.
- All low-level ICV (LL ICV) criteria were met.
- All interference check samples (ICS) were within criteria.
- All initial calibration blank (ICB) criteria were met.
- All continuing calibration blank (CCB) criteria were met.
- All internal standard criteria associated with the target metals were met.
- A dilution test (DT) was performed on the same sample as the MS/MSD. The DT was only applicable for those metals that failed in the MS/MSD and were detected in the parent sample at a concentration of 50 times the LOQ or greater. All applicable metals were outside criteria as follows.

BMGR-ANT-DU01-001C-0-2”

Analyte	DT %D	Criteria
Barium	15.4	%D ≤ 10
Chromium	14.1	
Lead	10.5	

Chromium was qualified “R”, as rejected in all samples in this SDG due to significant contamination in the grinding blank; therefore, no additional corrective action was taken due to the DT exceedance. Barium and Lead were already qualified as noted above due to MS/MSD recovery failure. Therefore, no additional corrective action was necessary

- The post digestion spike (PDS) was performed on the same sample as the MS/MSD. The PDS was only applicable for those metals that failed in the MS/MSD and were detected less than 50 times the LOQ. The following applicable metal was outside criteria in the PDS.

BMGR-ANT-DU01-001C-0-2”

Analyte	PDS %R	Criteria
Copper	78.7	80-120%

Copper was also qualified due to grinding blank contamination so the results in the triplicate samples were qualified “J” as estimated with no assigned bias.

- Raw data was reviewed for qualitative and quantitative accuracy.

One laboratory method blank was associated with the metals analyses in this SDG. The laboratory method blank was non-detect for all target metals.

One laboratory grinding blank was associated with the metals analysis in this SDG. Due to the metals concentrations inherent in the sand matrix, the laboratory also analyzed the sand from the same lot used for the grinding blank in triplicate. The three analyses were averaged to determine the amount of each metal contributed by the sand matrix. The metals concentrations native to the sand matrix were subtracted from the grinding blank results to determine the concentration of metals contributed by the grinding process. The following metals had concentrations contributed by grinding that exceeded the LOQ:

Analyte	Conc. contributed by grinding process (mg/kg)	LOQ (mg/kg)
Barium	2.2	0.25
Chromium	302	0.50
Copper	8.4	2.5
Lead	0.95	0.1

The grinding blank demonstrated a significant amount of chromium contributed by grinding. The amount of chromium calculated to be due to the grinding process exceeded the sample results reported. Therefore, the chromium results for all samples in this SDG were qualified “R” as rejected and unusable. Copper was detected in all samples in this SDG at a similar concentration contributed by the grinding process. Therefore, the copper result in sample BMGR-BG-DU01-001-0-2 was qualified “J+” as estimated with a potential high bias. The copper results in the triplicate samples, BMGR-ANT-DU01-001A-0-2, BMGR-ANT-DU01-001B-0-2, and BMGR-ANT-DU01-001C-0-2 were qualified “J” as estimated with no assigned bias due to additional QC issues noted above. All sample results for barium and lead were significantly greater than the amount contributed by grinding and no corrective action was necessary for these metals.

Completeness

Completeness has been evaluated by comparing the total number of samples collected with the total number of samples with valid analytical data.

All metals results for the samples in this SDG were considered usable except for the four chromium results that were qualified as rejected and flagged “R”. Therefore, the completeness for the metals portion of this SDG is 75%, which was below the minimum acceptance criteria of 90%.

COMPARABILITY

All data was generated using contract-specific standard methods and reported with known data quality, type of analysis, units, etc.

SENSITIVITY

The LOD and LOQ values reported for the samples were compared to those listed in the QAPP to ensure that sensitivity requirements were met. All sample LODs and LOQs for the samples were adjusted based on dilution and/or initial/final volumes.

The LOD and LOQ for explosives analyte 1,3-Dinitrobenzene was greater than the project action limit (PAL) as noted in the QAPP.

DATA USABILITY

The purpose of this data validation report is to ensure the integrity and reliability of analytical laboratory data. The data quality is evaluated based on precision, accuracy, representativeness, comparability, and completeness (PARCC) characteristics of the data. The validated data indicated that the laboratory correctly performed the analyses. Based on the data quality assessment, some results are considered estimated as discussed above. However, all results qualified as estimated are usable for the purposes of the project. All sample results for chromium were qualified “R” as rejected due to significant contamination demonstrated by the grinding blank. These results were not considered usable for project decision making.

SAMPLE RESULTS AND DATA QUALIFIERS

The sample results and final data qualifiers and reason codes that were added, removed, or changed as a result of the data validation process are included in a table as Attachment B to this report.

DATA QUALIFIER DEFINITIONS

The data qualifiers are defined in Table 36.3 of the project-specific UFP-QAPP, as follows:

U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been “tentatively identified” or “presumptively” as present and the associated numerical value was the estimated concentration in the sample.

UJ The analyte was not detected and was reported as less than the LOD. However, the associated numerical value is approximate.

X The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project QC criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

REASON CODE DEFINITIONS

The data validation reason codes were used to document the logic behind all data validation qualifiers. The following reason codes for data qualification were associated with the samples in this SDG:

D2: Field triplicate precision infraction

C6: Confirmation precision infraction

M2: MS/MSD percent recovery infraction with high bias

M3: MS/MSD percent recovery infraction with low bias

M5: Post digestion spike infraction

B9: Grinding blank infraction (qualified data)

ACRONYMS AND ABBREVIATIONS

The following is a list of acronyms and abbreviations that were used in this data validation report.

APPL	Agriculture and Priority Pollutants Laboratories
CCB	Continuing Calibration Blank
CCV	Continuing Calibration Verification
CoC	Chain of Custody
DoD	Department of Defense
DT	Dilution Test
ICAL	Initial Calibration
ICB	Initial Calibration Blank
ICS	Interference Check Sample
ICV	Initial Calibration Verification
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LL ICV	Low-Level Initial Calibration Verification
LOD	Limit of Detection
LOQ	Limit of Quantitation
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MRS	Munitions Response Site
NFG	National Functional Guidelines
PAL	Project Action Limit
PDS	Post Digestion Spike
QC	Quality Control
QSM	Quality Systems Manual

RPD	Relative Percent Difference
RSD	Relative Standard Deviation
SDG	Sample Delivery Group
SRM	Standard Reference Material
UFP-QAPP	Uniform Federal Policy – Quality Assurance Project Plan

Attachment A

Calculations

(the explosive calculations are a separate document in excel)

Explosive Calculations

SDG 95693

Analyte Conc	Analyte Resp	RF	Reported RF		
0.005	44674	2.234E+02	223.4		Tetryl
0.01	91470	2.287E+02	228.7		page 35
0.02	178763	2.235E+02	223.5		
0.05	459934	2.300E+02	230		
0.1	876424	2.191E+02	219.1		
0.2	1869447	2.337E+02	233.7		
0.5	4704331	2.352E+02	235.2		
1	9098547	2.275E+02	227.5		
2	17685690	2.211E+02	221.1		
	Calc				
mean RRF	2.276E+02		226.9		
%RSD	2.40		2.45		

Conc. on-colun $\frac{\text{peak height*conv factor (20ml/10g soil * DF4)}}{\text{average cal factor * inj. Vol.}}$

Surrogate	pg. 184 of 326		Sample (BMGR-ANT-DU01-001A-0-2") BA29864		
1,2-DNB	On column	Reported	Spike	%R calc	%R Reported
Response	848147				
conc	590.817	590.892	595.829	99.16	99.17

Compound Quant					
Reported compounds	page 184 of 326		Sample:(BMGR-ANT-DU01-001A-0-2") BA29864		
Tetryl	On column	Reported	Calc Conc	Reported	
Response	582043				
conc	509.448	509.498	0.51	0.51	pg. 13 of 326

LCS/LCSD		LCS	LCSD		
Tetryl	Spike Amount	Spike Rec	Spike Rec		
pg. 26	1.98	1.79	1.91		
	LCS %R	LCSD %R	RPD		
	90.4	96.5	6.5	Calc	
	90.4	96.5	6.5	Reported pg 26	
	LCS		LCSD		
Quant	On column	Reported	On column	Reported	
Response	2052387		2181064		
conc (on col)	1793.012	1793.017	1907.350	1905.432	pg. 204, 206
conc (calc)	1.79	1.79	1.91	1.91	pg. 26

BMGR-ANT-DU01-001A-0-2"
SDG: 95693

Sample Report

$y = mx + b \rightarrow x = \frac{y - b}{m}$

Sample Name	BA29864S01 DF10
File Name	048SMPL.d
Data Path Name	Metals-icpms\data\210430A_#2.b
Acq Time	04/30/21 4:37:02 PM
Sample Type	Sample
Total Dilution	0.1010
Comment	Parsons
ISTD Ref FileName	007CALB.d
Sample QC Pass/Fail	Pass
ISTD QC Pass/Fail	Fail
Operator	Chemist_Metals

Pg. 324 (digestion log)

$\left(\frac{0.100L}{9.90g}\right) DF \times 10 = 0.1010$

(Ba-ICAL pg. 240)

(IS)

$\left[\text{conc.} = \left(\frac{4853722.84}{4191580.04}\right) - 0.00001308 \right] \times DF \times 0.1010 = 66.678$ ✓ mg/Kg

$.001754$

↖ (Ba-ICAL pg. 240)

QC Analyte Table

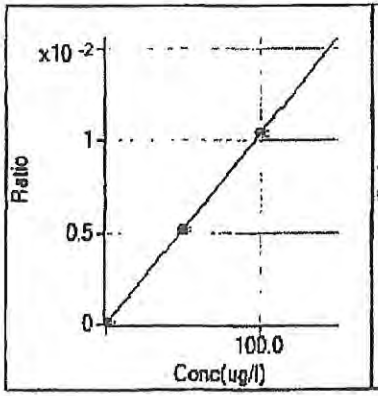
Name	Mass	ISTD	Tune	Conc.	Units	RSD	CPS	LDR	QC Flag
Be	9	6	NoGas	0.795	ug/l	5.7	10139.85	10000	
B	11	45	NoGas	1.714	ug/l	2.5	45541.60	10000	
Na	23	45	He	70.179	ug/l	0.6	601321.23	1000000	
Mg	24	45	He	2905.822	ug/l	0.6	14568586.67	1000000	
Al	27	45	He	7102.431	ug/l	0.6	20533360.00	1000000	
P	31	45	He	138.338	ug/l	1.0	21641.54	500000	
K	39	45	He	1411.683	ug/l	0.6	7359269.00	500000	
Ca	40	45	H2	1712.030	ug/l	1.8	1693362.42	500000	
Ca	44	45	He	1806.060	ug/l	0.6	547008.75	500000	
Ti	47	45	He	213.905	ug/l	0.5	344234.52	10000	
V	51	45	He	17.627	ug/l	0.5	760854.36	10000	
Cr	52	72	He	141.642	ug/l	0.7	5434579.17	10000	
Mn	55	45	He	176.238	ug/l	0.2	7470189.33	50000	
Fe	56	45	He	11987.219	ug/l	0.9	625096256.00	1000000	
Co	59	45	He	4.422	ug/l	0.1	353263.63	10000	
Ni	60	45	He	9.225	ug/l	0.9	183722.29	10000	
Cu	63	72	He	19.996	ug/l	0.3	794574.44	10000	
Zn	66	115	He	39.154	ug/l	0.6	324630.81	50000	
As	75	115	He	2.037	ug/l	0.4	11118.79	2000	
Se	78	45	He	0.231	ug/l	5.8	299.33	10000	
Se	78	115	H2	0.043	ug/l	31.6	6.53	10000	
Sr	88	115	NoGas	27.363	ug/l	1.0	8885993.82	50000	
Mo	95	115	NoGas	0.319	ug/l	3.1	21513.81	10000	
Ag	107	115	NoGas	0.052	ug/l	6.0	10049.95	5000	
Cd	111	115	He	0.149	ug/l	5.1	2480.20	10000	
Sn	118	115	He	0.563	ug/l	0.2	22931.80	10000	
Sb	121	115	NoGas	0.133	ug/l	2.5	24801.85	10000	
Ba	137	165	NoGas	66.698 ✓	ug/l	1.9	4853722.84	50000	
Tl	205	165	NoGas	0.098	ug/l	0.3	59289.10	5000	
Pb	208	165	NoGas	9.701	ug/l	0.9	7910374.05	50000	

QC ISTD Table

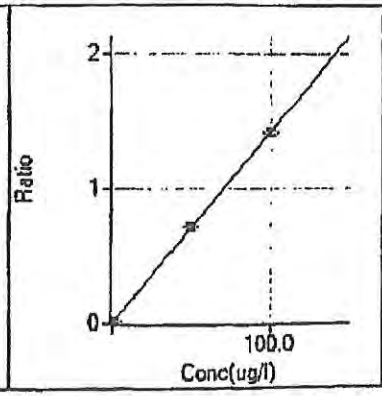
Name	Mass	Tune Mode	CPS	CPS RSD	Ref CPS	% Rec	%QC Low	%QC High	QC Flag
Li	6	NoGas	37673.99	7.8	67144.37	56.11	70	120	ISTD Failed
Sc	45	NoGas	1233205.14	0.7	875142.12	140.91	70	120	ISTD Failed

IS = 4191580.04

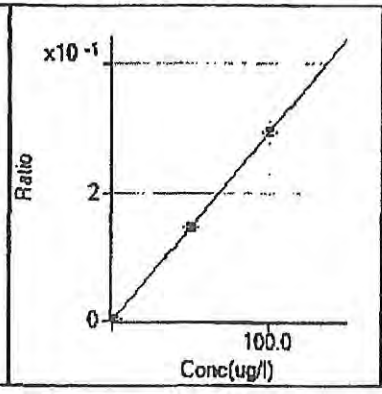
Pg. 294



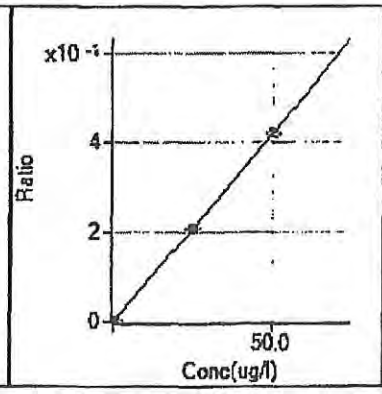
78 Se [H2]
ISTD: 115 In
y = 1.037E-4 x + 6.016E-6
R 1.0000
DL 0.08609
BEC 0.05801



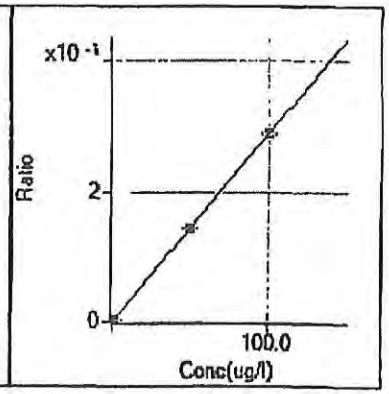
88 Sr [NoGas]
ISTD: 115 In
y = 1.418E-2 x + 5.837E-5
R 1.0000
DL 0.003414
BEC 0.004116



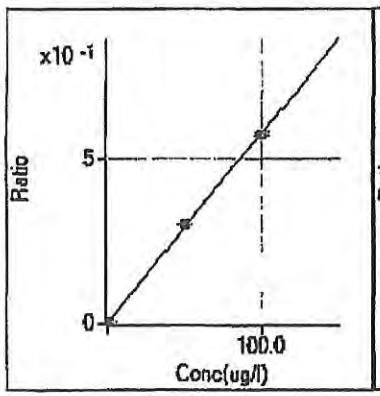
95 Mo [NoGas]
ISTD: 115 In
y = 2.939E-3 x + 9.483E-6
R 1.0000
DL 0.008641
BEC 0.003226



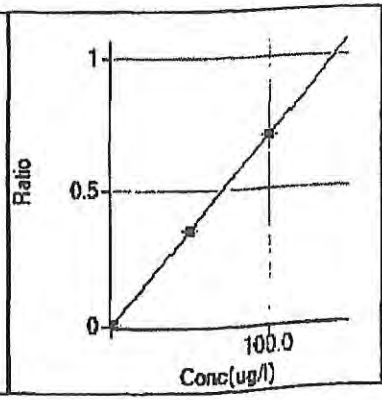
107 Ag [NoGas]
ISTD: 115 In
y = 8.412E-3 x + 6.802E-6
R 1.0000
DL 0.0008487
BEC 0.0008086



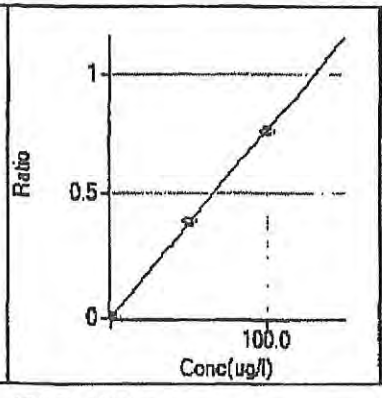
111 Cd [He]
ISTD: 115 In
y = 2.897E-3 x + 2.079E-6
R 1.0000
DL 0.003729
BEC 0.0007177



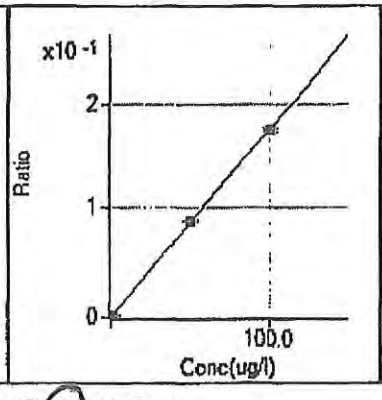
118 Sn [NoGas]
ISTD: 115 In
y = 5.820E-3 x + 1.799E-4
R 0.9999
DL 0.01061
BEC 0.03091



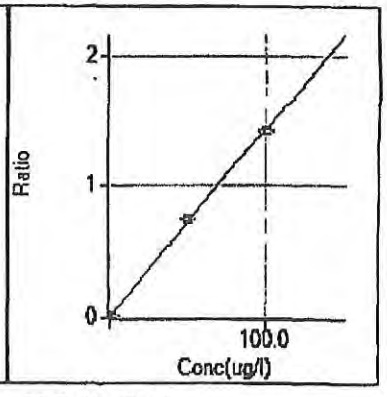
118 Sn [He]
ISTD: 115 In
y = 7.086E-3 x + 2.036E-4
R 1.0000
DL 0.01482
BEC 0.02873



121 Sb [NoGas]
ISTD: 115 In
y = 7.684E-3 x + 5.871E-4
R 1.0000
DL 0.03296
BEC 0.07641



137 Ba [NoGas]
ISTD: 165 Ho
y = 1.754E-3 x + 1.308E-5
R 1.0000
DL 0.007869
BEC 0.007459



205 Tl [NoGas]
ISTD: 165 Ho
y = 1.451E-2 x + 7.582E-5
R 0.9999
DL 0.002022
BEC 0.005224

Attachment B

Sample Results and Data Qualifiers

SDG	Matrix	Collection Date	Field Sample ID	Lab Sample ID	Analytical Method	Analyte	Value Qualifier[1]	Result	Lab Qualifier	Validation Flag	Validation Reason Code	DL	LOD	LOQ	Units	Dilution Factor
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001A-0-2	BA29864	SW6020A	BARIUM	=	66.7		J+	M2	0.070	0.200	0.25	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001A-0-2	BA29864	SW6020A	CHROMIUM, TOTAL	=	142		R	B9	0.075	0.200	0.50	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001A-0-2	BA29864	SW6020A	COPPER	=	20		J	M3, M5, B9	0.04	0.20	2.5	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001A-0-2	BA29864	SW6020A	LEAD	=	9.7		J-	M3	0.02	0.05	0.1	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001A-0-2	BA29864	SW8330B	1,3,5-TRINITROBENZENE	ND	0	U			0.013	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001A-0-2	BA29864	SW8330B	1,3-DINITROBENZENE	ND	0	U			0.022	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001A-0-2	BA29864	SW8330B	2,4,6-TRINITROTOLUENE	ND	0	U			0.031	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001A-0-2	BA29864	SW8330B	2,4-DINITROTOLUENE	ND	0	U			0.028	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001A-0-2	BA29864	SW8330B	2,6-DINITROTOLUENE	ND	0	U			0.031	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001A-0-2	BA29864	SW8330B	2-AMINO-4,6-DINITROTOLUENE	ND	0	U			0.034	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001A-0-2	BA29864	SW8330B	2-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001A-0-2	BA29864	SW8330B	3-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001A-0-2	BA29864	SW8330B	4-AMINO-2,6-DINITROTOLUENE	ND	0	U			0.034	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001A-0-2	BA29864	SW8330B	4-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001A-0-2	BA29864	SW8330B	HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	ND	0	U			0.025	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001A-0-2	BA29864	SW8330B	NITROBENZENE	ND	0	U			0.028	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001A-0-2	BA29864	SW8330B	NITROGLYCERIN	ND	0	U			0.061	0.150	0.20	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001A-0-2	BA29864	SW8330B	OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001A-0-2	BA29864	SW8330B	PENTAERYTHRITOL TETRANITRATE	ND	0	U			0.108	0.250	0.50	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001A-0-2	BA29864	SW8330B	TETRYL	=	0.51		J	D2	0.037	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001B-0-2	BA29865	SW6020A	BARIUM	=	69.9		J+	M2	0.070	0.200	0.25	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001B-0-2	BA29865	SW6020A	CHROMIUM, TOTAL	=	85.1		R	B9	0.075	0.200	0.50	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001B-0-2	BA29865	SW6020A	COPPER	=	15.3		J	M3, M5, B9	0.04	0.20	2.5	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001B-0-2	BA29865	SW6020A	LEAD	=	9.3		J-	M3	0.02	0.05	0.1	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001B-0-2	BA29865	SW8330B	1,3,5-TRINITROBENZENE	ND	0	U			0.013	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001B-0-2	BA29865	SW8330B	1,3-DINITROBENZENE	ND	0	U			0.022	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001B-0-2	BA29865	SW8330B	2,4,6-TRINITROTOLUENE	ND	0	U			0.031	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001B-0-2	BA29865	SW8330B	2,4-DINITROTOLUENE	ND	0	U			0.028	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001B-0-2	BA29865	SW8330B	2,6-DINITROTOLUENE	ND	0	U			0.031	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001B-0-2	BA29865	SW8330B	2-AMINO-4,6-DINITROTOLUENE	ND	0	U			0.034	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001B-0-2	BA29865	SW8330B	2-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001B-0-2	BA29865	SW8330B	3-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001B-0-2	BA29865	SW8330B	4-AMINO-2,6-DINITROTOLUENE	ND	0	U			0.034	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001B-0-2	BA29865	SW8330B	4-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001B-0-2	BA29865	SW8330B	HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	ND	0	U			0.025	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001B-0-2	BA29865	SW8330B	NITROBENZENE	ND	0	U			0.028	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001B-0-2	BA29865	SW8330B	NITROGLYCERIN	ND	0	U			0.061	0.150	0.20	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001B-0-2	BA29865	SW8330B	OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001B-0-2	BA29865	SW8330B	PENTAERYTHRITOL TETRANITRATE	ND	0	U			0.108	0.250	0.50	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001B-0-2	BA29865	SW8330B	TETRYL	=	0.16	Y	J	D2, C6	0.037	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001C-0-2	BA29866	SW6020A	BARIUM	=	68.4		J+	M2	0.070	0.200	0.25	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001C-0-2	BA29866	SW6020A	CHROMIUM, TOTAL	=	147		R	B9	0.075	0.200	0.50	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001C-0-2	BA29866	SW6020A	COPPER	=	15.9		J	M3, M5, B9	0.04	0.20	2.5	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001C-0-2	BA29866	SW6020A	LEAD	=	8.9		J-	M3	0.02	0.05	0.1	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001C-0-2	BA29866	SW8330B	1,3,5-TRINITROBENZENE	ND	0	U			0.013	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001C-0-2	BA29866	SW8330B	1,3-DINITROBENZENE	ND	0	U			0.022	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001C-0-2	BA29866	SW8330B	2,4,6-TRINITROTOLUENE	ND	0	U			0.031	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001C-0-2	BA29866	SW8330B	2,4-DINITROTOLUENE	ND	0	U			0.028	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001C-0-2	BA29866	SW8330B	2,6-DINITROTOLUENE	ND	0	U			0.031	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001C-0-2	BA29866	SW8330B	2-AMINO-4,6-DINITROTOLUENE	ND	0	U			0.034	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001C-0-2	BA29866	SW8330B	2-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001C-0-2	BA29866	SW8330B	3-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001C-0-2	BA29866	SW8330B	4-AMINO-2,6-DINITROTOLUENE	ND	0	U			0.034	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001C-0-2	BA29866	SW8330B	4-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001C-0-2	BA29866	SW8330B	HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	ND	0	U			0.025	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001C-0-2	BA29866	SW8330B	NITROBENZENE	ND	0	U			0.028	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001C-0-2	BA29866	SW8330B	NITROGLYCERIN	ND	0	U			0.061	0.150	0.20	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001C-0-2	BA29866	SW8330B	OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001C-0-2	BA29866	SW8330B	PENTAERYTHRITOL TETRANITRATE	ND	0	U			0.108	0.250	0.50	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-ANT-DU01-001C-0-2	BA29866	SW8330B	TETRYL	=	0.32	Y	J	D2, C6	0.037	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-BG-DU01-001-0-2	BA29867	SW6020A	BARIUM	=	128				0.070	0.200	0.25	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-BG-DU01-001-0-2	BA29867	SW6020A	CHROMIUM, TOTAL	=	134		R	B9	0.075	0.200	0.50	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-BG-DU01-001-0-2	BA29867	SW6020A	COPPER	=	13		J+	B9	0.04	0.20	2.5	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-BG-DU01-001-0-2	BA29867	SW6020A	LEAD	=	8.2				0.02	0.05	0.1	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-BG-DU01-001-0-2	BA29867	SW8330B	1,3,5-TRINITROBENZENE	ND	0	U			0.013	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-BG-DU01-001-0-2	BA29867	SW8330B	1,3-DINITROBENZENE	ND	0	U			0.022	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-BG-DU01-001-0-2	BA29867	SW8330B	2,4,6-TRINITROTOLUENE	ND	0	U			0.031	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-BG-DU01-001-0-2	BA29867	SW8330B	2,4-DINITROTOLUENE	ND	0	U			0.028	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-BG-DU01-001-0-2	BA29867	SW8330B	2,6-DINITROTOLUENE	ND	0	U			0.031	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-BG-DU01-001-0-2	BA29867	SW8330B	2-AMINO-4,6-DINITROTOLUENE	ND	0	U			0.034	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-BG-DU01-001-0-2	BA29867	SW8330B	2-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-BG-DU01-001-0-2	BA29867	SW8330B	3-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-BG-DU01-001-0-2	BA29867	SW8330B	4-AMINO-2,6-DINITROTOLUENE	ND	0	U			0.034	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-BG-DU01-001-0-2	BA29867	SW8330B	4-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-BG-DU01-001-0-2	BA29867	SW8330B	HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	ND	0	U			0.025	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-BG-DU01-001-0-2	BA29867	SW8330B	NITROBENZENE	ND	0	U			0.028	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-BG-DU01-001-0-2	BA29867	SW8330B	NITROGLYCERIN	ND	0	U			0.061	0.150	0.20	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-BG-DU01-001-0-2	BA29867	SW8330B	OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-BG-DU01-001-0-2	BA29867	SW8330B	PENTAERYTHRITOL TETRANITRATE	ND	0	U			0.108	0.250	0.50	MG/KG	1
95693	Soil	02-Apr-2021	BMGR-BG-DU01-001-0-2	BA29867	SW8330B	TETRYL	ND	0	U			0.037	0.075	0.10	MG/KG	1

Notes:

(1) Value Qualifier: ND - Nondetected Result; = - Result value equal to or above the DL.

MG/KG= milligram per kilogram

B9 - Grinding blank infraction (qualified data)

C6 - Confirmation precision infraction

D2 - Field triplicate precision infraction

M2 - MS/MSD percent recovery infraction with high bias

M3 - MS/MSD percent recovery infraction with low bias

M5 - Post digestion spike infraction
U - Analyte was not detected and was reported as less than the LOD
J - Result is an estimated value with an unknown bias
J+ - Result is an estimated quantity, but the result may be biased high
J- - Result is an estimated quantity, but the result may be biased low
R - Result is rejected due to serious deficiencies in meeting quality control criteria

Attachment C

Data Validation Checklists

VALIDATION CHECKLIST- Organics

SDG#: 95693 **Date**: 5/18/21

Laboratory: APPL **Reviewer:** Beth Driskill

Method: 8330B

	Validation Area	Acceptable? Y/N/NA	Comments
I.	Case narrative	Y	
II.	Sample receipt/Technical holding times	Y	
III.	Instrument performance check/Tune	NA	Not applicable to explosives method
IV.	Initial calibration/ICV	Y	
V.	Continuing Calibration	Y	
VI.	Laboratory Blanks	Y	Method blank and grinding blank
VII.	Field blanks	NA	All disposable equipment used
VIII.	Surrogate spikes	Y	
IX.	Matrix spike/Matrix spike duplicate	N	PETN high and non-detect in the parent sample. See DVR.
X.	Laboratory control samples	Y	
XI.	Field duplicates/Field triplicates	N	Tetryl RSD high in triplicate. FD not applicable. See DVR.
XII.	Internal standards	NA	Not applicable to explosives method
XIII.	Compound quantitation LOQ/LOD/DL	Y	
XIV.	Target compound identification	Y	
XV.	Column confirmation	N	Tetryl RPD high in BMGR-ANT-DU01-001C-0-2 and BMGR-ANT-DU01-001B-0-2 See DVR.

VALIDATION CHECKLIST- Inorganics

SDG#: 95693 **Date**: 6/21/21

Laboratory: APPL **Reviewer:** Beth Driskill

Method: 6020A

	Validation Area	Acceptable? Y/N/NA	Comments
I.	Case narrative	Y	
II.	Sample receipt/Technical holding times	Y	
III.	Instrument performance check/Tune	Y	
IV.	Initial calibration/ICV/LLICV	Y	
V.	Continuing Calibration	Y	
VI.	Laboratory Blanks- MB, ICB/CCB	N	Grinding blank had significant detections. See DVR discussion on qualified results.
VII.	Field blanks	NA	Samples in this SDG were collected using disposable equipment; therefore, field blanks were not applicable.
VIII.	Interference check standard	Y	
IX.	Matrix spike/Matrix spike duplicate	N	All targets recovered outside criteria. See DVR.
X.	Laboratory control samples	Y	
XI.	Field duplicates/Field triplicates	Y	Field triplicate only. FD not applicable
XII.	Internal standards	Y	
XIII.	Dilution test	N	See DVR
XIV.	Post digestion spike	N	See DVR
XV.	Compound quantitation LOQ/LOD/DL	Y	
XVI.	Target compound identification	Y	

DATA VALIDATION SUMMARY REPORT

for samples collected from

BARRY M GOLDWATER RANGE

FORMER AREA A MUNITIONS RESPONSE SITE (MRS)

Data Validation by: Beth Driskill

Project Manager: Chris ten Braak

Report Date: June 21, 2021

Parsons - Austin

INTRODUCTION

The following data validation summary report covers five (5) incremental soil samples. The samples were collected from Former Area A, Barry M. Goldwater Range at Luke Airforce Base, Arizona on April 7, 2021. The samples were logged under the following Sample Delivery Group (SDG):

95728

The samples in this SDG were analyzed for explosives by U.S. EPA Method SW8330B and select metals (barium, chromium, copper, and lead) by U.S. EPA Method SW6020A. The tables below detail the sample IDs and requested parameters. There were no field quality control (QC) samples associated with this SDG.

The samples in this SDG were collected using disposable equipment. Therefore, no equipment blanks or source blanks were associated with the samples in this SDG.

All samples were collected by Parsons, placed on ice and were shipped overnight to Agriculture and Priority Pollutants Laboratories (APPL), Inc. in Clovis, California. The samples were received by APPL, Inc. in good condition at an acceptable temperature of 6.0 degrees Celsius.

All samples were prepared and analyzed following the procedures outlined in the project-specific Uniform Federal Policy - Quality Assurance Project Plan (UFP-QAPP) (Parsons, 2018a) and the Department of Defense (DoD) Quality Systems Manual (QSM) Version 5.1.

SAMPLE IDs AND REQUESTED PARAMETERS

Client Sample ID	Laboratory Sample ID	Matrix	COMMENTS
BMGR-ANT-DU01-002-0-2”	BA30101	Solid	
BMGR-ANT-DU01-003-0-2”	BA30102	Solid	
BMGR-ANT-DU01-004-0-2”	BA30103	Solid	
BMGR-ANT-BG-002-0-2”	BA30104	Solid	
BMGR-ANT-BG-003-0-2”	BA30105	Solid	

Note: All samples listed above were analyzed for the parameters listed in the table below and all samples had Stage 4 manual validation performed.

EXTRACTION, ANALYTICAL, AND REPORTING DETAILS

Parameter	Matrix	Prep Method	Analytical Method	Units
Explosives	Solid	SW8330B	SW8330B	mg/Kg
Metals	Solid	SW3050B	SW6020A	mg/Kg

EVALUATION CRITERIA

The Stage IV data package submitted by the laboratory has been reviewed and verified following the guidelines outlined in the project-specific UFP-QAPP, DoD General Data Validation Guideline, 2021, and National Functional Guidelines (NFG) for both organic and inorganic methods, November 2020. Information reviewed in the data packages included sample results; field and laboratory quality control results; instrument calibration; calibration verifications; case narratives; sample receipt forms, chain-of-custody (COC) forms, and a recalculation of one QC (ICAL, LCS, MS/MSD, surrogate) and/or one sample result for each parameter. The calculations can be found in Attachment A of this report. The analyses and findings presented in this report are based on the reviewed information, and whether guidelines in the associated analytical method, DoD QSM, and QAPP were met.

A table showing all data qualifiers applied for the samples in this SDG as a result of the data validation process is included as Attachment B to this report. Data validation checklists for each analytical method listed in the table above are also included as Attachment C.

EXPLOSIVES

General

The explosives portion of this SDG consisted of five (5) incremental soil samples. The samples were collected on April 7, 2021 and were analyzed for explosives as specified in the project-specific UFP-QAPP.

The explosives samples were dried, sieved, mechanically ground for 60 seconds, incrementally sampled, and then extracted and analyzed in accordance with U.S. EPA Method SW8330B. All samples in this SDG were analyzed following the procedures outlined in the DoD QSM, version 5.1 and the project-specific UFP-QAPP.

The samples were prepared and analyzed within the holding time required by the method. The samples were prepared and analyzed in one batch. The samples were analyzed on one primary instrument under a single initial calibration (ICAL). All analyses were performed undiluted.

Accuracy

Accuracy was evaluated using the percent recovery obtained from the Laboratory Control Sample (LCS), Laboratory Control Sample Duplicate (LCSD), and the surrogate spikes.

All LCS, LCSD, and surrogate spike recoveries were within acceptance criteria.

Accuracy was further evaluated with the use of a LCS Standard Reference Material (SRM) which consisted of a pre-spiked solid matrix purchased by the laboratory that was put through the grinding process and prepared and analyzed along with the field samples. The LCS SRM spike recoveries were within acceptance criteria.

Precision

Precision was evaluated using the relative percent difference (RPD) obtained from the LCS/LCSD results.

All LCS/LCSD RPDs were within acceptance criteria.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the COC procedures to those described in the DoD QSM and project QAPP;
- Comparing actual analytical procedures to those described in the DoD QSM and project-specific UFP-QAPP;
- Evaluating holding times; and
- Examining laboratory blanks for cross contamination of samples during analysis.

The samples in this SDG were analyzed following the COC and the analytical procedures described in the DoD QSM and project-specific UFP-QAPP. All samples were prepared and analyzed within the holding time required by the method. The following QC elements were also evaluated:

- All ICAL criteria were met.
- The initial calibration verification (ICV) samples were prepared from a second source standard. All ICV criteria were met.
- All continuing calibration verification (CCV) criteria were met.
- Column confirmation criteria for detected results was not applicable, all results were non-detect in the samples.
- Raw data was reviewed for qualitative and quantitative accuracy.

One laboratory method blank, which was also the grinding blank, was associated with the explosives analyses in this SDG. The laboratory method/grinding blank was non-detect for all target explosives.

Completeness

Completeness has been evaluated by comparing the total number of samples collected with the total number of samples with valid analytical data.

All results for explosives for the samples in this SDG were considered usable. Therefore, the completeness for the explosives portion of this SDG is 100%, which meets the minimum acceptance criteria of 90%.

METALS

General

The metals portion of this SDG consisted of five (5) incremental soil samples. The samples were collected on April 7, 2021 and were analyzed for metals as specified in the project-specific UFP-QAPP.

The metals samples were dried, sieved, mechanically ground for 60 seconds, incrementally sampled, digested, and then analyzed in accordance with U.S. EPA Method SW6020A. All samples in this SDG were analyzed following the procedures outlined in the DoD QSM, version 5.1 and the project-specific UFP-QAPP.

All samples were prepared and analyzed within the holding time required by the method. The samples were digested and analyzed in one batch under one ICAL. All analyses were performed undiluted.

Accuracy

Accuracy was evaluated using the percent recovery obtained from the LCS and LCSD

All LCS and LCSD recoveries were within acceptance criteria.

Precision

Precision was evaluated using the RPD obtained from the LCS/LCSD concentrations.

All LCS/LCSD RPDs were within acceptance criteria.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the COC procedures to those described in the DoD QSM and project-specific UFP-QAPP;
- Comparing actual analytical procedures to those described in the DoD QSM and project-specific UFP-QAPP;
- Evaluating holding times; and
- Examining laboratory blanks for cross contamination of samples during analysis.

The samples in this SDG were analyzed following the COC and the analytical procedures described in the DoD QSM and project-specific UFP-QAPP. All samples were prepared and analyzed within the holding time required by the method. The following QC elements were also evaluated:

- All instrument tune criteria were met.
- All initial calibration criteria were met.

- The ICV was prepared from a second source standard. All ICV criteria were met.
- All CCV criteria were met.
- All low-level ICV (LL ICV) criteria were met.
- All interference check samples (ICS) were within criteria.
- All initial calibration blank (ICB) criteria were met.
- All continuing calibration blank (CCB) criteria were met.
- All internal standard criteria associated with the target metals were met.
- Raw data was reviewed for qualitative and quantitative accuracy.

One laboratory method blank was associated with the metals analyses in this SDG. The laboratory method blank was non-detect for all target metals.

One laboratory grinding blank was associated with the metals analysis in this SDG. Due to the metals concentrations inherent in the sand matrix, the laboratory also analyzed the sand from the same lot used for the grinding blank in triplicate. The three analyses were averaged to determine the amount of each metal contributed by the sand matrix. The metals concentrations native to the sand matrix were subtracted from the grinding blank results to determine the concentration of metals contributed by the grinding process. The following metals had concentrations contributed by grinding that exceeded the LOQ:

Analyte	Conc. contributed by grinding (mg/kg)	LOQ (mg/kg)
Barium	2.2	0.25
Chromium	302	0.50
Copper	8.4	2.5
Lead	0.95	0.1

The grinding blank demonstrated a significant amount of chromium contributed by grinding. The amount of chromium calculated to be due to the grinding process exceeded the sample results reported. Therefore, the chromium results for all samples in this SDG were qualified "R" as rejected and unusable. Copper was detected in all samples in this SDG at a concentration similar that contributed by the grinding process. Therefore, the copper results in all samples were qualified "J+" as estimated with potential high bias. Lead was detected at approximately 5 times the amount contributed by grinding in sample BMGR-ANT-DU01-004-0-2. The result for lead in this sample was qualified "J+" as estimated with potential high bias. All other sample results were significantly greater than the amount contributed by grinding and no further corrective action was necessary.

Completeness

Completeness has been evaluated by comparing the total number of samples collected with the total number of samples with valid analytical data.

All metals results for the samples in this SDG were considered usable except for the five chromium results that were qualified "R" as rejected. Therefore, the completeness for the

metals portion of this SDG is 75%, which was below the minimum acceptance criteria of 90%.

COMPARABILITY

All data was generated using contract-specific standard methods and reported with known data quality, type of analysis, units, etc.

SENSITIVITY

The LOD and LOQ values reported for the samples were compared to those listed in the QAPP to ensure that sensitivity requirements were met. All sample LODs and LOQs for the samples were adjusted based on dilution and/or initial/final volumes.

The LOD and LOQ for explosives analyte 1,3-Dinitrobenzene was greater than the project action limit (PAL) as noted in the QAPP.

DATA USABILITY

The purpose of this data validation report is to ensure the integrity and reliability of analytical laboratory data. The data quality is evaluated based on precision, accuracy, representativeness, comparability, and completeness (PARCC) characteristics of the data. The validated data indicated that the laboratory correctly performed the analyses. Based on the data quality assessment, some results are considered estimated as discussed above. However, all results qualified as estimated are usable for the purposes of the project. All sample results for chromium were qualified “R” as rejected due to significant contamination demonstrated by the grinding blank. These results were not considered usable for project decision making.

SAMPLE RESULTS AND DATA QUALIFIERS

The sample results and final data qualifiers and reason codes that were added, removed, or changed as a result of the data validation process are included in a table as Attachment B to this report.

DATA QUALIFIER DEFINITIONS

The data qualifiers are defined in Table 36.3 of the project-specific UFP-QAPP, as follows:

U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been “tentatively identified” or “presumptively” as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project QC criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

REASON CODE DEFINITIONS

The data validation reason codes were used to document the logic behind all data validation qualifiers. The following reason codes for data qualification were associated with the samples in this SDG:

B9: Grinding blank infraction (qualified data)

ACRONYMS AND ABBREVIATIONS

The following is a list of acronyms and abbreviations that were used in this data validation report.

APPL	Agriculture and Priority Pollutants Laboratories
CCB	Continuing Calibration Blank
CCV	Continuing Calibration Verification
CoC	Chain of Custody
DoD	Department of Defense
ICAL	Initial Calibration
ICB	Initial Calibration Blank
ICS	Interference Check Sample
ICV	Initial Calibration Verification
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LL ICV	Low-Level Initial Calibration Verification
LOD	Limit of Detection
LOQ	Limit of Quantitation
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MRS	Munitions Response Site
NFG	National Functional Guidelines
PAL	Project Action Limit
QC	Quality Control
QSM	Quality Systems Manual
RPD	Relative Percent Difference
SDG	Sample Delivery Group

SRM	Standard Reference Material
UFP-QAPP	Uniform Federal Policy – Quality Assurance Project Plan

Attachment A

Calculations

(the explosive calculations are a separate document in excel)

Explosive Calculations

SDG 95728

Analyte Conc	Analyte Resp	RF	Reported RF		
0.005	44674	2.234E+02	223.4		Tetryl
0.01	91470	2.287E+02	228.7		page 36
0.02	178763	2.235E+02	223.5		
0.05	459934	2.300E+02	230		
0.1	876424	2.191E+02	219.1		
0.2	1869447	2.337E+02	233.7		
0.5	4704331	2.352E+02	235.2		
1	9098547	2.275E+02	227.5		
2	17685690	2.211E+02	221.1		
	Calc				
mean RRF	2.276E+02		226.9		
%RSD	2.40		2.45		

Conc. on-colun $\frac{\text{peak height*conv factor (20ml/10g soil * DF4)}}{\text{average cal factor * inj. Vol.}}$

Surrogate	pg. 87 of 208		Sample (BMGR-ANT-DU01-002-0-2") BA30101		
1,2-DNB	On column	Reported	Spike	%R calc	%R Reported
Response	905479				
conc	627.658	627.717	592.885	105.87	105.87

Compound Quant					
Reported compounds	Not applicable- all samples were non-detect				
NA	On column	Reported	Calc Conc	Reported	
Response	0				
conc	0.000	0.000	0.00	0.00	pg.

LCS/LCSD		LCS	LCSD		
Tetryl	Spike Amount	Spike Rec	Spike Rec		
pg. 26	1.98	2.02	1.74		
	LCS %R	LCSD %R	RPD		
	102.0	87.9	14.9	Calc	
	102.0	87.9	14.9	Reported pg 29	
	LCS		LCSD		
Quant	On column	Reported	On column	Reported	
Response	2319101		1992803		
conc (on col)	2021.931	2022.019	1739.201	1737.520	pg. 99, 101
conc (calc)	2.02	2.02	1.74	1.74	pg. 29

SDG: 95128

BMGR-ANT-D001-002-0-2"

Sample Report

$y = mx + b \Rightarrow x = \frac{y-b}{m}$

Sample Name	BA30101S01 DF10
File Name	054SMPL.d
Data Path Name	Metals-icpms\data\210430A_#2.b
Acq Time	04/30/21 5:18:23 PM
Sample Type	Sample
Total Dilution	0.1004
Comment	Persons
ISTD Ref FileName	007CALB.d
Sample QC Pass/Fail	Pass
ISTD QC Pass/Fail	Fail
Operator	Chemist_Metals

pg. 206 (digestion log)

$\left(\frac{0.100L}{9.96g}\right)^{DF} \times 10 = 0.1004$

(Ba-ICAL pg. 135)

$Conc. = \left(\frac{11363953.16}{4029466.82}\right) - 0.00001308 \times DF \times 0.1004 = 161.43$ mg/L

(IS)

.001754

(Ba-ICAL pg 135)

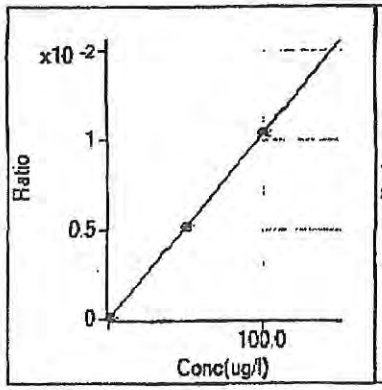
QC Analyte Table

Name	Mass	ISTD	Tune	Conc.	Units	RSD	CPS	LDR	QC Flag
Be	9	6	NoGas	1.242	ug/l	6.2	14309.49	10000	
B	11	45	NoGas	3.172	ug/l	2.0	87592.02	10000	
Na	23	45	He	507.124	ug/l	2.0	4286542.00	1000000	
Mg	24	45	He	12158.557	ug/l	2.0	62840793.33	1000000	
Al	27	45	He	12338.584	ug/l	0.9	36666869.33	1000000	
P	31	45	He	878.048	ug/l	0.3	140639.07	500000	
K	39	45	He	1009.827	ug/l	0.7	5422926.83	500000	
Ca	40	45	H2	10910.489	ug/l	0.6	11822832.67	500000	
Ca	44	45	He	11534.613	ug/l	0.4	3591004.83	500000	
Ti	47	45	He	404.098	ug/l	2.4	668201.94	10000	
V	51	45	He	33.791	ug/l	3.9	1491619.96	10000	
Cr	52	72	He	90.167	ug/l	4.7	3487727.50	10000	
Mn	55	45	He	309.034	ug/l	5.9	13448561.67	50000	
Fe	56	45	He	15049.796	ug/l	6.2	805717546.67	1000000	
Co	59	45	He	10.553	ug/l	6.8	865435.10	10000	
Ni	60	45	He	59.457	ug/l	7.0	1215065.04	10000	
Cu	63	72	He	20.693	ug/l	6.7	828571.00	10000	
Zn	66	115	He	43.698	ug/l	1.0	335990.13	50000	
As	75	115	He	2.101	ug/l	4.6	10629.83	2000	
Se	78	45	He	0.310	ug/l	5.2	387.01	10000	
Se	78	115	H2	0.034	ug/l	44.9	4.80	10000	
Sr	88	115	NoGas	175.882	ug/l	0.7	54135115.86	50000	
Mo	95	115	NoGas	0.475	ug/l	1.7	30357.18	10000	
Ag	107	115	NoGas	0.049	ug/l	3.0	8919.32	5000	
Cd	111	115	He	0.132	ug/l	4.2	2031.47	10000	
Sn	118	115	He	0.456	ug/l	1.2	17257.94	10000	
Sb	121	115	NoGas	0.059	ug/l	1.8	11184.00	10000	
Ba	137	165	NoGas	161.448	ug/l	0.9	11363953.16	50000	
Tl	205	165	NoGas	0.067	ug/l	2.9	39619.67	5000	
Pb	208	165	NoGas	6.904	ug/l	0.5	5445156.95	50000	

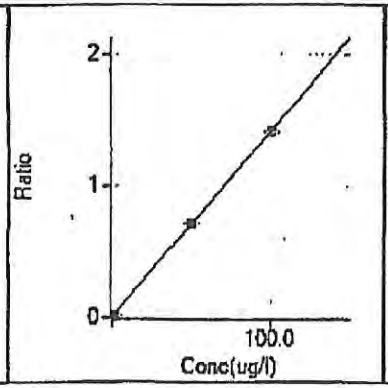
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QC ISTD Table

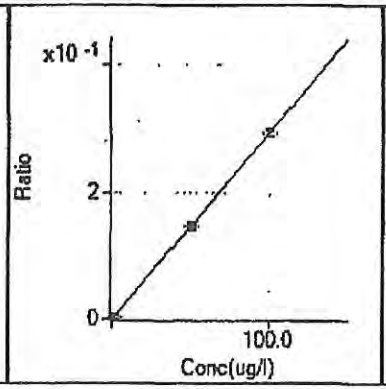
Name	Mass	Tune Mode	CPS	CPS RSD	Ref CPS	% Rec	%QC Low	%QC High	QC Flag
Li	6	NoGas	33797.02	5.1	67144.37	50.33	70	120	ISTD Failed
Sc	45	NoGas	1391257.48	0.7	875142.12	158.98	70	120	ISTD Failed



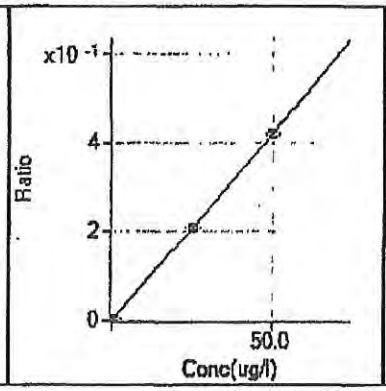
78 Se [H2]
ISTD: 115 In
y = 1.037E-4 x + 6.016E-6
R 1.0000
DL 0.08609
BEC 0.05801



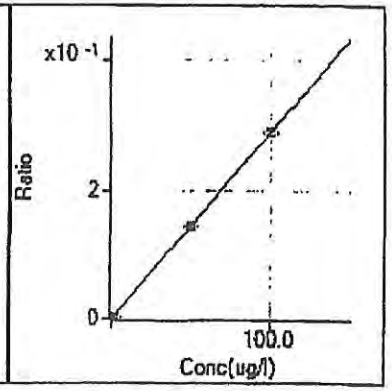
88 Sr [NoGas]
ISTD: 115 In
y = 1.418E-2 x + 5.837E-5
R 1.0000
DL 0.003414
BEC 0.004116



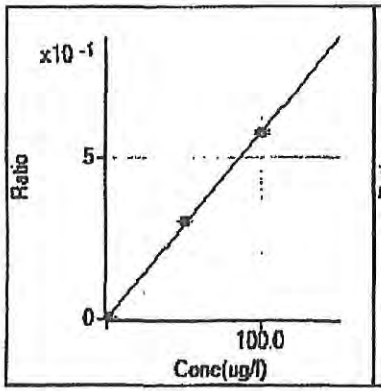
95 Mo [NoGas]
ISTD: 115 In
y = 2.939E-3 x + 9.483E-6
R 1.0000
DL 0.008641
BEC 0.003226



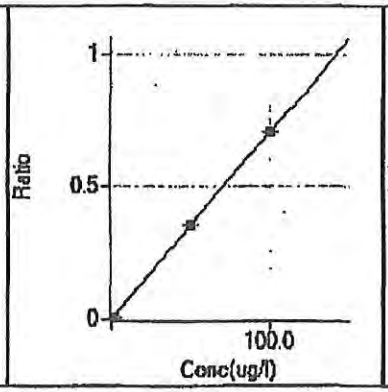
107 Ag [NoGas]
ISTD: 115 In
y = 8.412E-3 x + 6.802E-6
R 1.0000
DL 0.0008487
BEC 0.0008086



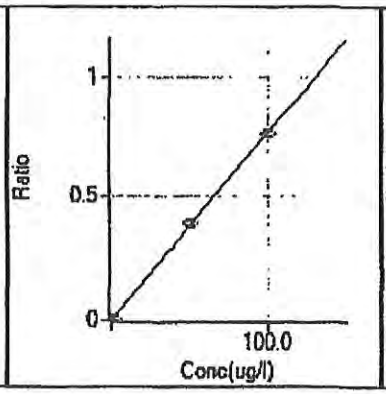
111 Cd [He]
ISTD: 115 In
y = 2.897E-3 x + 2.079E-6
R 1.0000
DL 0.003729
BEC 0.0007177



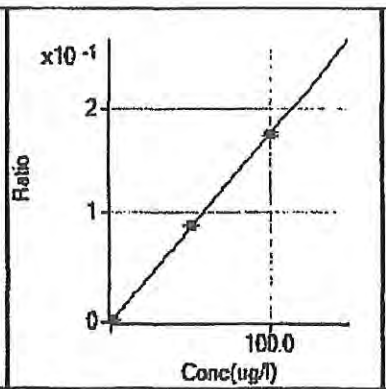
118 Sn [NoGas]
ISTD: 115 In
y = 5.820E-3 x + 1.799E-4
R 0.9999
DL 0.01061
BEC 0.03091



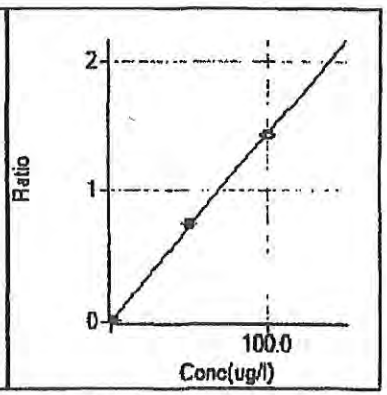
118 Sn [He]
ISTD: 115 In
y = 7.086E-3 x + 2.036E-4
R 1.0000
DL 0.01482
BEC 0.02873



121 Sb [NoGas]
ISTD: 115 In
y = 7.684E-3 x + 5.871E-4
R 1.0000
DL 0.03296
BEC 0.07641



137 Ba [NoGas]
ISTD: 165 Ho
y = 1.754E-3 x + 1.308E-5
R 1.0000
DL 0.007869
BEC 0.007459



205 Tl [NoGas]
ISTD: 165 Ho
y = 1.451E-2 x + 7.582E-5
R 0.9999
DL 0.002022
BEC 0.005224

Attachment B

Sample Results and Data Qualifiers

SDG	Matrix	Collection Date	Field Sample ID	Lab Sample ID	Analytical Method	Analyte	Value Qualifier[1]	Result	Lab Qualifier	Validation Flag	Validation Reason Code	DL	LOD	LOQ	Units	Dilution Factor
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-002-0-2	BA30101	SW6020A	BARIUM	=	161				0.070	0.200	0.25	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-002-0-2	BA30101	SW6020A	CHROMIUM, TOTAL	=	90.2		R	B9	0.075	0.200	0.50	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-002-0-2	BA30101	SW6020A	COPPER	=	20.7		J+	B9	0.04	0.20	2.5	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-002-0-2	BA30101	SW6020A	LEAD	=	6.9				0.02	0.05	0.1	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-002-0-2	BA30101	SW8330B	1,3,5-TRINITROBENZENE	ND	0	U			0.013	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-002-0-2	BA30101	SW8330B	1,3-DINITROBENZENE	ND	0	U			0.022	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-002-0-2	BA30101	SW8330B	2,4,6-TRINITROTOLUENE	ND	0	U			0.031	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-002-0-2	BA30101	SW8330B	2,4-DINITROTOLUENE	ND	0	U			0.028	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-002-0-2	BA30101	SW8330B	2,6-DINITROTOLUENE	ND	0	U			0.031	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-002-0-2	BA30101	SW8330B	2-AMINO-4,6-DINITROTOLUENE	ND	0	U			0.034	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-002-0-2	BA30101	SW8330B	2-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-002-0-2	BA30101	SW8330B	3-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-002-0-2	BA30101	SW8330B	4-AMINO-2,6-DINITROTOLUENE	ND	0	U			0.034	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-002-0-2	BA30101	SW8330B	4-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-002-0-2	BA30101	SW8330B	HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	ND	0	U			0.025	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-002-0-2	BA30101	SW8330B	NITROBENZENE	ND	0	U			0.028	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-002-0-2	BA30101	SW8330B	NITROGLYCERIN	ND	0	U			0.061	0.150	0.20	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-002-0-2	BA30101	SW8330B	OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-002-0-2	BA30101	SW8330B	PENTAERYTHRITOL TETRANITRATE	ND	0	U			0.108	0.250	0.50	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-002-0-2	BA30101	SW8330B	TETRYL	ND	0	U			0.037	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-003-0-2	BA30102	SW6020A	BARIUM	=	37.1				0.070	0.200	0.25	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-003-0-2	BA30102	SW6020A	CHROMIUM, TOTAL	=	105		R	B9	0.075	0.200	0.50	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-003-0-2	BA30102	SW6020A	COPPER	=	13		J+	B9	0.04	0.20	2.5	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-003-0-2	BA30102	SW6020A	LEAD	=	4.9				0.02	0.05	0.1	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-003-0-2	BA30102	SW8330B	1,3,5-TRINITROBENZENE	ND	0	U			0.013	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-003-0-2	BA30102	SW8330B	1,3-DINITROBENZENE	ND	0	U			0.022	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-003-0-2	BA30102	SW8330B	2,4,6-TRINITROTOLUENE	ND	0	U			0.031	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-003-0-2	BA30102	SW8330B	2,4-DINITROTOLUENE	ND	0	U			0.028	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-003-0-2	BA30102	SW8330B	2,6-DINITROTOLUENE	ND	0	U			0.031	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-003-0-2	BA30102	SW8330B	2-AMINO-4,6-DINITROTOLUENE	ND	0	U			0.034	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-003-0-2	BA30102	SW8330B	2-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-003-0-2	BA30102	SW8330B	3-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-003-0-2	BA30102	SW8330B	4-AMINO-2,6-DINITROTOLUENE	ND	0	U			0.034	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-003-0-2	BA30102	SW8330B	4-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-003-0-2	BA30102	SW8330B	HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	ND	0	U			0.025	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-003-0-2	BA30102	SW8330B	NITROBENZENE	ND	0	U			0.028	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-003-0-2	BA30102	SW8330B	NITROGLYCERIN	ND	0	U			0.061	0.150	0.20	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-003-0-2	BA30102	SW8330B	OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-003-0-2	BA30102	SW8330B	PENTAERYTHRITOL TETRANITRATE	ND	0	U			0.108	0.250	0.50	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-003-0-2	BA30102	SW8330B	TETRYL	ND	0	U			0.037	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-004-0-2	BA30103	SW6020A	BARIUM	=	42.2				0.070	0.200	0.25	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-004-0-2	BA30103	SW6020A	CHROMIUM, TOTAL	=	109		R	B9	0.075	0.200	0.50	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-004-0-2	BA30103	SW6020A	COPPER	=	10.9		J+	B9	0.04	0.20	2.5	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-004-0-2	BA30103	SW6020A	LEAD	=	4.7		J+	B9	0.02	0.05	0.1	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-004-0-2	BA30103	SW8330B	1,3,5-TRINITROBENZENE	ND	0	U			0.013	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-004-0-2	BA30103	SW8330B	1,3-DINITROBENZENE	ND	0	U			0.022	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-004-0-2	BA30103	SW8330B	2,4,6-TRINITROTOLUENE	ND	0	U			0.031	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-004-0-2	BA30103	SW8330B	2,4-DINITROTOLUENE	ND	0	U			0.028	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-004-0-2	BA30103	SW8330B	2,6-DINITROTOLUENE	ND	0	U			0.031	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-004-0-2	BA30103	SW8330B	2-AMINO-4,6-DINITROTOLUENE	ND	0	U			0.034	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-004-0-2	BA30103	SW8330B	2-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-004-0-2	BA30103	SW8330B	3-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-004-0-2	BA30103	SW8330B	4-AMINO-2,6-DINITROTOLUENE	ND	0	U			0.034	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-004-0-2	BA30103	SW8330B	4-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-004-0-2	BA30103	SW8330B	HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	ND	0	U			0.025	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-004-0-2	BA30103	SW8330B	NITROBENZENE	ND	0	U			0.028	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-004-0-2	BA30103	SW8330B	NITROGLYCERIN	ND	0	U			0.061	0.150	0.20	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-004-0-2	BA30103	SW8330B	OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-004-0-2	BA30103	SW8330B	PENTAERYTHRITOL TETRANITRATE	ND	0	U			0.108	0.250	0.50	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-DU01-004-0-2	BA30103	SW8330B	TETRYL	ND	0	U			0.037	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-002-0-2	BA30104	SW6020A	BARIUM	=	61.4				0.070	0.200	0.25	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-002-0-2	BA30104	SW6020A	CHROMIUM, TOTAL	=	156		R	B9	0.075	0.200	0.50	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-002-0-2	BA30104	SW6020A	COPPER	=	13.4		J+	B9	0.04	0.20	2.5	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-002-0-2	BA30104	SW6020A	LEAD	=	36.3				0.02	0.05	0.1	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-002-0-2	BA30104	SW8330B	1,3,5-TRINITROBENZENE	ND	0	U			0.013	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-002-0-2	BA30104	SW8330B	1,3-DINITROBENZENE	ND	0	U			0.022	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-002-0-2	BA30104	SW8330B	2,4,6-TRINITROTOLUENE	ND	0	U			0.031	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-002-0-2	BA30104	SW8330B	2,4-DINITROTOLUENE	ND	0	U			0.028	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-002-0-2	BA30104	SW8330B	2,6-DINITROTOLUENE	ND	0	U			0.031	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-002-0-2	BA30104	SW8330B	2-AMINO-4,6-DINITROTOLUENE	ND	0	U			0.034	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-002-0-2	BA30104	SW8330B	2-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-002-0-2	BA30104	SW8330B	3-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-002-0-2	BA30104	SW8330B	4-AMINO-2,6-DINITROTOLUENE	ND	0	U			0.034	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-002-0-2	BA30104	SW8330B	4-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-002-0-2	BA30104	SW8330B	HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	ND	0	U			0.025	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-002-0-2	BA30104	SW8330B	NITROBENZENE	ND	0	U			0.028	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-002-0-2	BA30104	SW8330B	NITROGLYCERIN	ND	0	U			0.061	0.150	0.20	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-002-0-2	BA30104	SW8330B	OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-002-0-2	BA30104	SW8330B	PENTAERYTHRITOL TETRANITRATE	ND	0	U			0.108	0.250	0.50	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-002-0-2	BA30104	SW8330B	TETRYL	ND	0	U			0.037	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-003-0-2	BA30105	SW6020A	BARIUM	=	65.1				0.070	0.200	0.25	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-003-0-2	BA30105	SW6020A	CHROMIUM, TOTAL	=	127		R	B9	0.075	0.200	0.50	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-003-0-2	BA30105	SW6020A	COPPER	=	10.2		J+	B9	0.04	0.20	2.5	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-003-0-2	BA30105	SW6020A	LEAD	=	26.5				0.02	0.05	0.1	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-003-0-2	BA30105	SW8330B	1,3,5-TRINITROBENZENE	ND	0	U			0.013	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-003-0-2	BA30105	SW8330B	1,3-DINITROBENZENE	ND	0	U			0.022	0.075	0.10	MG/KG	1

95728	Soil	07-Apr-2021	BMGR-ANT-BG-003-0-2	BA30105	SW8330B	2,4,6-TRINITROTOLUENE	ND	0	U			0.031	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-003-0-2	BA30105	SW8330B	2,4-DINITROTOLUENE	ND	0	U			0.028	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-003-0-2	BA30105	SW8330B	2,6-DINITROTOLUENE	ND	0	U			0.031	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-003-0-2	BA30105	SW8330B	2-AMINO-4,6-DINITROTOLUENE	ND	0	U			0.034	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-003-0-2	BA30105	SW8330B	2-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-003-0-2	BA30105	SW8330B	3-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-003-0-2	BA30105	SW8330B	4-AMINO-2,6-DINITROTOLUENE	ND	0	U			0.034	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-003-0-2	BA30105	SW8330B	4-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-003-0-2	BA30105	SW8330B	HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	ND	0	U			0.025	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-003-0-2	BA30105	SW8330B	NITROBENZENE	ND	0	U			0.028	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-003-0-2	BA30105	SW8330B	NITROGLYCERIN	ND	0	U			0.061	0.150	0.20	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-003-0-2	BA30105	SW8330B	OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	ND	0	U			0.037	0.075	0.10	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-003-0-2	BA30105	SW8330B	PENTAERYTHRITOL TETRANITRATE	ND	0	U			0.108	0.250	0.50	MG/KG	1
95728	Soil	07-Apr-2021	BMGR-ANT-BG-003-0-2	BA30105	SW8330B	TETRYL	ND	0	U			0.037	0.075	0.10	MG/KG	1

Notes:

(1) Value Qualifier: ND - Nondetected Result; = - Result value equal to or above the DL.

MG/KG= milligram per kilogram

B9 - Grinding blank infraction (qualified data)

U - Analyte was not detected and was reported as less than the LOD

R - Result is rejected due to serious deficiencies in meeting quality control criteria

J+ - Result is an estimated quantity, but the result may be biased high

Attachment C

Data Validation Checklists

VALIDATION CHECKLIST- Inorganics

SDG#: 95728 **Date**: 6/21/21

Laboratory: APPL **Reviewer:** Beth Driskill

Method: 6020A

	Validation Area	Acceptable? Y/N/NA	Comments
I.	Case narrative	Y	
II.	Sample receipt/Technical holding times	Y	
III.	Instrument performance check/Tune	Y	
IV.	Initial calibration/ICV/LLICV	Y	
V.	Continuing Calibration	Y	
VI.	Laboratory Blanks- MB, ICB/CCB	N	Grinding blank had significant detections. See DVR discussion on qualified results.
VII.	Field blanks	NA	Samples in this SDG were collected using disposable equipment; therefore, field blanks were not applicable.
VIII.	Interference check standard	Y	
IX.	Matrix spike/Matrix spike duplicate	NA	No MS/MSD included with this SDG.
X.	Laboratory control samples	Y	
XI.	Field duplicates/Field triplicates	NA	No field duplicate or triplicates included in this SDG.
XII.	Internal standards	Y	
XIII.	Dilution test	NA	No dilution test analyzed with this SDG.
XIV.	Post digestion spike	NA	No PDS analyzed with this SDG.
XV.	Compound quantitation LOQ/LOD/DL	Y	
XVI.	Target compound identification	Y	

VALIDATION CHECKLIST- Organics

SDG#: 95728 **Date**: 5/18/21

Laboratory: APPL **Reviewer:** Beth Driskill

Method: 8330B

	Validation Area	Acceptable? Y/N/NA	Comments
I.	Case narrative	Y	
II.	Sample receipt/Technical holding times	Y	
III.	Instrument performance check/Tune	NA	Not applicable for explosives method
IV.	Initial calibration/ICV	Y	
V.	Continuing Calibration	Y	
VI.	Laboratory Blanks	Y	Method blank and grinding blank
VII.	Field blanks	NA	All disposable equipment used
VIII.	Surrogate spikes	Y	
IX.	Matrix spike/Matrix spike duplicate	NA	No MS/MSD included with this SDG.
X.	Laboratory control samples	Y	
XI.	Field duplicates/Field triplicates	NA	No field duplicate or triplicates included in this SDG.
XII.	Internal standards	NA	Not applicable for explosives method
XIII.	Compound quantitation LOQ/LOD/DL	Y	
XIV.	Target compound identification	Y	
XV.	Column confirmation	NA	All samples were non-detect so column confirmation was not applicable.

DATA VALIDATION SUMMARY REPORT

for samples collected from

BARRY M GOLDWATER RANGE

FORMER AREA A MUNITIONS RESPONSE SITE (MRS)

Data Validation by: Beth Driskill

Project Manager: Chris ten Braak

Report Date: June 8, 2021

Parsons - Austin

INTRODUCTION

The following data validation summary report covers one (1) incremental soil sample. The sample was collected from Former Area A, Barry M. Goldwater Range at Luke Airforce Base, Arizona on May 4, 2021. The sample was logged under the following Sample Delivery Group (SDG):

96077

The sample in this SDG was analyzed for explosives by U.S. EPA Method SW8330B and select metals (barium, chromium, copper, and lead) by U.S. EPA Method SW6020A. The tables below detail the sample ID and requested parameters. There were no field quality control (QC) samples included with this SDG.

The sample in this SDG was collected using disposable equipment. Therefore, no equipment blanks or source blanks were associated with the sample in this SDG.

The sample was collected by Parsons, placed on ice and was shipped overnight to Agriculture and Priority Pollutants Laboratories (APPL), Inc. in Clovis, California. The sample was received by APPL, Inc. in good condition at an acceptable temperature of 4.6 degrees Celsius.

All samples were prepared and analyzed following the procedures outlined in the project-specific Uniform Federal Policy - Quality Assurance Project Plan (UFP-QAPP) (Parsons, 2018a) and the Department of Defense (DoD) Quality Systems Manual (QSM) Version 5.1.

SAMPLE IDs AND REQUESTED PARAMETERS

Client Sample ID	Laboratory Sample ID	Matrix	COMMENTS
BMGR-ANT-DU01-005-0-2	BA31981	Solid	

Note: The sample listed above was analyzed for the parameters listed in the table below and all samples had Stage 4 manual validation performed.

EXTRACTION, ANALYTICAL, AND REPORTING DETAILS

Parameter	Matrix	Prep Method	Analytical Method	Units
Explosives	Solid	SW8330B	SW8330B	mg/Kg
Metals	Solid	SW3050B	SW6020A	mg/Kg

EVALUATION CRITERIA

The Stage IV data package submitted by the laboratory has been reviewed and verified following the guidelines outlined in the project-specific UFP-QAPP, DoD General Data Validation Guideline, 2021, and National Functional Guidelines (NFG) for both organic and inorganic methods, November 2020. Information reviewed in the data packages included sample results; field and laboratory quality control results; instrument calibration; calibration verifications; case narratives; sample receipt forms, chain-of-custody (COC) forms, and a recalculation of QC (ICAL, LCS, MS/MSD, Surrogate) or 1 sample result for each parameter. The calculations can be found as Attachment A to this report. The analyses and findings presented in this report are based on the reviewed information, and whether guidelines in the associated analytical method, DoD QSM and QAPP were met.

A table with results for the samples in this SDG is included as Attachment B to this report. Data validation checklists for each analytical method listed in the table above are also included in this report as Attachment C.

EXPLOSIVES

General

The explosives portion of this SDG consisted of one (1) incremental soil sample. The sample was collected on May 4, 2021 and was analyzed for explosives as specified in the project-specific UFP-QAPP.

The explosives sample was dried, sieved, mechanically ground for 60 seconds, incrementally sampled, and then extracted. The sample was analyzed in accordance with U.S. EPA Method SW8330B, the procedures outlined in the DoD QSM, version 5.1, and the project-specific UFP-QAPP.

The sample was prepared and analyzed within the holding time required by the method. The sample was prepared and analyzed in one batch, on one primary instrument, and under a single initial calibration (ICAL). Detected results were confirmed on a secondary column. All analyses were performed undiluted.

Accuracy

Accuracy was evaluated using the percent recovery obtained from the Laboratory Control Sample (LCS), Laboratory Control Sample Duplicate (LCSD), and the surrogate spikes.

All LCS, LCSD, and surrogate spike recoveries were within acceptance criteria.

Accuracy was further evaluated with the use of a LCS Standard Reference Material (SRM) which consisted of a pre-spiked solid matrix purchased by the laboratory that was put

through the grinding process and prepared and analyzed along with the field samples. The LCS SRM spike recoveries were within acceptance criteria.

Precision

Precision was evaluated using the relative percent difference (RPD) obtained from the LCS/LCSD analyte results. A lab triplicate was also prepared and analyzed but was performed on a non-project sample; therefore, the lab triplicate data was not discussed in this report.

All LCS/LCSD RPDs were within acceptance criteria.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the COC procedures to those described in the DoD QSM and project QAPP;
- Comparing actual analytical procedures to those described in the DoD QSM and project-specific UFP-QAPP;
- Evaluating holding times; and
- Examining laboratory blanks for cross contamination of samples during analysis.

The samples in this SDG were analyzed following the COC and the analytical procedures described in the DoD QSM and project-specific UFP-QAPP. All samples were prepared and analyzed within the holding time required by the method. The following QC elements were also evaluated:

- All ICAL criteria were met.
- The initial calibration verification (ICV) samples were prepared from a second source standard. All ICV criteria were met.
- All continuing calibration verification (CCV) criteria were met.
- Column confirmation criteria for detected results was not applicable, all results were non-detect in the samples.
- Raw data was reviewed for qualitative and quantitative accuracy.

One laboratory method blank which is also the grinding blank was associated with the explosives analyses in this SDG. The laboratory method/grinding blank was non-detect for all target explosives.

Completeness

Completeness has been evaluated by comparing the total number of samples collected with the total number of samples with valid analytical data.

All results for explosives for the samples in this SDG were considered usable. Therefore, the completeness for the explosives portion of this SDG is 100%, which meets the minimum acceptance criteria of 90%.

METALS

General

The metals portion of this SDG consisted of one (1) incremental soil sample. The sample was collected on May 4, 2021 and was analyzed for metals as specified in the project-specific UFP-QAPP.

The metals sample was dried, sieved, ground via mortar and pestle, incrementally sampled, digested, and then analyzed in accordance with U.S. EPA Method SW6020A. All samples in this SDG were analyzed following the procedures outlined in the DoD QSM, version 5.1 and the project-specific UFP-QAPP except as follows. The metals portion of the samples in this SDG were not ground using a puck mill as required in the project-specific UFP-QAPP but were ground using mortar and pestle. The affect that this deviation from the project-specific UFP-QAPP might have on the metals results is unknown; therefore, professional judgement was used and the metals results were all qualified estimated with an unknown bias and were flagged "J".

All sample was prepared and analyzed within the holding time required by the method. The sample was digested and analyzed in one batch under one ICAL. All analyses were performed undiluted.

Accuracy

Accuracy was evaluated using the percent recovery obtained from the LCS and LCSD.

All LCS recoveries were within acceptance criteria.

Precision

Precision was evaluated using the RPD obtained from the LCS/LCSD concentrations.

All LCS/LCSD RPDs were within acceptance criteria.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the COC procedures to those described in the DoD QSM and project-specific UFP-QAPP;
- Comparing actual analytical procedures to those described in the DoD QSM and project-specific UFP-QAPP;
- Evaluating holding times; and
- Examining laboratory blanks for cross contamination of samples during analysis.

The samples in this SDG were analyzed following the COC and the analytical procedures described in the DoD QSM and project-specific UFP-QAPP except as noted above. All samples were prepared and analyzed within the holding time required by the method. The following QC elements were also evaluated:

- All instrument tune criteria were met.
- All initial calibration criteria were met.

- The ICV was prepared from a second source standard. All ICV criteria were met.
- All CCV criteria were met.
- All low-level ICV (LL ICV) criteria were met.
- All interference check samples (ICS) were within criteria.
- All initial calibration blank (ICB) criteria were met.
- All continuing calibration blank (CCB) criteria were met.
- All internal standard criteria associated with the target metals were met.
- Raw data was reviewed for qualitative and quantitative accuracy.

One laboratory method blank was associated with the metals analyses in this SDG. The laboratory method blank had detections below the LOQ for all target metals as follows.

Analyte	Conc. (mg/kg)	LOQ (mg/kg)
Barium	0.073 J	0.25
Chromium	0.10 J	0.5
Copper	0.082 J	2.5
Lead	0.037 J	0.1

The sample results were above the LOQ and significantly greater than the blank concentration for all four metals. Therefore, data quality was not impacted, and no corrective action was necessary.

Completeness

Completeness has been evaluated by comparing the total number of samples collected with the total number of samples with valid analytical data.

All metals results for the samples in this SDG were considered usable. Therefore, the completeness for the metals portion of this SDG is 100%, which meets the minimum acceptance criteria of 90%.

COMPARABILITY

All data was generated using contract-specific standard methods and reported with known data quality, type of analysis, units, etc. As noted above, the metals sample in this SDG was not ground via puck mill as required in the project-specific UFP-QAPP for incremental samples. Instead, the sample aliquot for metals was ground using a mortar and pestle. All other QAPP requirements were followed for this sample. As the grinding apparatus used for this sample deviated from the project-specific UFP-QAPP, the results for this sample were qualified "J" as estimated based on professional judgment.

SENSITIVITY

The LOD and LOQ values reported for the samples were compared to those listed in the QAPP to ensure that sensitivity requirements were met. All sample LODs and LOQs for the samples were adjusted based on dilution and/or initial/final volumes.

The LOD and LOQ for explosives analyte 1,3-Dinitrobenzene was greater than the project action limit (PAL) as noted in the QAPP.

DATA USABILITY

The purpose of this data validation report is to ensure the integrity and reliability of analytical laboratory data. The data quality is evaluated based on precision, accuracy, representativeness, comparability, and completeness (PARCC) characteristics of the data. The validated data indicated that the laboratory correctly performed the analyses. Based on the data quality assessment, some results are considered estimated as discussed above. None of the results were affected by any serious deficiencies in the data requiring the data to be rejected; therefore, all data in this SDG are considered usable for the purposes of this project.

SAMPLE RESULTS AND DATA QUALIFIERS

The sample results and final data qualifiers and reason codes that were added, removed, or changed as a result of the data validation process are included in a table as Attachment B to this report.

DATA QUALIFIER DEFINITIONS

The data qualifiers are defined in Table 36.3 of the project-specific UFP-QAPP, as follows:

U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been “tentatively identified” or “presumptively” as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD. However, the associated numerical value is approximate.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project QC criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

REASON CODE DEFINITIONS

The data validation reason codes were used to document the logic behind all data validation qualifiers. The following reason codes for data qualification were associated with the samples in this SDG:

P3: Professional Judgement.

ACRONYMS AND ABBREVIATIONS

The following is a list of acronyms and abbreviations that were used in this data validation report.

APPL	Agriculture and Priority Pollutants Laboratories
CCB	Continuing Calibration Blank
CCV	Continuing Calibration Verification
CoC	Chain of Custody
DoD	Department of Defense
ICAL	Initial Calibration
ICB	Initial Calibration Blank
ICS	Interference Check Sample
ICV	Initial Calibration Verification
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LL ICV	Low-Level Initial Calibration Verification
LOD	Limit of Detection
LOQ	Limit of Quantitation
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MRS	Munitions Response Site
NFG	National Functional Guidelines
PAL	Project Action Limit
QC	Quality Control
QSM	Quality Systems Manual
RPD	Relative Percent Difference
SDG	Sample Delivery Group

SRM	Standard Reference Material
UFP-QAPP	Uniform Federal Policy – Quality Assurance Project Plan

Attachment A

Calculations

(the explosive calculations are a separate document in excel)

Explosive Calculations

SDG 96077

Analyte Conc	Analyte Resp	RF	Reported RF		
0.005	55539	2.777E+02	277.7		Nitrobenzene
0.01	106851	2.671E+02	267.1		page 27
0.02	217673	2.721E+02	272.1		
0.05	545934	2.730E+02	273		
0.1	1090233	2.726E+02	272.6		
0.2	2199494	2.749E+02	274.9		
0.5	5540863	2.770E+02	277		
1	10961121	2.740E+02	274		
2	22327562	2.791E+02	279.1		
	Calc				
mean RRF	2.736E+02		274.2		
%RSD	1.21		1.31		

Conc. on-colun $\frac{\text{peak height*conv factor (20ml/10g soil * DF4)}}{\text{average cal factor * inj. Vol.}}$

Surrogate	pg. 171		Sample (BMGR-ANT-DU01-005-0-2) BA31981		
1,2-DNB	On column	Reported	Spike	%R calc	%R Reported
Response	942346				
conc	658.430	658.481	597.61	110.18	110.19

Compound Quant	Not applicable- all samples were non-detect				
Reported compounds					
NA	On column	Reported	Calc Conc	Reported	
Response	0				
conc	0.000	0.000	0.00	0.00	pg.

LCS/LCSD		LCS	LCSD		
Nitrobenzene	Spike Amount	Spike Rec	Spike Rec		
pg. 20	1.97	2.05	2.05		
	LCS %R	LCSD %R	RPD		
	104.1	104.1	0.0	Calc	
	104.0	104.0	0.0	Reported pg 20	
	LCS		LCSD		
Quant	On column	Reported	On column	Reported	
Response	2841075		2841289		
conc (on col)	2045.670	2045.887	2045.824	2046.041	pg. 179 and 181
conc (calc)	2.05	2.05	2.05	2.05	pg. 20

SDG: 96077

BMGR-ANT-DU01-005-0-2 Sample Report $y=mx+b \rightarrow x=\frac{y-b}{m}$

Sample Name	BA31981S01
File Name	078SMPL.d
Data Path Name	C:\Agilent\ICPMH\1\DATA\210604A.b
Acq Time	06/04/21 8:55:32 PM
Sample Type	Sample
Total Dilution	1.0000
Comment	Parsons
ISTD Ref FileName	032CALB.d
Sample QC Pass/Fail	Pass
ISTD QC Pass/Fail	Pass
Operator	Chemist_Metals

(IS) Ba IDAL pg. 217

$X\,Conc. = \left(\frac{339769.21}{2207022.05}\right) - .00002739$ DF

$\times 1.0 = \frac{63.099}{.002439}$ mg/L

Ba IDAL pg. 217

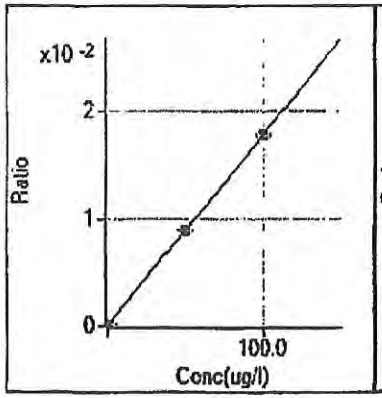
QC Analyte Table

Name	Mass	ISTD	Tune	Conc.	Units	RSD	CPS	LDR	QC Flag
Be	9	45	NoGas	0.349	ug/l	18.7	1176.75	10000	
B	11	45	NoGas	0.529	ug/l	61.0	18176.33	10000	
Na	23	45	He	31.031	ug/l	6.0	81021.64	1000000	
Mg	24	45	He	6024.601	ug/l	0.9	2519600.50	1000000	
Al	27	45	He	9269.689	ug/l	0.9	2281720.25	1000000	
P	31	45	He	476.544	ug/l	0.4	7065.41	500000	
K	39	45	He	1978.747	ug/l	0.7	894630.96	500000	
Ca	40	45	H2	18322.153	ug/l	1.2	2311805.50	500000	
Ca	44	45	He	17673.650	ug/l	0.8	415013.77	500000	
Ti	47	45	He	552.903	ug/l	0.8	64607.64	10000	
V	51	72	He	29.209	ug/l	0.8	90001.50	10000	
Cr	52	45	He	24.828	ug/l	0.8	88800.58	10000	
Mn	55	45	He	277.978	ug/l	0.8	831091.54	50000	
Fe	56	45	He	16137.987	ug/l	0.5	56365290.67	1000000	
Co	59	45	He	7.095	ug/l	0.4	37216.87	10000	
Ni	60	45	He	15.429	ug/l	1.8	20171.95	10000	
Cu	63	45	He	17.885	ug/l	1.3	60898.06	10000	
Zn	66	115	He	38.739	ug/l	1.9	30832.98	50000	
As	75	115	He	1.682	ug/l	4.1	972.03	2000	
Se	78	45	He	0.315	ug/l	31.0	75.67	10000	
Se	78	115	H2	0.109	ug/l	57.6	2.67	10000	
Sr	88	115	NoGas	45.279	ug/l	2.6	1393821.78	50000	
Mo	95	115	NoGas	0.197	ug/l	11.8	1196.77	10000	
Ag	107	115	NoGas	0.055	ug/l	20.5	876.73	5000	
Cd	111	115	He	0.074	ug/l	15.8	105.33	10000	
Sn	118	115	He	0.293	ug/l	3.3	1042.04	10000	
Sb	121	115	NoGas	0.039	ug/l	44.0	1703.49	10000	
Ba	137	165	NoGas	63.099	ug/l	2.2	339769.21	50000	
Tl	205	165	NoGas	0.110	ug/l	10.6	4280.78	5000	
Pb	208	165	NoGas	5.952	ug/l	1.3	309956.63	50000	

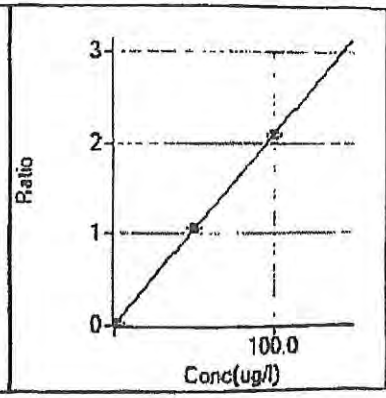
IS = 2207022.05 pg. 261

QC ISTD Table

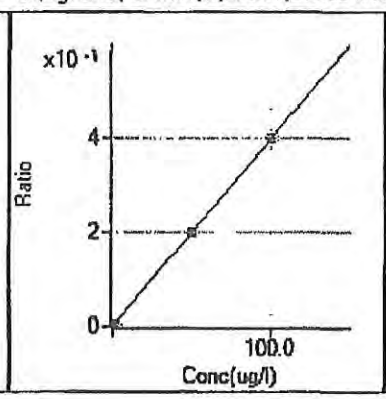
Name	Mass	Tune Mode	CPS	CPS RSD	Ref CPS	% Rec	%QC Low	%QC High	QC Flag
Li	6	NoGas	67147.80	3.0	73364.86	91.53	70	120	
Sc	45	NoGas	708254.60	0.7	672652.02	105.29	70	120	



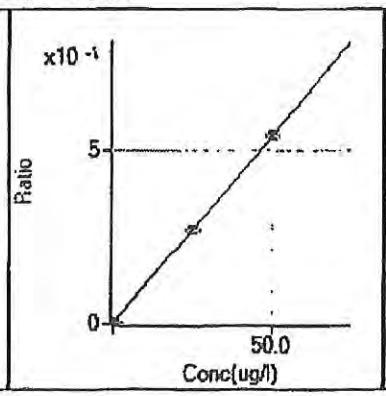
78 Se [H2]
ISTD: 115 In
y = 1.784E-4 x + 3.643E-6
R 1.0000
DL 0.1061
BEC 0.02042



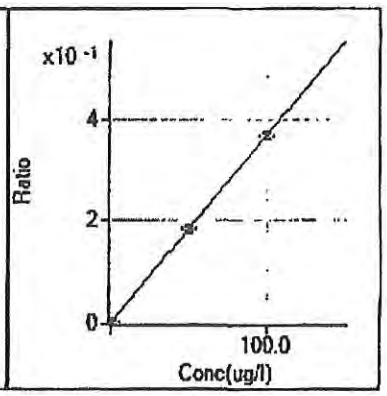
88 Sr [NoGas]
ISTD: 115 In
y = 2.101E-2 x + 6.678E-5
R 1.0000
DL 0.002219
BEC 0.003178



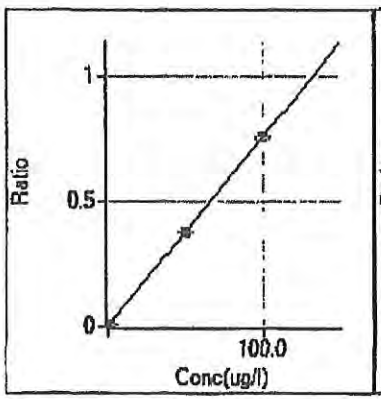
95 Mo [NoGas]
ISTD: 115 In
y = 3.992E-3 x + 3.224E-5
R 1.0000
DL 0.004669
BEC 0.008077



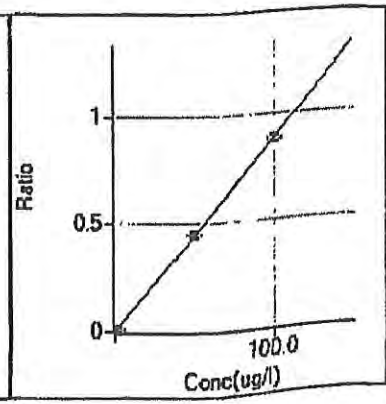
107 Ag [NoGas]
ISTD: 115 In
y = 1.078E-2 x + 1.068E-5
R 1.0000
DL 0.003689
BEC 0.0009904



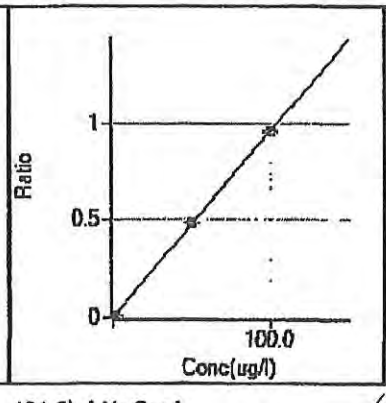
111 Cd [He]
ISTD: 115 In
y = 3.690E-3 x
R 1.0000
DL 0
BEC 0



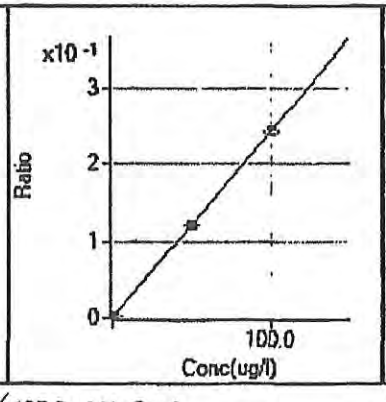
118 Sn [NoGas]
ISTD: 115 In
y = 7.578E-3 x + 8.830E-5
R 1.0000
DL 0.005475
BEC 0.01165



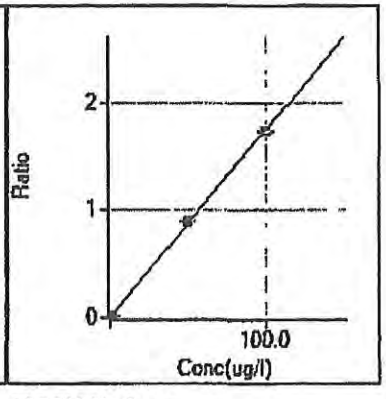
118 Sn [He]
ISTD: 115 In
y = 8.878E-3 x + 1.044E-4
R 1.0000
DL 0.01188
BEC 0.01176



121 Sb [NoGas]
ISTD: 115 In
y = 9.575E-3 x + 7.892E-4
R 1.0000
DL 0.04297
BEC 0.08242



✓ 137 Ba [NoGas]
✓ ISTD: 165 Ho
y = 2.439E-3 x + 2.739E-5
R 1.0000
DL 0.0164
BEC 0.01123



205 Tl [NoGas]
ISTD: 165 Ho
y = 1.750E-2 x + 1.742E-5
R 0.9999
DL 0.002249
BEC 0.0009951

Attachment B

Sample Results and Data Qualifiers

SDG	Matrix	Collection Date	Field Sample ID	Lab Sample ID	Analytical Method	Analyte	Value Qualifier[1]	Result	Lab Qualifier	Validation Flag	Validation Reason Code	DL	LOD	LOQ	Units	Dilution Factor
96077	Soil	04-May-2021	BMGR-ANT-DU01-005-0-2	BA31981	SW6020A	BARIUM	=	63.1		J	P3	0.070	0.200	0.25	MG/KG	1
96077	Soil	04-May-2021	BMGR-ANT-DU01-005-0-2	BA31981	SW6020A	CHROMIUM, TOTAL	=	24.8		J	P3	0.075	0.20	0.5	MG/KG	1
96077	Soil	04-May-2021	BMGR-ANT-DU01-005-0-2	BA31981	SW6020A	COPPER	=	17.9		J	P3	0.04	0.20	2.5	MG/KG	1
96077	Soil	04-May-2021	BMGR-ANT-DU01-005-0-2	BA31981	SW6020A	LEAD	=	6		J	P3	0.02	0.05	0.1	MG/KG	1
96077	Soil	04-May-2021	BMGR-ANT-DU01-005-0-2	BA31981	SW8330B	1,3,5-TRINITROBENZENE	ND	0	U			0.013	0.075	0.10	MG/KG	1
96077	Soil	04-May-2021	BMGR-ANT-DU01-005-0-2	BA31981	SW8330B	1,3-DINITROBENZENE	ND	0	U			0.022	0.075	0.10	MG/KG	1
96077	Soil	04-May-2021	BMGR-ANT-DU01-005-0-2	BA31981	SW8330B	2,4,6-TRINITROTOLUENE	ND	0	U			0.031	0.075	0.10	MG/KG	1
96077	Soil	04-May-2021	BMGR-ANT-DU01-005-0-2	BA31981	SW8330B	2,4-DINITROTOLUENE	ND	0	U			0.028	0.075	0.10	MG/KG	1
96077	Soil	04-May-2021	BMGR-ANT-DU01-005-0-2	BA31981	SW8330B	2,6-DINITROTOLUENE	ND	0	U			0.031	0.075	0.10	MG/KG	1
96077	Soil	04-May-2021	BMGR-ANT-DU01-005-0-2	BA31981	SW8330B	2-AMINO-4,6-DINITROTOLUENE	ND	0	U			0.034	0.075	0.10	MG/KG	1
96077	Soil	04-May-2021	BMGR-ANT-DU01-005-0-2	BA31981	SW8330B	2-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
96077	Soil	04-May-2021	BMGR-ANT-DU01-005-0-2	BA31981	SW8330B	3-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
96077	Soil	04-May-2021	BMGR-ANT-DU01-005-0-2	BA31981	SW8330B	4-AMINO-2,6-DINITROTOLUENE	ND	0	U			0.034	0.075	0.10	MG/KG	1
96077	Soil	04-May-2021	BMGR-ANT-DU01-005-0-2	BA31981	SW8330B	4-NITROTOLUENE	ND	0	U			0.037	0.075	0.10	MG/KG	1
96077	Soil	04-May-2021	BMGR-ANT-DU01-005-0-2	BA31981	SW8330B	HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	ND	0	U			0.025	0.075	0.10	MG/KG	1
96077	Soil	04-May-2021	BMGR-ANT-DU01-005-0-2	BA31981	SW8330B	NITROBENZENE	ND	0	U			0.028	0.075	0.10	MG/KG	1
96077	Soil	04-May-2021	BMGR-ANT-DU01-005-0-2	BA31981	SW8330B	NITROGLYCERIN	ND	0	U			0.061	0.150	0.20	MG/KG	1
96077	Soil	04-May-2021	BMGR-ANT-DU01-005-0-2	BA31981	SW8330B	OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	ND	0	U			0.037	0.075	0.10	MG/KG	1
96077	Soil	04-May-2021	BMGR-ANT-DU01-005-0-2	BA31981	SW8330B	PENTAERYTHRITOL TETRANITRATE	ND	0	U			0.108	0.250	0.50	MG/KG	1
96077	Soil	04-May-2021	BMGR-ANT-DU01-005-0-2	BA31981	SW8330B	TETRYL	ND	0	U			0.037	0.075	0.10	MG/KG	1

Notes:

(1) Value Qualifier: ND - Nondetected Result; = - Result value equal to or above the DL.

MG/KG= milligram per kilogram

P3 - Professional Judgment

U - Analyte was not detected and was reported as less than the LOD

J - Result is an estimated value with an unknown bias

Attachment C

Data Validation Checklists

VALIDATION CHECKLIST- Organics

SDG#: 96077 **Date**: 6/8/21

Laboratory: APPL **Reviewer:** Beth Driskill

Method: 8330B

	Validation Area	Acceptable? Y/N/NA	Comments
I.	Case narrative	Y	
II.	Sample receipt/Technical holding times	Y	
III.	Instrument performance check/Tune	NA	Not applicable for explosives method
IV.	Initial calibration/ICV	Y	
V.	Continuing Calibration	Y	
VI.	Laboratory Blanks	Y	Method blank and grinding blank
VII.	Field blanks	NA	All disposable equipment used
VIII.	Surrogate spikes	Y	
IX.	Matrix spike/Matrix spike duplicate	NA	No MS/MSD included with this SDG.
X.	Laboratory control samples	Y	
XI.	Field duplicates/Field triplicates	NA	No field duplicate or triplicates included in this SDG.
XII.	Internal standards	NA	Not applicable for explosives method
XIII.	Compound quantitation LOQ/LOD/DL	Y	
XIV.	Target compound identification	Y	
XV.	Column confirmation	NA	All samples were non-detect so column confirmation was not applicable.

VALIDATION CHECKLIST- Inorganics

SDG#: 96077 **Date**: 6/8/21

Laboratory: APPL **Reviewer:** Beth Driskill

Method: 6020A

	Validation Area	Acceptable? Y/N/NA	Comments
I.	Case narrative	Y	
II.	Sample receipt/Technical holding times	Y	
III.	Instrument performance check/Tune	Y	
IV.	Initial calibration/ICV/LLICV	Y	
V.	Continuing Calibration	Y	
VI.	Laboratory Blanks- MB, ICB/CCB	N	MB had detections of all four target metals below the LOQ. No qualification, sample greater than 10 times blank concentration.
VII.	Field blanks	NA	Samples in this SDG were collected using disposable equipment; therefore, field blanks were not applicable.
VIII.	Interference check standard	Y	
IX.	Matrix spike/Matrix spike duplicate	NA	No MS/MSD included with this SDG.
X.	Laboratory control samples	Y	
XI.	Field duplicates/Field triplicates	NA	No field duplicate or triplicates included in this SDG.
XII.	Internal standards	Y	
XIII.	Dilution test	NA	No dilution test analyzed with this SDG.
XIV.	Post digestion spike	NA	No PDS analyzed with this SDG.
XV.	Compound quantitation LOQ/LOD/DL	Y	
XVI.	Target compound identification	Y	

Appendix C – Institutional Analysis

AREA A MUNITIONS RESPONSE SITE

BARRY M. GOLDWATER RANGE/ LUKE AIR FORCE BASE, ARIZONA

Prepared for:

U.S. Air Force Civil Engineer Center
485 Quentin Roosevelt Rd.,
San Antonio, TX 78226

Luke Air Force Base
14185 Falcon St.,
Luke AFB, AZ 85309

Prepared by:

U.S. Army Corps of Engineers,
Omaha District
1616 Capitol Ave., Ste. 9000
Omaha, NE 68102

Parsons
1776 Lincoln St., Ste. 600
Denver, Colorado

Contract No. W912DY-16-D-0024
Task Order No. W9128F17F0255

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APPENDIX C: INSTITUTIONAL ANALYSIS

- The Institutional Analysis attachments are:
  - Attachment 1: Institutional Analysis
  - Attachment 2: Institutional Analysis Report

APPENDIX C-1
INSTITUTIONAL ANALYSIS

C-1.1 INTRODUCTION

This Institutional Analysis was prepared by Parsons for the U.S. Army Corps of Engineers, Northwest Division, Omaha District (CENWO), under Contract No. W912DY-16-D-0024, Delivery Order W9128F17F0255. This institutional analysis identifies the government agencies that have jurisdiction over Barry M. Goldwater Range/ Luke Air Force Base, specifically Area A Munitions Response Site (MRS), and assesses their capability and willingness to assert control that would protect the public at large from munitions and explosives of concern (MEC)/ material potentially presenting an explosive hazard (MPPEH)/ munitions constituents (MC) risks. Additional information on the type of jurisdiction of each entity (i.e., implementing land use controls or Military Munitions Response Program [MMRP]-related actions) is included in the Institution Summary below.

C-1.2 INSTITUTION SUMMARY

In order for institutional control strategies to be successful and effective, cooperation of local and state authorities is required. Assessment of the government agencies associated with Area A MRS included collection of the following data:

- Name of Agency;
- Origin of Institution;
- Basis of Authority;
- Sunset Provisions;
- Geographic Jurisdiction;
- Public Safety Function;
- Land Use Control Function;
- Financial Capability;
- Desire to participate in the institutional control program and
- Constraints on institutional effectiveness.

C-1.2.1 Results

U.S. ARMY CORPS OF ENGINEERS, NORTHWEST DIVISION, OMAHA DISTRICT

Origin of Institution:	The Corps of Engineers was established as a separate branch by the Army in 1802. The Northwest Division, Omaha District was established in 1934.
Basis of Authority:	Congressional authority.
Sunset Provisions:	None
Geographic Jurisdiction:	The Military District includes Arizona.
Public Safety Function:	Responsible for public affairs.
Land Use Control Function:	Limited.
Financial Capability:	As funded through Air Force by COE allocations for BMGR Area A MRS.
Desire to participate:	Yes
Constraints on institutional effectiveness:	Does not have control or authority over the property. May only recommend actions.

U.S. AIR FORCE CIVIL ENGINEER CENTER

Origin of Institution:	AFCEC was formed in 2012 when the Air Force Center for Engineering and the Environment and Air Force Real Property Agency merged with the Air Force Civil Engineer Support Agency.
Basis of Authority:	Congressional Authority
Sunset Provisions:	None
Geographic Jurisdiction:	Nationwide
Public Safety Function:	Responsible for managing the Air Force restoration, compliance, sustainability and National Environmental Policy Act programs
Land Use Control Function:	Contract management.
Financial Capability:	Provides funding for BMGR Area A MRS.
Desire to participate:	Yes
Constraints on institutional effectiveness:	Area A is part of the Sonoran Desert National Monument and is managed by BLM.

BUREAU OF LAND MANAGEMENT

Origin of Institution:	The Bureau of Land Management was created in 1946 when the General Land Office and the U.S. Grazing Services were merged together, functioning out of regional offices. In 1954 state offices were created and a new BLM Arizona State Office was established in Phoenix, where it remains today.
Basis of Authority:	Responsible for sustaining the health, diversity, and productivity of public lands for the use and enjoyment of present and future generations.
Sunset Provisions:	None
Geographic Jurisdiction:	Nationwide.
Public Safety Function:	Responsible for environmental awareness for the public.
Land Use Control Function:	Land owner
Financial Capability:	As Funded.
Desire to participate:	Yes
Constraints on institutional effectiveness:	Area A is part of the Sonoran Desert National Monument and is managed by BLM.

LUKE AIR FORCE BASE

Origin of Institution:	In 1940, the US Army sent a representative to Arizona to choose a site for an Army Air Corps training site. The city of Phoenix leased 1,440 acres to the government. Luke Field closed on 30 November 1946 and upon reopening on 1 February 1951 it was redesignated Luke Air Force Base.
Basis of Authority:	Landowner, DoD Owned and managed by the U.S. Air Force. The base general plan designates the use of the property.
Sunset Provisions:	None
Geographic Jurisdiction:	Luke Air Force Base (1,440 acres) and Barry M. Goldwater Air Force Range (1,900,000 acres).
Public Safety Function:	Responsible for MEC/CWM awareness and maintaining restricted access to the site.
Land Use Control Function:	Property operating under existing Master Plan.
Financial Capability:	Limited
Desire to participate:	Yes
Constraints on institutional effectiveness:	Area A is part of the Sonoran Desert National Monument and is managed by BLM.

U.S. ENVIRONMENTAL PROTECTION AGENCY

Origin of Institution:	In July of 1970, the EPA was established in response to the growing public demand for cleaner water, air and land.
Basis of Authority:	Environmental regulators for the United States
Sunset Provisions:	None
Geographic Jurisdiction:	Region 9, Serving Arizona, California, Nevada and Hawaii, Guam, Northern Mariana Islands, America Samoa and Trust Territories.
Public Safety Function:	Protect the public from environmental hazards
Land Use Control Function:	Only within applicable regulatory framework.
Financial Capability:	Limited
Desire to participate:	Yes
Constraints on institutional effectiveness:	Must operate within regulatory framework and authority limited to emergencies that effect the public.

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Origin of Institution:	ADEQ was established as a separate, cabinet-level agency in 1987 with the purpose of administering all of the state's protection programs. The same legislation also established a comprehensive groundwater protection program and the state's Water Quality Assurance Revolving Fund.
Basis of Authority:	Arizona Administrative Code
Sunset Provisions:	None
Geographic Jurisdiction:	State of Arizona
Public Safety Function:	Protect health and safety of residents.
Land Use Control Function:	Only within applicable regulatory framework.
Financial Capability:	Limited
Desire to participate:	Yes
Constraints on institutional effectiveness:	Must operate within regulatory framework and authority limited to emergencies that effect the public.

APPENDIX C-2
INSTITUTIONAL ANALYSIS REPORT

C-2.1 PURPOSE OF STUDY

This report outlines the agencies that have jurisdiction over Barry M. Goldwater Range/ Luke Air Force Base, specifically Area A Munitions Response Site (MRS), and assesses their capability and willingness to support and enforce institutional controls. Agencies that would implement institutional controls recommended for Area A MRS are identified.

C-2.2 METHODOLOGY

The methodology used to evaluate potential institutional controls focuses on reducing potential munitions and explosives of concern (MEC)/ material potentially presenting an explosive hazard (MPPEH)/ munitions constituents (MC) risks at Area A MRS and included the review of the government institutions and non-government entities that have some form of jurisdiction or ownership of Area A MRS. Once jurisdictions and ownership were determined, information concerning this entity was reviewed. The procedure is defined below:

- Based on knowledge of the area and discussions with USACE and LAFB, a list of organizations was outlined.
- The primary institutions having jurisdiction over the investigation area addressed under the RI were reviewed. The governmental agency exercising authority over the land containing the Area A MRS investigation area is LAFB. LAFB has jurisdiction and the capability and willingness to assert control over the land containing potential MEC/MPPEH hazards or MC risks.

C-2.3 SCOPE OF EFFORT

Parsons has prepared this detailed institutional analysis report in accordance with guidance developed by the USAESCH. The federal government agencies with jurisdiction over BMGR Area A MRS have been assessed with regard to their concern and capability to exercise institutional controls over the subject property.

C-2.4 SELECTION CRITERIA

A list of agencies, individuals and organizations were selected based on relevance to the institutional control process. A set of criteria was utilized in the selection of agencies. These organizations and agencies should:

- Have jurisdiction as a public agency.
- Have primary concern for ordnance hazards because of ownership or use.

- Have technical capability for access control and/or behavior modification strategies.
- Provide a variety of sources (i.e., print, and visual) that would provide complete coverage/contact with users.
- Repeat the same or different strategy at a later date.
- Have authority to assist in implementation of institutional controls.
- Have responsibility for land-use control and/or public safety.
- Have capacity to conduct public information and education activities.
- Expressed an ability and willingness to assist.

C-2.5 ACCEPTANCE OF JOINT RESPONSIBLITIES

Relationships with the BMGR Area A MRS stakeholders have historically been established through joint efforts between BLM and Luke AFB. BLM is the property owner of BMGR Area A MRS investigation area. Institutional controls can provide a mechanism to reduce the risk of exposure to MEC/MPPEH hazards or MC risks.

C-2.6 TECHNICAL CAPABLITIES

Luke AFB has the ability to limit access and provide safety awareness to people that visit within the boundaries of the BMGR Area A MRS investigation area. Luke AFB also has the capabilities to apply planning and zoning restrictions within its property boundary and has an existing framework in the form of a Master Plan for the subject properties.

C-2.7 INTERGOVERNMENTAL RELATIONSHIPS

Luke AFB, USACE, and state and federal regulatory agencies have cooperated during the RI/FS at the BMGR Area A MRS investigation area. Based on previous cooperation, the government agencies are likely to continue to recognize the safety concerns at Luke AFB and follow recommendations made by the TPP Team. Recommendations could include instituting land use controls (LUCs) for portions or all of the BMGR Area A MRS investigation area.

C-2.8 STABILITY

Luke AFB, BLM, and USACE are government entities and, hence, are expected to be the most stable type of organization.

C-2.9 FUNDING SOURCE RECOMMENDED FOR DETAILED ANALYSIS

LUCs provide cost effective ways to ensure and maintain the safety of the public and provide awareness. The Air Force CEC should provide the main source of funding for the access controls and printed media.

C-2.10 RECOMMENDATIONS

The Luke AFB already has some restrictions in place at BMGR Area A MRS investigation area in the form of security fencing and signage. The barbed wire fencing used around the perimeter of Area A does not appear to be maintained in all areas and may not be fully encompassing of the site. Access to BMGR Area A is considered semi open to the public. A safety briefing and sign in must occur before accessing the area. While the sign in and safety briefing are required to access Area A, the entrances to Area A are not locked or manned. Due to the evidence observed within the area, a trespasser presence seems highly likely. Due to the location of the site, it is likely to assume that the trespassers are entering the site from the south and exiting the north boundary. Additions or changes to the existing strategies, which may be necessary, would be based on overall knowledge of the site and conditions and discussions with the TPP Team including Luke AFB during the feasibility study, proposed plan, and decision document. The final recommendation may involve educational awareness and continued restrictions for the BMGR Area A MRS investigation area as the appropriate method for reducing MEC/MPPEH or MC risks to the Luke AFB staff (and the public). LUC strategies that may be recommended would be considered in coordination with other potential response action alternatives that would be developed in the feasibility study.

Appendix D – Demolition Activity Summation

AREA A MUNITIONS RESPONSE SITE

BARRY M. GOLDWATER RANGE/ LUKE AIR FORCE BASE, ARIZONA

Prepared for:

U.S. Air Force Civil Engineer Center
485 Quentin Roosevelt Rd.,
San Antonio, TX 78226

Luke Air Force Base
14185 Falcon St.,
Luke AFB, AZ 85309

Prepared by:

U.S. Army Corps of Engineers,
Omaha District
1616 Capitol Ave., Ste. 9000
Omaha, NE 68102

Parsons
1776 Lincoln St., Ste. 600
Denver, Colorado

Contract No. W912DY-16-D-0024
Task Order No. W9128F17F0255

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APPENDIX D: DEMOLITION ACTIVITY SUMMATION

- The Demolition Activity Summation attachments are:
  - Attachment 1: March 22, 2019 Demolition Operations
  - Attachment 2: May 22, 2019 Demolition Operations
  - Attachment 3: December 18, 2019 Demolition Operations
  - Attachment 4: March 12, 2020 Demolition Operations
  - Attachment 5: April 02, 2021 Demolition Operations
  - Attachment 6: May 04, 2021 Demolition Operations

PARSONS

Demolition Operation Safety and Operational Brief/Checklist

Project Name Ranny Goldmine 275 WP Date 22 Mar 19

Demo Team Leader Spencer Smith

SUXOS Scott Phillips

UXOSO Matt Busch

UXOQCS Rich Eudaily

- Care and handling of explosive materials
- Personal hygiene
- Two-man rule and approved exceptions
- Potential trip/fall hazards
- Horseplay on the range
- Stay alert for any explosive hazards
- Location of emergency shelter (if available)
- Vehicle parking (vehicles must be oriented out of the site for immediate departure, with keys in the ignition)
- Location of emergency vehicle (keep engine running)
- Wind direction (to assess potential toxic fumes)
- Location of first aid kit and fire extinguisher
- Route to nearest hospital or emergency aid station
- Type of communications in event of an emergency
- Storage location of demolition materials and MEC awaiting disposal.

Pre-Demo/Disposal Operational Briefing

SUXOS or UXOSO will designate other team/personnel locations during operations for safety observer or road guard functions.

UXOSO will maintain control of the site during demo operations. Ingress, egress, rally points, and safe locations will be designated prior to operations.

☑ The disposal site selected and reviewed by the management team

Northing 3630803 Easting 0349607

☑ MSD has been established for the disposal operation based on:

○ Max Frag Distance 1348 Feet

○ Overpressure – K Value 328 1348 Feet

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☑ **MEC Disposal:**
Type and Quantity SEE Attached List

☑ **Donor Explosives:**
Type, Placement and Quantity See Attached List

☑ **Initiation Method:** ☒ NonEl (Shock Tube) ☐ Electric ☐ Non-Electric

☑ **Explosives Transportation:** ☒ Route Map

☑ **Frag Data Sheet has been reviewed and attached**

☐ **The demo plan will contain the appropriate engineering controls**

- ☐ **The number of required sandbags has been properly calculated based on the MEC to be destroyed**
- ☐ **The amount of material has been calculated using the Buried Explosives Module (BEM)**
- ☐ **The requirements for water barricades detailed in HNC-ED-CS-S-00-3 been followed**

☑ **Other considerations** WP Open detonation / BDM-33 Spalling Charge

☐ **The following pubs are available on-site: 1) TP16, 2) HNC-ED-CS-S-00-3 Water Mitigation, 3) HNC-ED-CS-S-96-8 – Revision 1 Guide for Barricades, 4) HNC-ED-CS-S-98-7 Use of Sandbags for Mitigation, 5) Use of Sandbags Amend 1 – Double Sandbags, 6) Buried Explosion Module Current version)**

Time of Operation 0900-1600

Team members assigned to demolition operations will follow the procedures found in the UFC-QAPP and Demo SOP. These documents will be available on-site during operations for review and clarification of issues or questions that may arise.

☑ **Demo Team Member Assignments:**
Site Preparation 5UXOS / UXO SO / UXO DTL
Explosives Preparation UXO DTL
Drivers 5UXOS / UXO 2
Firing Device Prep UXO DTL & UXO 2

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Other Task(s) _____

☑ **Demo TL has positive control of the firing device/key**

☑ **Safety Precautions**

MEC Precautions

Demolition Precautions

Area and Exclusion Zone

☑ **Misfire Procedures – See SOP MEC-01 for specific details**

○ **Electric**

60-minute wait after 2nd attempt and attempt with second firing device.

○ **Non-electric**

Safety Fuze time **PLUS** a 60-minute wait time

☑ **Shock Tube**

60-minute if shock tube has propagated. (See SOP MEC-01 Rev6)

60-minute wait time if **ANY** of the shock tube is known to fire (propagate). 60-minute wait time if unknown if shock tube has fired. If shock tube is **KNOWN** to not have fired, cut at least 6 inches from tube and attempt to re-fire (see SOP MEC-01 for details).

☑ **PPE Requirements**

☑ **Modified Level D** ○ **Other:** _____

☑ **Engineering Controls**

Purpose of Controls Road Block - stop unauthorized access

Type of Controls Physical & Visual Block

Required Material(s) for Controls Vehicles & Personnel

PARSONS

☑ **Notifications (Base security, Law Enforcement, Fire, EMS, FAA, other):**

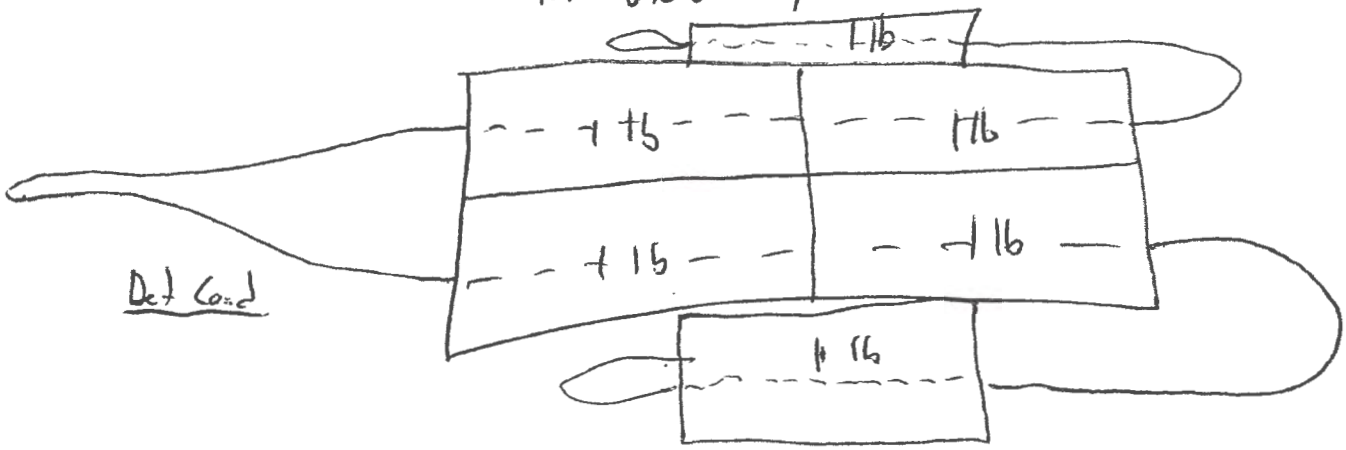
Optional	Range Management Ops	Tim Benny 623-856-8813	☐	
Optional	Snake Eye	623-856-8818	☐	* will call this #
**	ECC BG (10 mins)	623-856-5241	☐	Need Location for Evac
	Mariano BLM	602-881-8664	☐	
*	Air Space (5 min)	John Padilla 623-856-5855	☐	POC. John Padilla
***	Weather Station	623-856-5258	☐	
			☐	

POC For Explosive Delivery: Mark McKean 928-300-3641
WESCO Explosives

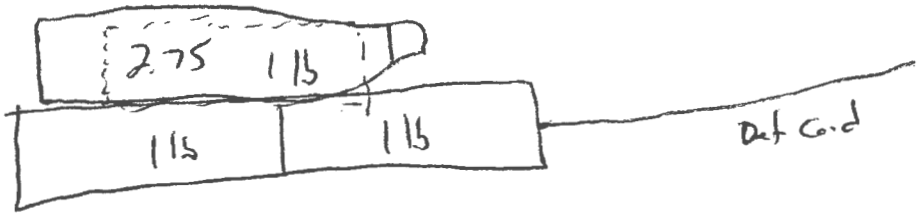
Name	Signature
Scott Phelps	
Spencer Smith	
Robin Morgan	
Eric Jollota	
Monterell Collins	
Jacan P. Leonard	
Luis Vazquez	
John Porba	
Richard Endress	Richard Endress
Matt Busch	
Leonel Chavez	
Carlos Payan	
Mariano Lanza	Lanza

WP Shot

TOP View Explosion



Side View



Phillips, Scott D

From: Phillips, Scott D
Sent: Tuesday, March 19, 2019 10:10 AM
To: 'BERRY, TIMOTHY W CIV USAF AETC 56 RMO/ARO'
Cc: Busch, Matthew; Phillips, Scott D; Endress, Richard
Subject: Parsons BLM Demo op near Barry Goldwater Range on 22 Mar 19 NOTAM request
Attachments: Demo 3.22.19.pdf

Tim

Request NOTAM be created for:
22 Mar 19, from 0900-1600 hrs.

2000 foot ground and air space clearance around Grid Coordinates.
UTM
12S 0349572 m E
3630882 m N

This air space clearance will cover both of the following shots that are spaced approximately 300 feet from each other (See attachment).

Shot #1
1 ea 2.75" Mk1 He warhead (2.3 ibs x1 = 2.3lbs (NEW)
3 ea BDU-33 practice bomb

Demo materials
4 ea Civilian perforators (19.5 grams x 3 = 58.5 grams/ .13 lbs (NEW)

Total New = 2.43 lbs NEW
Frag Distance in feet = 1400 ft

Shot #2
1 ea 2.75" M156 WP warhead (.12 ibs x1 = .12lbs (NEW)

Demo materials
6 ea Civilian boosters (1 lb x 6 = 6 lbs (NEW)

Total New = 6.12 lbs NEW
Frag Distance in feet = 1400 ft

If you require any additional information.

Contact me at 682-990-2727 (cell) or by email scott.d.phillips@parsons.com.

Regards,
Scott Phillips

MOTOR VEHICLE INSPECTION (TRANSPORTING HAZARDOUS MATERIALS)

(Read Instructions before completing this form.)

This form applies to all vehicles which must be marked or placarded in accordance with Title 49 CFR.

1. BILL OF LADING/TRANSPORTATION CONTROL NUMBER: INV014882

SECTION 1 - DOCUMENTATION	ORIGIN a.	DESTINATION b.
2. CARRIER/GOVERNMENT ORGANIZATION	Parsons	
3. DATE/TIME OF INSPECTION	22 Mar 19 0710	
4. LOCATION OF INSPECTION	Barry Goldwater AF Brass	
5. OPERATOR(S) NAME(S)	Robin "MO" Morgan	
6. OPERATOR(S) LICENSE NUMBER(S)	TX 43268464	
7. MEDICAL EXAMINER'S CERTIFICATE*	44195712 4	

8. (X if satisfactory at origin)							9. CVSA DECAL DISPLAYED ON COMMERCIAL EQUIPMENT*	YES	NO
a. HAZMAT ENDORSEMENT	X	d. ERG OR EQUIVALENT COMMERCIAL:		YES		NO	a. TRUCK/TRACTOR		
b. VALID LEASE*		e. DRIVER'S VEHICLE INSPECTION REPORT*					b. TRAILER		
c. ROUTE PLAN	X	f. COPY OF 49 CFR PART 397							

SECTION II - MECHANICAL INSPECTION

All items shall be checked on empty equipment prior to loading. Items with an asterisk shall be checked on all incoming loaded equipment.

10. TYPE OF VEHICLE(S): FORD F250 4X4

11. VEHICLE NUMBER(S): 1FT7W2BT4CEB24182

12. PART INSPECTED (X as applicable)	ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT		ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT	COMMENTS (3)
a. SPARE ELECTRICAL FUSES	X				k. EXHAUST SYSTEM	X				
b. HORN OPERATIVE	X				l. BRAKE SYSTEM*	X				
c. STEERING SYSTEM	X				m. SUSPENSION	X				
d. WINDSHIELD/WIPERS	X				n. COUPLING DEVICES	X				
e. MIRRORS	X				o. CARGO SPACE	X				
f. WARNING EQUIPMENT	X				p. LANDING GEAR*	—		—		
g. FIRE EXTINGUISHER*	X				q. TIRES, WHEELS, RIMS	X				
h. ELECTRICAL WIRING	X				r. TAILGATE/DOORS*	X				
i. LIGHTS AND REFLECTORS	X				s. TARPAULIN*	X				
j. FUEL SYSTEM*	X				t. OTHER (Specify)					

13. INSPECTION RESULTS (X one) ACCEPTED [X] REJECTED [ ]

(If rejected give reason under "Remarks". Equipment will be approved if deficiencies are corrected prior to loading.)

14. SATELLITE MOTOR SURVEILLANCE SYSTEM: (X one) ACCEPTED [ ] REJECTED [ ]

15. REMARKS: Entire Trip was off road on BLM Land

16. INSPECTOR SIGNATURE (Origin)

17. INSPECTOR SIGNATURE (Destination)

SECTION III - POST LOADING INSPECTION

This section applies to Commercial and Government/Military vehicles. All items will be checked prior to release of loaded equipment and shall be checked on all incoming loaded equipment.

	ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT	COMMENTS (3)
18. LOADED IAW APPLICABLE SEGREGATION/COMPATIBILITY TABLE OF 49 CFR					
19. LOAD PROPERLY SECURED TO PREVENT MOVEMENT					
20. SEALS APPLIED TO CLOSED VEHICLE; TARPAULIN APPLIED ON OPEN EQUIPMENT					
21. PROPER PLACARDS APPLIED					
22. SHIPPING PAPERS/DD FORM 2890 FOR GOVERNMENT VEHICLE SHIPMENTS					
23. COPY OF DD FORM 626 FOR DRIVER					
24. SHIPPED UNDER DOT SPECIAL PERMIT 868					

25. INSPECTOR SIGNATURE (Origin)

26. DRIVER(S) SIGNATURE (Origin)

27. INSPECTOR SIGNATURE (Destination)

28. DRIVER(S) SIGNATURE (Destination)

Explosives Usage Record

Contract Number

Team Number: DEMO 1 Date: 22 MAR 19 Project Name: BG AZ Sweep

Team Leader: Spencer Smith/ Scott Phillips Work Areas & Grid Numbers: DEMO #1

Explosives Issued Signature Of Team Leader:

Item	Quantity	Lot Number	Checkers Initials
SPARTAN 450 G	6 ea	SP0450	SDP
NONEL MS0 40FT	7 ea	DA00641	SDP
80 Gm PETN DET CORD	80 ft	PETN80	SDP
NONEL LEAD LINE	5000 ft	DJ25025	SDP
Shaped Charge 1.4 D	8 ea	101210636	SDP

Explosives Expended Signature Of Team Leader

Item	Quantity	Lot Number	Checkers Initials
SPARTAN 450 G	6 ea	SP0450	SDP
NONEL MS0 40 FT	7 ea	DA 00641	SDP
80 Gm PETN DET CORD	80 ft	PETN 80	SDP
NONEL LEAD LINE	5000 ft	DJ25025	SDP
Shaped Charge 1.4D	8 ea	101210636	SDP

Explosives Returned Signature Of SUXOS:

Item	Quantity	Lot Number	Checkers Initials
NONE			

The signatures in each section of this document indicate that the items listed in that section were in fact issued, expended, or returned to storage and that the quantities listed were verified through a physical count.

DEMOLITION SHOT RECORD

Site Name/Location: Barry Goldwater AF Sweep "Area A"			Date: 22 MAR 19
Shot Location (Anomaly ID No./GPS Coord.): UTM 12S 3630803 / 0349607	Demolition Supervisor: SPENCER SMITH / SCOTT PHILLIPS		State License # (if applicable):
Type of UXO/MEC Destroyed, Vented, or Burned: 2.75" WP, 2.75" HE, 3ea BDU-33	Firing Method: NON-EI		Time of Shot: 12:30
Direction and Distance to Nearest Building, Road, Utility Line, etc.: 16 miles	Temp: 77 Ceiling: 3000	Wind Dir./Speed: SSE 9 mph Clouds/Sun: Sun	
Type and Amount of Tamping Used: Fill Dirt & Open Detonation (WP)		Mat or Other Protection Used (list):	
Seismographic/Sound Level Meter Used: Yes ☐ No ☐		Readings/Results:	

Demolition Materials Used

Description	Amount	Description	Amount
Perforator	8 ea	Time Fuze	—
Det Cord	80 ft	Squibs	—
Electric Detonator	—	Black/Smokeless Powder	—
Non-Electric Detonator	—	Two Component	—
Non-EI Detonator	7 ea	Other (list) 11bs Booster	6 ea

Certification

I certify that the explosives listed were used for their intended purpose, and that the UXO/MEC listed were rendered inert/destroyed.

Signature of Demolition supervisor: _____ Date: 22 MAR 19

DEMOLITION SHOT RECORD

Site Name/Location:			Date:
Shot Location (Anomaly ID No./GPS Coord.)	Demolition Supervisor:		State License # (if applicable):
Type of UXO/MEC Destroyed, Vented, or Burned:	Firing Method:		Time of Shot:
Direction and Distance to Nearest Building, Road, Utility Line, etc.:	Temp: _____ Ceiling: _____	Wind Dir./Speed: _____ Clouds/Sun: _____	
Type and Amount of Tamping Used:		Mat or Other Protection Used (list):	
Seismographic/Sound Level Meter Used: Yes ☐ No ☐		Readings/Results:	

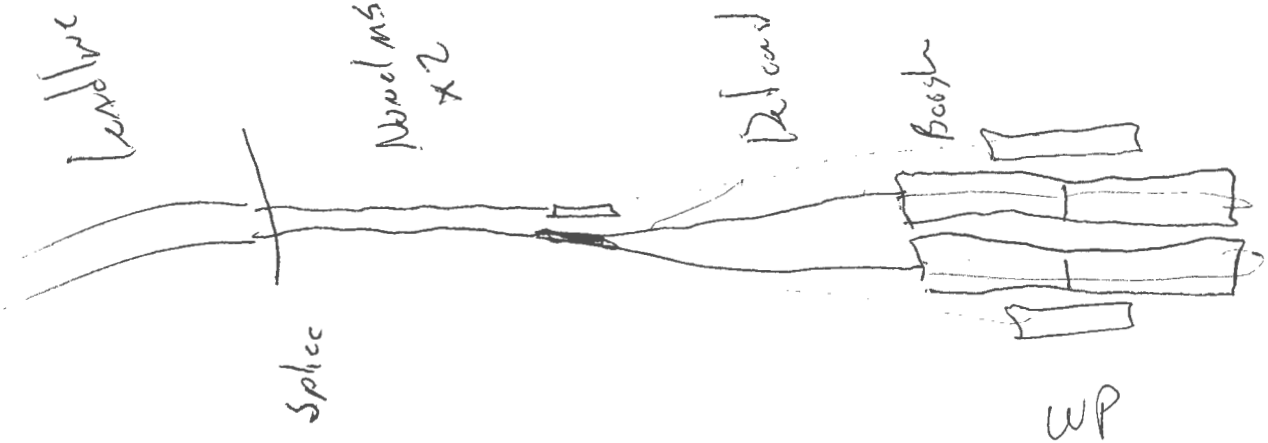
Demolition Materials Used

Description	Amount	Description	Amount
Perforator		Time Fuze	
Det Cord		Squibs	
Electric Detonator		Black/Smokeless Powder	
Non-Electric Detonator		Two Component	
Non-EI Detonator		Other (list)	

Certification

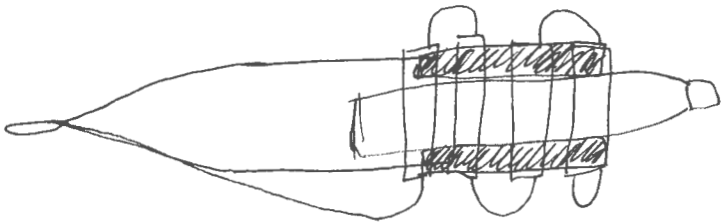
I certify that the explosives listed were used for their intended purpose, and that the UXO/MEC listed were rendered inert/destroyed.

Signature of Demolition supervisor: _____ Date: _____

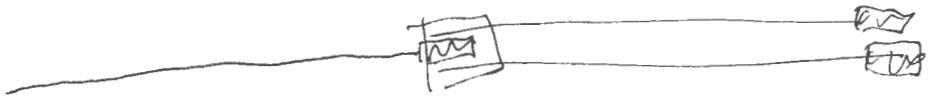


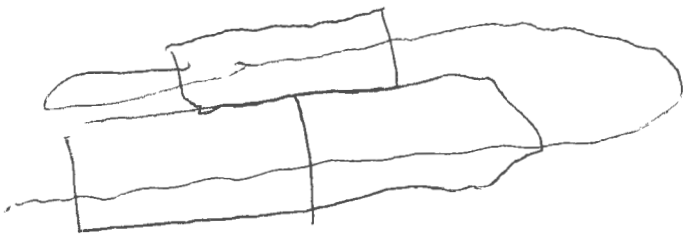
WP





x4 Booster under
x2 Booster side





Explosives Delivery List
↳ Location

Location of Shot – In place
– Range.
– Other in MSR

Consolidate other items.

Tom ~~James~~ Sizemore POC ? Barry Gilbert

timothy.berry@3dos.af.mil

Explosive List
→ Boosters
Perps

27 MAR
09:00 – 16:00

2K
Grid/Location "UTM"

RMO: 623-856-8813 Tim Barry
Range Munitions Ops

→ Non El Firing Device w/ T connectors
→ Cutters / Non el splice/Bunch block

Soil Sampling

Tom Tedsco

Mr. Wiland

Contact List for Demo Developed

→ Snake Eye (Air-span)
→ BLM
→ Maricopa Sheriff
- ECC
- Fire Department
- Weather

Truck - Wade Lined

Windshield Glue

Ak Field
623-856-5258
↳ 623-856-5289

Weather → Snake Eye: 623-856-8818 (Possible POC Kevin [redacted] 623-856-3976)
"Rich named plan

ECC: 623-856-5241

Call Snakeye 623-856-8818

↳ Recall Roster

↳ Timeline to schedule demo

↳ Grid Coordinates WP 2.75" 12S UTM 0358748 / 3626188

HE. 2.75" 12S UTM 0357432 / 3626001

Kev.Barnes@wescoexplosives.com

928-301-1158 no

~~Wesco~~ WESCO

Kev Barns

RFP Issued
Quantity
Product Sheet
Shipment
Delivery

3hrs - 2.95 ~~per~~ mile/placard mile

1/4lb HE w/2.2lbs WP

Grid

New

Exclusion Zones

BLM

Maricopa PD

Call

623-856-8813

Tim Barry / Scott Hanson

Timothy.Barry.3@us.af.mil

ECC 5241 / 5200

BLM

ECC - Fire Chief Chris Housemn 623-856-1734

- Rural Metro / Gila Bnd Rescue - 480-945-6311

5241

Dispatch P.D

MOTOR VEHICLE INSPECTION (TRANSPORTING HAZARDOUS MATERIALS)

(Read Instructions before completing this form.)

This form applies to all vehicles which must be marked or placarded in accordance with Title 49 CFR.

1. BILL OF LADING/TRANSPORTATION CONTROL NUMBER: INV014882

SECTION 1 - DOCUMENTATION	ORIGIN a.	DESTINATION b.
2. CARRIER/GOVERNMENT ORGANIZATION	Parsons	
3. DATE/TIME OF INSPECTION	22 Mar 19 0710	
4. LOCATION OF INSPECTION	Barry Goldwater AF Base	
5. OPERATOR(S) NAME(S)	Robin "MO" Morgan	
6. OPERATOR(S) LICENSE NUMBER(S)	TX 43768464	
7. MEDICAL EXAMINER'S CERTIFICATE*	44195712 4	

8. (X if satisfactory at origin)						9. CVSA DECAL DISPLAYED ON COMMERCIAL EQUIPMENT*	YES	NO
a. HAZMAT ENDORSEMENT	X	d. ERG OR EQUIVALENT COMMERCIAL:	YES		NO	a. TRUCK/TRACTOR		
b. VALID LEASE*		e. DRIVER'S VEHICLE INSPECTION REPORT*				b. TRAILER		
c. ROUTE PLAN	X	f. COPY OF 49 CFR PART 397						

SECTION II - MECHANICAL INSPECTION

All items shall be checked on empty equipment prior to loading. Items with an asterisk shall be checked on all incoming loaded equipment.

10. TYPE OF VEHICLE(S): FORD F250 4X4

11. VEHICLE NUMBER(S): 1FT7W2BT4CEB24182

12. PART INSPECTED (X as applicable)	ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT		ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT	COMMENTS (3)
a. SPARE ELECTRICAL FUSES	X				k. EXHAUST SYSTEM	X				
b. HORN OPERATIVE	X				l. BRAKE SYSTEM*	X				
c. STEERING SYSTEM	X				m. SUSPENSION	X				
d. WINDSHIELD/WIPERS	X				n. COUPLING DEVICES	X				
e. MIRRORS	X				o. CARGO SPACE	X				
f. WARNING EQUIPMENT	X				p. LANDING GEAR*	—		—		
g. FIRE EXTINGUISHER*	X				q. TIRES, WHEELS, RIMS	X				
h. ELECTRICAL WIRING	X				r. TAILGATE/DOORS*	X				
i. LIGHTS AND REFLECTORS	X				s. TARPAULIN*	X				
j. FUEL SYSTEM*	X				t. OTHER (Specify)					

13. INSPECTION RESULTS (X one) ACCEPTED [X] REJECTED [ ]

(If rejected give reason under "Remarks". Equipment will be approved if deficiencies are corrected prior to loading.)

14. SATELLITE MOTOR SURVEILLANCE SYSTEM: (X one) ACCEPTED [ ] REJECTED [ ]

15. REMARKS: Entire Trip was off road on BLM Land

16. INSPECTOR SIGNATURE (Origin)

17. INSPECTOR SIGNATURE (Destination)

SECTION III - POST LOADING INSPECTION

This section applies to Commercial and Government/Military vehicles. All items will be checked prior to release of loaded equipment and shall be checked on all incoming loaded equipment.

	ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT	COMMENTS (3)
18. LOADED IAW APPLICABLE SEGREGATION/COMPATIBILITY TABLE OF 49 CFR					
19. LOAD PROPERLY SECURED TO PREVENT MOVEMENT					
20. SEALS APPLIED TO CLOSED VEHICLE; TARPAULIN APPLIED ON OPEN EQUIPMENT					
21. PROPER PLACARDS APPLIED					
22. SHIPPING PAPERS/DD FORM 2890 FOR GOVERNMENT VEHICLE SHIPMENTS					
23. COPY OF DD FORM 626 FOR DRIVER					
24. SHIPPED UNDER DOT SPECIAL PERMIT 868					

25. INSPECTOR SIGNATURE (Origin)

26. DRIVER(S) SIGNATURE (Origin)

27. INSPECTOR SIGNATURE (Destination)

28. DRIVER(S) SIGNATURE (Destination)

BURIED EXPLOSION MODULE

(Version 7.1)

MK 1

Note: White cells require input. All other cells are calculated.

Based on DDESB Technical Paper 16, Revision 5

(ENGLISH UNITS)

BURIAL CHARACTERISTIC INPUTS

BURIAL MEDIUM	SOIL TYPE	DEPTH OF BURIAL (ft)
Soil	Dry Sand	0.00

(See TP 16, Revision 5 for soil details)

EXPLOSIVE CHARGE INPUTS

ITEM DESCRIPTION: 2.75 in M151 & Mk 64

NUMBER OF ITEMS: 1

DONOR CHARGE EXPLOSIVE TYPE: RDX

TOTAL WEIGHT OF DONOR CHARGES (lbs): 0.04

HORIZONTAL DISTANCE (for pressure calcs):

VALUES USED IN BEM CALCULATIONS

SINGLE ITEM NEW (lbs)	2.30	TOTAL TNT WEIGHT USED (lbs)	2.73
ITEM DIAMETER (in)	2.750		
SINGLE ITEM MAXIMUM FRAG. WEIGHT (lbs)	0.0463	FRAGMENT WEIGHT USED IN CALCULATIONS (lbs)	0.0463
SINGLE ITEM MAXIMUM FRAG. VELOCITY (ft/s)	5,677	FRAGMENT VELOCITY USED IN CALCULATIONS (ft/s)	5,677

BURIED EXPLOSION MODULE OUTPUTS

CRATER OR CAMOUFLET?

CRATER

TRUE CRATER RADIUS (ft)	2	
MAX. SOIL EJECTA DISTANCE (ft)	112	
MAX. FRAGMENT DISTANCE (ft)	1,348	
Surface K328 Distance (ft)	458.2	
Buried Equiv. K328 (0.066 psi)	458.2	ft
Buried Equiv. K24 (2.3 psi)	27.1	ft

NON-ESSENTIAL PERSONNEL DISTANCE (ft): 1,348

Note: Provide essential personnel equivalent K24 overpressure distance and protection from all fragments.

Pressure Values

Distance	(psi)	(dB)	
Greater of Soil Ejecta and Max. Frag. (1348 ft)	0.0273	139.5	
User-Entered Horizontal Distance (ft)	-N/A-	-N/A-	See Note 4

WARNING MESSAGES

Note 4: User-Entered Distance Out of Limits -- Extrapolated - Ref. TP 16

BURIED EXPLOSION MODULE

(Version 7.1)

WP

Note: White cells require input. All other cells are calculated.

Based on DDESB Technical Paper 16, Revision 5
(ENGLISH UNITS)

BURIAL CHARACTERISTIC INPUTS

BURIAL MEDIUM	SOIL TYPE	DEPTH OF BURIAL (ft)
Soil	Dry Sand	0.00

(See TP 16, Revision 5 for soil details)

EXPLOSIVE CHARGE INPUTS

ITEM DESCRIPTION	NUMBER OF ITEMS
2.75 in M151 & Mk 64	1

DONOR CHARGE EXPLOSIVE TYPE	TOTAL WEIGHT OF DONOR CHARGES (lbs)	HORIZONTAL DISTANCE (for pressure calcs)
PETN	3.82	

VALUES USED IN BEM CALCULATIONS

SINGLE ITEM NEW (lbs)	2.30	TOTAL TNT WEIGHT USED (lbs)	7.52
ITEM DIAMETER (in)	2.750		
SINGLE ITEM MAXIMUM FRAG. WEIGHT (lbs)	0.0463	FRAGMENT WEIGHT USED IN CALCULATIONS (lbs)	0.0463
SINGLE ITEM MAXIMUM FRAG. VELOCITY (ft/s)	5,677	FRAGMENT VELOCITY USED IN CALCULATIONS (ft/s)	5,677

BURIED EXPLOSION MODULE OUTPUTS

CRATER OR CAMOUFLET?

CRATER

TRUE CRATER RADIUS (ft)	2	
MAX. SOIL EJECTA DISTANCE (ft)	146	
MAX. FRAGMENT DISTANCE (ft)	1,348	

Surface K328 Distance (ft)	642.6	
Buried Equiv. K328 (0.066 psi)	642.6	ft
Buried Equiv. K24 (2.3 psi)	38.2	ft

NON-ESSENTIAL PERSONNEL DISTANCE (ft) 1,348

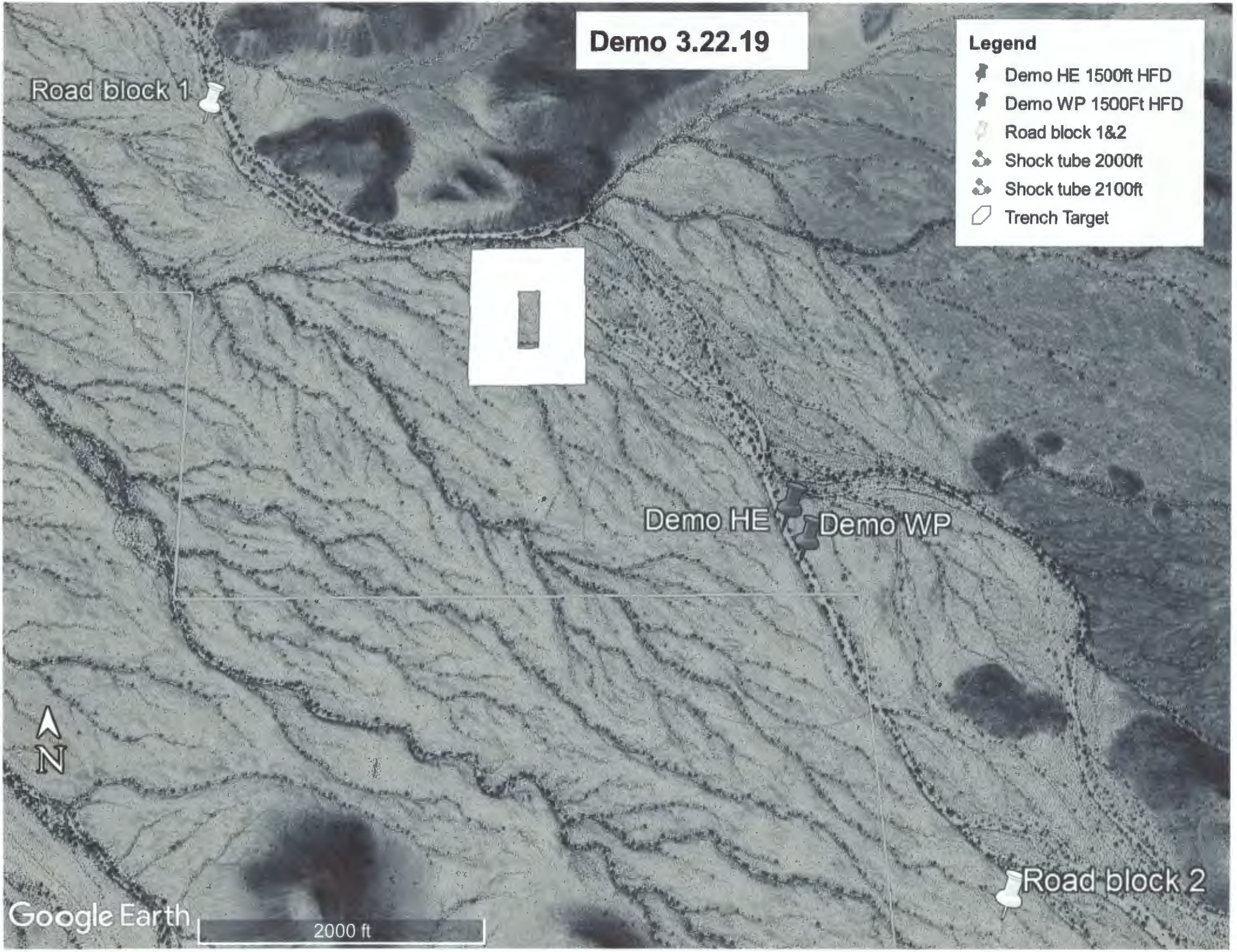
Note: Provide essential personnel equivalent K24 overpressure distance and protection from all fragments.

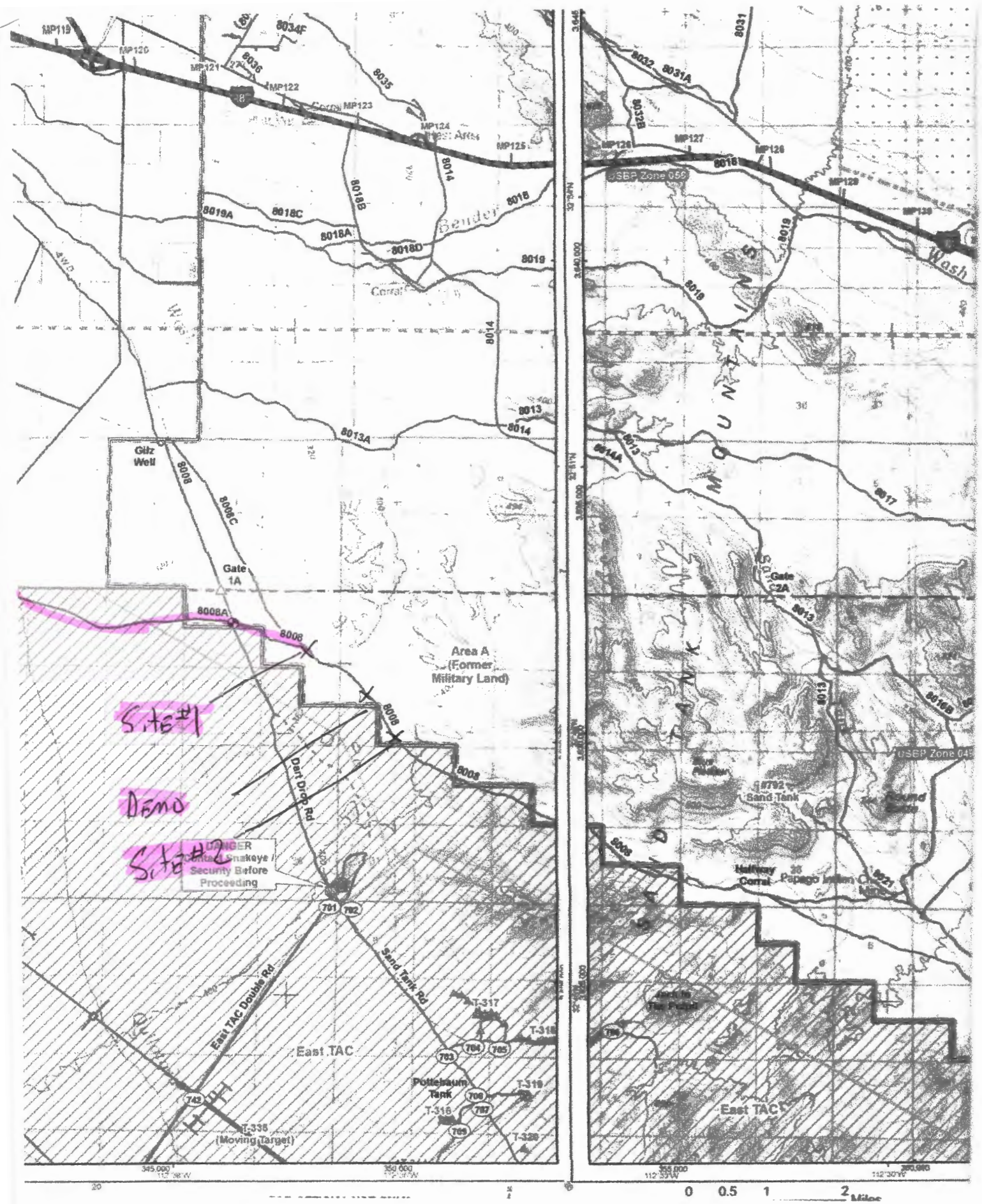
Pressure Values

Distance	(psi)	(dB)	
Greater of Soil Ejecta and Max. Frag. (1348 ft)	0.0402	142.8	
User-Entered Horizontal Distance (ft)	-N/A-	-N/A-	See Note 4

WARNING MESSAGES

Note 4: User-Entered Distance Out of Limits -- Extrapolated - Ref. TP 16


Demo 3.22.19
Legend
Demo HE 1500ft HFD
Demo WP 1500Ft HFD
Road block 1&2
Shock tube 2000ft
Shock tube 2100ft
Trench Target
Road block 1
Demo HE
Demo WP
Road block 2
N
Google Earth
2000 ft


MP119
MP120
MP121
MP122
MP123
MP124
MP125
MP126
MP127
MP128
MP129
MP130
8034F
8036
8035
8014
8018B
8018A
8018C
8018D
8019A
8019
8018
8013A
8013
8014
8014A
8017
8031
8032
8031A
8032B
Bender
Wash
Gate 1A
Gate 2A
Gate 2
Gate 3
Gate 4
Gate 5
Gate 6
Gate 7
Gate 8
Gate 9
Gate 10
Gate 11
Gate 12
Gate 13
Gate 14
Gate 15
Gate 16
Gate 17
Gate 18
Gate 19
Gate 20
Gate 21
Gate

Salt Area #2 (East) 0349997 mE
3630024 mN

HE 3630882 mN
12S UTM 0349572 ME

WP
UTM 12S 0349607 ME
3630803 mN

Salt Dam #1 (West)
5008/8088C 0348152 ME
3631963 mN

Scott

PARSONS

Demolition Operation Safety and Operational Brief/Checklist

Project Name Barry Goldwater AZ / Flare ? SAA Date 12 MAY 19

Demo Team Leader Spencer Smith

SUXOS Scott Phillips

UXOSO / UXOQCS Rich Endress

UXOQCS

- Care and handling of explosive materials
- Personal hygiene
- Two-man rule and approved exceptions
- Potential trip/fall hazards
- Horseplay on the range
- Stay alert for any explosive hazards
- Location of emergency shelter (if available)
- Vehicle parking (vehicles must be oriented out of the site for immediate departure, with keys in the ignition)
- Location of emergency vehicle (keep engine running)
- Wind direction (to assess potential toxic fumes)
- Location of first aid kit and fire extinguisher
- Route to nearest hospital or emergency aid station
- Type of communications in event of an emergency
- Storage location of demolition materials and MEC awaiting disposal.

Pre-Demo/Disposal Operational Briefing

SUXOS or UXOSO will designate other team/personnel locations during operations for safety observer or road guard functions.

UXOSO will maintain control of the site during demo operations. Ingress, egress, rally points, and safe locations will be designated prior to operations.

☑ The disposal site selected and reviewed by the management team

Northing 3630882 Easting 0349572

☑ MSD has been established for the disposal operation based on:

○ Max Frag Distance 318 Feet

☒ Overpressure – K Value 328 1727 Feet

PARSONS

☐ **MEC Disposal:**
Type and Quantity See Attached List

☐ **Donor Explosives:**
Type, Placement and Quantity See Attached List

☐ **Initiation Method:** ☒ NonEl (Shock Tube) ☐ Electric ☐ Non-Electric

☐ **Explosives Transportation:** ☒ **Route Map** (See Attached)

☐ **Frag Data Sheet has been reviewed and attached**

☐ **The demo plan will contain the appropriate engineering controls**

- ☐ **The number of required sandbags has been properly calculated based on the MEC to be destroyed**
- ☐ **The amount of material has been calculated using the Buried Explosives Module (BEM)**
- ☐ **The requirements for water barricades detailed in HNC-ED-CS-S-00-3 been followed**

☐ **Other considerations** _____

☐ **The following pubs are available on-site: 1) TP16, 2) HNC-ED-CS-S-00-3 Water Mitigation, 3) HNC-ED-CS-S-96-8 – Revision 1 Guide for Barricades, 4) HNC-ED-CS-S-98-7 Use of Sandbags for Mitigation, 5) Use of Sandbags Amend 1 – Double Sandbags, 6) Buried Explosion Module Current version)**

Time of Operation 0900 – 1600

Team members assigned to demolition operations will follow the procedures found in the UFC-QAPP and Demo SOP. These documents will be available on-site during operations for review and clarification of issues or questions that may arise.

☑ **Demo Team Member Assignments:**

Site Preparation SUXOS / UXOSO / UXODTL
Explosives Preparation UXODTL
Drivers SUXOS / UXO2
Firing Device Prep UXODTL / UXO2
Other Task(s) _____

PARSONS

☑ **Demo TL has positive control of the firing device/key**

☐ **Safety Precautions**

MEC Precautions

Demolition Precautions

Area and Exclusion Zone

☑ **Misfire Procedures – See SOP MEC-01 for specific details**

○ **Electric**

60-minute wait after 2nd attempt and attempt with second firing device.

○ **Non-electric**

Safety Fuze time **PLUS** a 60-minute wait time

⊘ **Shock Tube**

60-minute if shock tube has propagated. (See SOP MEC-01 Rev6)

60-minute wait time if **ANY** of the shock tube is known to fire (propagate). 60-minute wait time if unknown if shock tube has fired. If shock tube is **KNOWN** to not have fired, cut at least 6 inches from tube and attempt to re-fire (see SOP MEC-01 for details).

☑ **PPE Requirements**

⊘ Modified Level D ○ Other: _____

☐ **Engineering Controls**

Purpose of Controls Road Blocks / Air Space / _____

Type of Controls Physical / Visual Block _____

Required Material(s) for Controls Vehicles / Radios / Cell Phones

PARSONS

☑ **Notifications (Base security, Law Enforcement, Fire, EMS, FAA, other):**

RANGE MANAGEMENT Ops : TIM BERRY 623-856-8813	☑
SNAKE EYE : 623-856-8818	☑
ECC BG Comms : 623-856-5241	☑
WEATHER Station : 623-856-5258	☑
AIR SPACE : 623-856-5855	☑
MARICOPA BLM : 602-881-8664	☑
	☐

Name	Signature
SCOTT PHILLIPS	
Spencer Smith	
Iris Velez	
Kalani Ebreo	
D. HouseKnecht	
ERIC JOLLOTA	
Jeff Young	
James Briggs	
Richard Kassel	
Richard Endress	

			New
.108	3	315 Bomb	.04

50 Ft

Total new	#3		New
.192	24	30cal	.608
.152	19	7.62	.008
.008	2	5.56	.004
3.23	95	50cal	.034
0	5	Countermeasure	0
6	2	Large Flare (Pieces	0
4.00	1	2.75 propellant	7.11/2 = 3.5 (HAF68) Page 69
7.582			
7.70		Explosive Sheet	

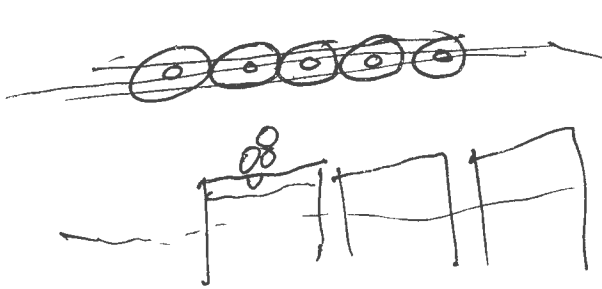


Nozzle Lead line

50 Ft

#2

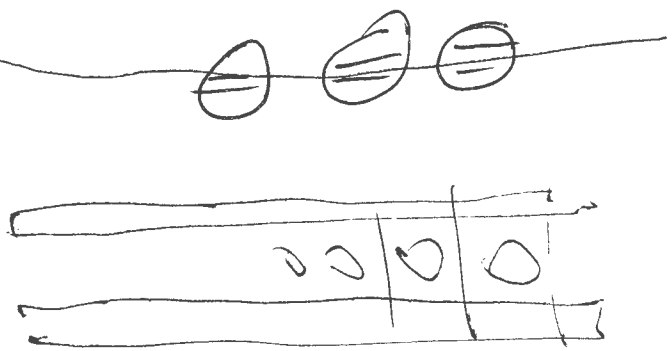
20mm X 13 .078 = 1.01



Explosive Sheet

#1

3cm MK24 ~~#3~~

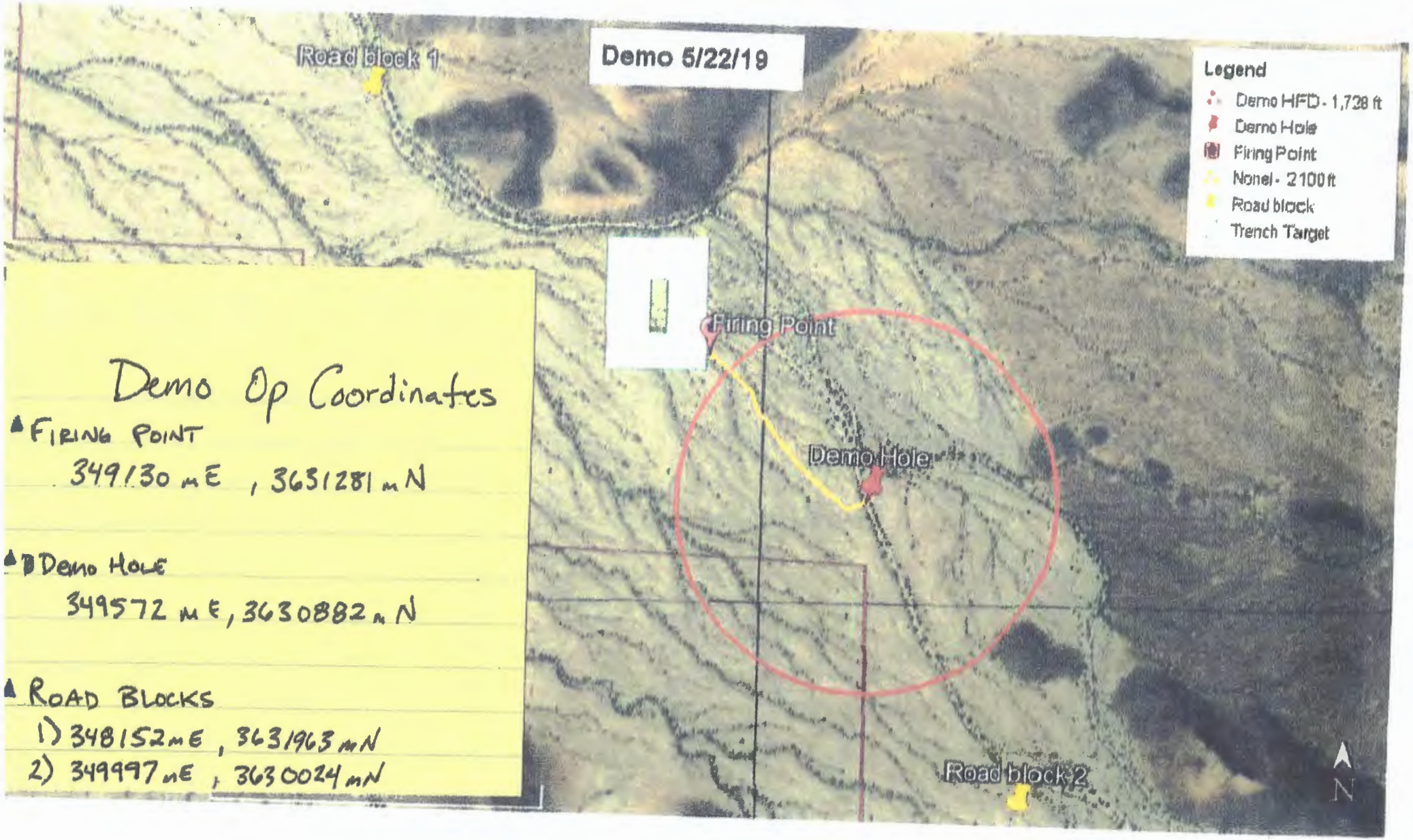


6ea Shape charges

150 Ft 80gr Det Cord

Primary			
Novel 40Ft/12m cap	3 ea	Sheet	35 lbs
Det Cord	150 Ft	Shape	3 ea
Novel Line	2500 Ft		

Clean Up			
Novel 40 Ft /cap	3 ea	Sheet	5 lbs
Det Cord	50 Ft	Shape	3 ea
Novel Line	2500 Ft		



Demo Op Coordinates

- **Firing Point**
  349130 mE , 3651281 mN
- **Demo Hole**
  349572 mE, 3630882 mN
- **Road Blocks**
  1) 348152 mE , 3631963 mN
  2) 349997 mE , 3630024 mN

2.1 Detailed MPPEH Listing - 1 MPPEH/MEC item(s) logged today, 164* MPPEH items remaining.

QTY	Item Recovered
24*	30 Cal (SAA);
19*	7.62mm (SAA);
2*	5.56mm (SAA);
95*	50 Cal (SAA);
14	20mm (TP) cartridge;
5	Countermeasure material;
2	Aircraft Flare material;
1	2.75-inch Rocket w/ partial propellent left;**
2	3lb Bomb in dispenser.

*Intact SAA is treated as MEC/MPPEH

**Warhead was destroyed, but motor low ordered and had propellent remaining.

MOTOR VEHICLE INSPECTION (TRANSPORTING HAZARDOUS MATERIALS)

(Read Instructions before completing this form.)

This form applies to all vehicles which must be marked or placarded in accordance with Title 49 CFR.

1. BILL OF LADING/TRANSPORTATION CONTROL NUMBER: INV0150065

SECTION 1 - DOCUMENTATION	ORIGIN a.	DESTINATION b.
2. CARRIER/GOVERNMENT ORGANIZATION	Bansons	
3. DATE/TIME OF INSPECTION	22 MAY19 0700	
4. LOCATION OF INSPECTION	Bonny Goldwater AFB	
5. OPERATOR(S) NAME(S)	Scott PHILIPS	
6. OPERATOR(S) LICENSE NUMBER(S)	TX 42215715	
7. MEDICAL EXAMINER'S CERTIFICATE*	N/A	

8. *(X if satisfactory at origin)*						9. CVSA DECAL DISPLAYED ON COMMERCIAL EQUIPMENT*	YES	NO
a. HAZMAT ENDORSEMENT		d. ERG OR EQUIVALENT COMMERCIAL:		YES	NO			
b. VALID LEASE*		e. DRIVER'S VEHICLE INSPECTION REPORT*				a. TRUCK/TRACTOR		
c. ROUTE PLAN	X	f. COPY OF 49 CFR PART 397				b. TRAILER		

SECTION II - MECHANICAL INSPECTION

All items shall be checked on empty equipment prior to loading. Items with an asterisk shall be checked on all incoming loaded equipment.

10. TYPE OF VEHICLE(S): FORD F250 4x4

11. VEHICLE NUMBER(S): 1FTW7W2B60FEC55401

12. PART INSPECTED *(X as applicable)*	ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT		ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT	COMMENTS (3)
a. SPARE ELECTRICAL FUSES	X				k. EXHAUST SYSTEM	X				
b. HORN OPERATIVE	X				l. BRAKE SYSTEM*	X				
c. STEERING SYSTEM	X				m. SUSPENSION	X				
d. WINDSHIELD/WIPERS	X				n. COUPLING DEVICES	X				
e. MIRRORS	X				o. CARGO SPACE	X				
f. WARNING EQUIPMENT	X				p. LANDING GEAR*	-		-		
g. FIRE EXTINGUISHER*	X				q. TIRES, WHEELS, RIMS	X				
h. ELECTRICAL WIRING	X				r. TAILGATE/DOORS*	X				
i. LIGHTS AND REFLECTORS	X				s. TARPAULIN*	X				
j. FUEL SYSTEM*	X				t. OTHER *(Specify)*					

13. INSPECTION RESULTS *(X one)* ACCEPTED: X REJECTED:

(If rejected give reason under "Remarks". Equipment will be approved if deficiencies are corrected prior to loading.)

14. SATELLITE MOTOR SURVEILLANCE SYSTEM: *(X one)* ACCEPTED: REJECTED:

15. REMARKS: Explosive Route on BLM Land / Unclassified

16. INSPECTOR SIGNATURE *(Origin)*

17. INSPECTOR SIGNATURE *(Destination)*

SECTION III - POST LOADING INSPECTION

This section applies to Commercial and Government/Military vehicles. All items will be checked prior to release of loaded equipment and shall be checked on all incoming loaded equipment.

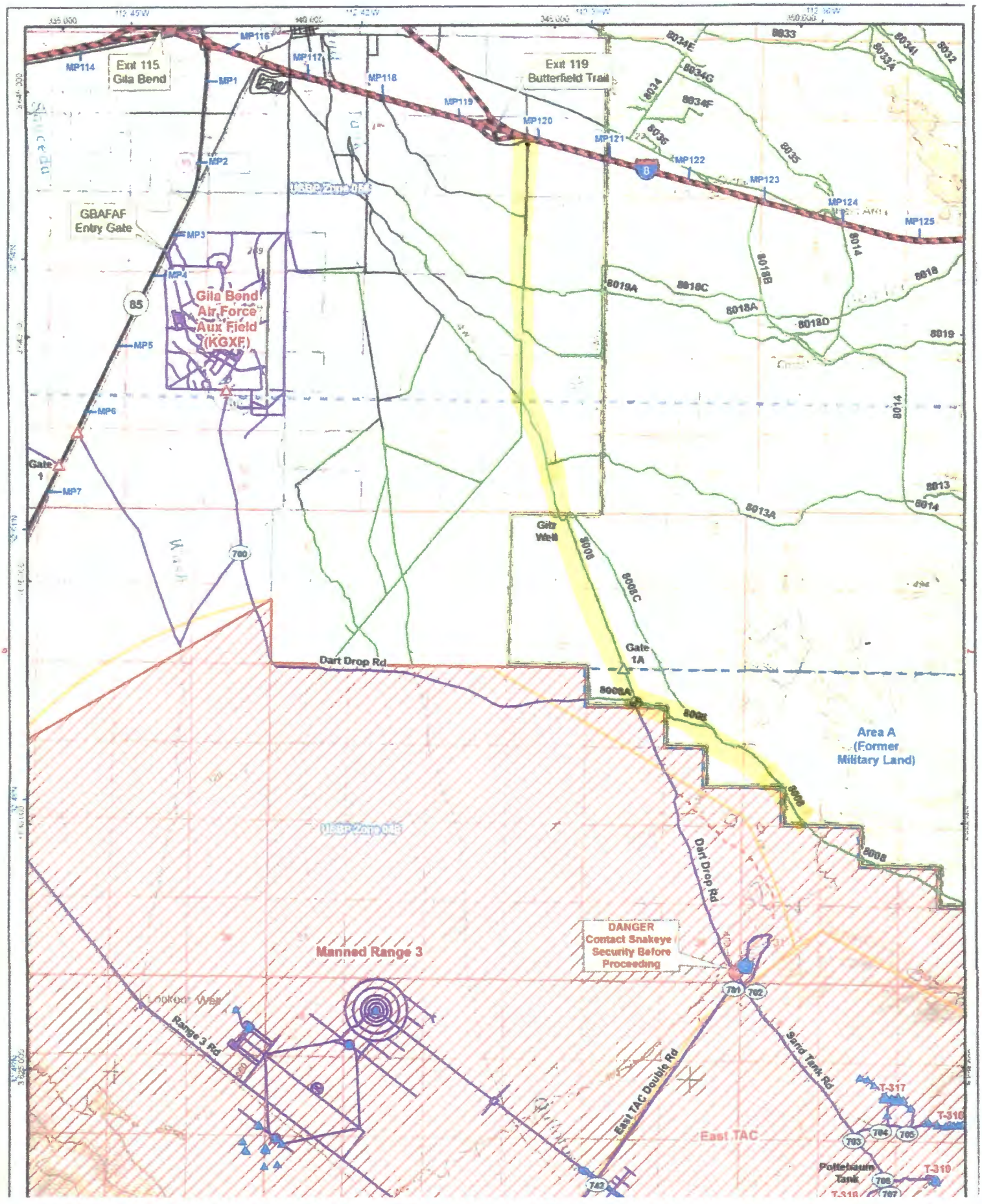
	ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT	COMMENTS (3)
18. LOADED IAW APPLICABLE SEGREGATION/COMPATIBILITY TABLE OF 49 CFR					
19. LOAD PROPERLY SECURED TO PREVENT MOVEMENT					
20. SEALS APPLIED TO CLOSED VEHICLE; TARPAULIN APPLIED ON OPEN EQUIPMENT					
21. PROPER PLACARDS APPLIED					
22. SHIPPING PAPERS/DD FORM 2890 FOR GOVERNMENT VEHICLE SHIPMENTS					
23. COPY OF DD FORM 626 FOR DRIVER					
24. SHIPPED UNDER DOT SPECIAL PERMIT 868					

25. INSPECTOR SIGNATURE *(Origin)*

26. DRIVER(S) SIGNATURE *(Origin)*

27. INSPECTOR SIGNATURE *(Destination)*

28. DRIVER(S) SIGNATURE *(Destination)*


Exit 115
Gila Bend
Exit 119
Butterfield Trail
GBAFAF
Entry Gate
Gila Bend
Air Force
Aux Field
(KGXF)
Gate
1
Gate
1A
Gila
Well
Dart Drop Rd
Area A
(Former
Military Land)
Manned Range 3
DANGER
Contact Snakeye
Security Before
Proceeding
Range 3 Rd
East TAC Double Rd
Sand Tank Rd
East TAC
Pottebaum
Tank
T-317
T-310
T-310
MP114
MP116
MP117
MP118
MP119
MP120
MP121
MP122
MP123
MP124
MP125
MP1
MP2
MP3
MP4
MP5
MP6
MP7
85
8
700
791
792
793
794
795
796
797
742

BURIED EXPLOSION MODULE

(Version 7.1)

Note: White cells require input. All other cells are calculated.

Based on DDESB Technical Paper 16, Revision 5

(ENGLISH UNITS)

BURIAL CHARACTERISTIC INPUTS

BURIAL MEDIUM: Soil

SOIL TYPE: Dry Sand

(See TP 16, Revision 5 for soil details)

DEPTH OF BURIAL (ft):

EXPLOSIVE CHARGE INPUTS

ITEM DESCRIPTION: Non-fragmenting (User Defined)

NUMBER OF ITEMS: 1

DESCRIPTION:

DONOR CHARGE EXPLOSIVE TYPE: RDX

TOTAL WEIGHT OF DONOR CHARGES (lbs): 50.00

HORIZONTAL DISTANCE (for pressure calcs):

ENTER NON-FRAGMENTING DETONATION PROPERTIES

EXPLOSIVE TYPE: RDX

SINGLE ITEM NET EXPLOSIVE WEIGHT (lbs): 50.00

VALUES USED IN BEM CALCULATIONS

SINGLE ITEM NEW (lbs)	50.00	TOTAL TNT WEIGHT USED (lbs)	146.00
ITEM DIAMETER (in)	0.100		
SINGLE ITEM MAXIMUM FRAG. WEIGHT (lbs)	0.0000	FRAGMENT WEIGHT USED IN CALCULATIONS (lbs)	0.0000
SINGLE ITEM MAXIMUM FRAG. VELOCITY (ft/s)	0	FRAGMENT VELOCITY USED IN CALCULATIONS (ft/s)	0

BURIED EXPLOSION MODULE OUTPUTS

CRATER OR CAMOUFLET?

CRATER

TRUE CRATER RADIUS (ft)	5	
MAX. SOIL EJECTA DISTANCE (ft)	318	See Note 7
MAX. FRAGMENT DISTANCE (ft)	0	

Surface K328 Distance (ft)	1,727.1	
Buried Equiv. K328 (0.066 psi)	1,727.1	ft
Buried Equiv. K24 (2.3 psi)	103.1	ft

NON-ESSENTIAL PERSONNEL DISTANCE (ft): 1,727

Pressure Values

Distance	(psi)	(dB)	
Greater of Soil Ejecta and Max. Frag. (318 ft)	0.6413	166.9	
User-Entered Horizontal Distance (ft)	-N/A-	-N/A-	See Note 4

Note: Provide essential personnel equivalent K24 overpressure distance and protection from all fragments.

WARNING MESSAGES

Note 4: User-Entered Distance Out of Limits -- Extrapolated - Ref. TP 16

Note 7: Fragmentation Distance is controlled by soil ejecta.

DEMOLITION SHOT RECORD

Site Name/Location:			Date:
Barry Goldwater AF Silo 6 "Area A"			22 MAY 19
Shot Location (Anomaly ID No./GPS Coord.)	Demolition Supervisor:	State License # (if applicable):	
UTM 12S 3630803 / 0349607	Scott Ahlrich / Spencer Smith		
Type of UXO/MEC Destroyed, Vented, or Burned:	Firing Method:	Time of Shot:	
2.75 Rocket, Flare / 50cal, 20mm TP, MK23	Nuc-151	11:00	
Direction and Distance to Nearest Building, Road, Utility Line, etc.: 16 miles	Temp: 77 Wind Dir./Speed: NNW 10 mph Ceiling: 2000 Clouds/Sun: Sun		
Type and Amount of Tamping Used: Fill Dirt	Mat or Other Protection Used (list):		
Seismographic/Sound Level Meter Used: Yes ☐ No ☐	Readings/Results:		

Demolition Materials Used

Description	Amount	Description	Amount
Perforator	8 cm	Time Fuze	
Det Cord	250 ft	Squibs	
Electric Detonator	—	Black/Smokeless Powder	
Non-Electric Detonator	—	Two Component	
Non-El Detonator	6 EA	Other (list) 20# C4 Mil Sheet	20 lbs

Certification

I certify that the explosives listed were used for their intended purpose, and that the UXO/MEC listed were rendered inert/destroyed.

Signature of Demolition supervisor: _____ Date: 22 MAY 19

DEMOLITION SHOT RECORD

Site Name/Location:			Date:
Shot Location (Anomaly ID No./GPS Coord.)	Demolition Supervisor:	State License # (if applicable):	
Type of UXO/MEC Destroyed, Vented, or Burned:	Firing Method:	Time of Shot:	
Direction and Distance to Nearest Building, Road, Utility Line, etc.:	Temp: _____ Wind Dir./Speed: _____ Ceiling: _____ Clouds/Sun: _____		
Type and Amount of Tamping Used:	Mat or Other Protection Used (list):		
Seismographic/Sound Level Meter Used: Yes ☐ No ☐	Readings/Results:		

Demolition Materials Used

Description	Amount	Description	Amount
Perforator		Time Fuze	
Det Cord		Squibs	
Electric Detonator		Black/Smokeless Powder	
Non-Electric Detonator		Two Component	
Non-El Detonator		Other (list)	

Certification

I certify that the explosives listed were used for their intended purpose, and that the UXO/MEC listed were rendered inert/destroyed.

Signature of Demolition supervisor: _____ Date: _____

Explosives Usage Record

Contract Number:

Team Number: DEMO 1 Date: 22 MAY 19 Project Name: BLAZ

Team Leader: SCOTT PHILLIPS, SPENCER SMITH Work Areas & Grid Numbers: DEMO # 1

Explosives Issued Signature Of Team Leader:

Item	Quantity	Lot Number	Checkers Initials
NONEL LEAD LINE	5000 ft	25FE19001	SMP
PRIMALINE 21 100gr	250 ft	10JU15G1	SMP
C4 MIL Sheet	20#	7-14-2016	SMP
RDX 19.5gr	8 ea	18 FEB 2015	SMP
NONEL MS 40'ers	6 EA	11 FE19x1	SMP

Explosives Expended Signature Of Team Leader

Item	Quantity	Lot Number	Checkers Initials
NONEL LEAD LINE	5000 ft	25FE19001	SMP
PRIMALINE 21 100gr	250 ft	10JU15G1	SMP
C4 MIL Sheet	20#	7-14-2016	SMP
RDX 19.5 gr	8 ea	18 FEB 2015	SMP
NONEL MS 40'ers	6 ea	11 FE 19x1	SMP

Explosives Returned Signature Of SUXOS:

Item	Quantity	Lot Number	Checkers Initials
NONE			

The signatures in each section of this document indicate that the items listed in that section were in fact issued, expended, or returned to storage and that the quantities listed were verified through a physical count.

Original | Scott Copy

PARSONS

Demolition Operation Safety and Operational Brief/Checklist

Project Name Barry Goldwater Date 18 Dec 2019

Demo Team Leader Robin "MO" Morgan

SUXOS Scott Phillips

UXOSO Matt Busch

UXOQCS Rich Endress

- Care and handling of explosive materials
- Personal hygiene
- Two-man rule and approved exceptions
- Potential trip/fall hazards
- Horseplay on the range
- Stay alert for any explosive hazards
- Location of emergency shelter (if available)
- Vehicle parking (vehicles must be oriented out of the site for immediate departure, with keys in the ignition)
- Location of emergency vehicle (keep engine running)
- Wind direction (to assess potential toxic fumes)
- Location of first aid kit and fire extinguisher
- Route to nearest hospital or emergency aid station
- Type of communications in event of an emergency
- Storage location of demolition materials and MEC awaiting disposal.

Pre-Demo/Disposal Operational Briefing

SUXOS or UXOSO will designate other team/personnel locations during operations for safety observer or road guard functions.

UXOSO will maintain control of the site during demo operations. Ingress, egress, rally points, and safe locations will be designated prior to operations.

☐ The disposal site selected and reviewed by the management team

UTM 12S

Northing 3625990 Easting 0376120

☐ MSD has been established for the disposal operation based on:

○ Max Frag Distance 96 Feet

○ Overpressure – K Value 328 379 Feet

PARSONS

☐ **MEC Disposal:**
Type and Quantity See Attached Sheet

☐ **Donor Explosives:**
Type, Placement and Quantity See Attached Sheet

☐ **Initiation Method:** ☒ NonEl (Shock Tube) ☐ Electric ☐ Non-Electric

☐ Explosives Transportation: ☒ Route Map See Attached Sheet

☐ Frag Data Sheet has been reviewed and attached See BEM Sheet

☐ The demo plan will contain the appropriate engineering controls Open detonation

- ☐ The number of required sandbags has been properly calculated based on the MEC to be destroyed
- ☐ The amount of material has been calculated using the Buried Explosives Module (BEM)
- ☐ The requirements for water barricades detailed in HNC-ED-CS-S-00-3 been followed

☐ Other considerations _____

☐ The following pubs are available on-site: 1) TP16, 2) HNC-ED-CS-S-00-3 Water Mitigation, 3) HNC-ED-CS-S-96-8 – Revision 1 Guide for Barricades, 4) HNC-ED-CS-S-98-7 Use of Sandbags for Mitigation, 5) Use of Sandbags Amend 1 – Double Sandbags, 6) Buried Explosion Module Current version)

Time of Operation 0900 - 1600

Team members assigned to demolition operations will follow the procedures found in the UFC-QAPP and Demo SOP. These documents will be available on-site during operations for review and clarification of issues or questions that may arise.

☐ **Demo Team Member Assignments:**
Site Preparation SUXOS, UXOSO, UXOQC, UXODTL
Explosives Preparation UXODTL, UXOT2
Drivers SUXOS, UXODTL
Firing Device Prep UXODTL, UXOT2
Other Task(s) _____

PARSONS

☐ **Demo TL has positive control of the firing device/key**

☐ **Safety Precautions**

MEC Precautions

Demolition Precautions

Area and Exclusion Zone (SEE Attached Sheet)

☐ **Misfire Procedures – See SOP MEC-01 for specific details**

○ **Electric**

60-minute wait after 2nd attempt and attempt with second firing device.

○ **Non-electric**

Safety Fuze time **PLUS** a 60-minute wait time

☒ **Shock Tube**

60-minute if shock tube has propagated. (See SOP MEC-01 Rev6)

60-minute wait time if **ANY** of the shock tube is known to fire (propagate). 60-minute wait time if unknown if shock tube has fired. If shock tube is **KNOWN** to not have fired, cut at least 6 inches from tube and attempt to re-fire (see SOP MEC-01 for details).

☐ **PPE Requirements**

☒ Modified Level D ○ Other: _____

☐ **Engineering Controls**

Purpose of Controls Ground Traffic & Aircraft Space

Type of Controls Physical, Visual & NOTAM

Required Material(s) for Controls Vehicles, Radios, Cell Phones

PARSONS

☐ **Notifications (Base security, Law Enforcement, Fire, EMS, FAA, other):**

4	Maricopa Sheriffs	602-876-1000	
#1	Air Space (5min)	John Padilla 623-856-5855	☐
2	Weather Station	623-856-5258	☐
3	David Johansen	402-290-5743	☐
Optional	Snakeye	623-856-8819	☐
Optional	Range Management	Tim Benny 623-856-8813	☐
5	BLM	Mariano 602-881-8664	☐
6	WESCO Explosives delivery	Mark McKean 928-300-3841	☐

#1 Calls Snakeye & Range Management

Name	Signature
Sergio Moreno	
Robin Morgan	
HOPE KILLION	
Darray Lindquist	
Monterell Collins	
Luis Vazquez	
Doug Coffey	
Sean Collery	
James Cox	
MATT BUSCH	
ERIK DOTSON	
SCOTT PHILLIPS	

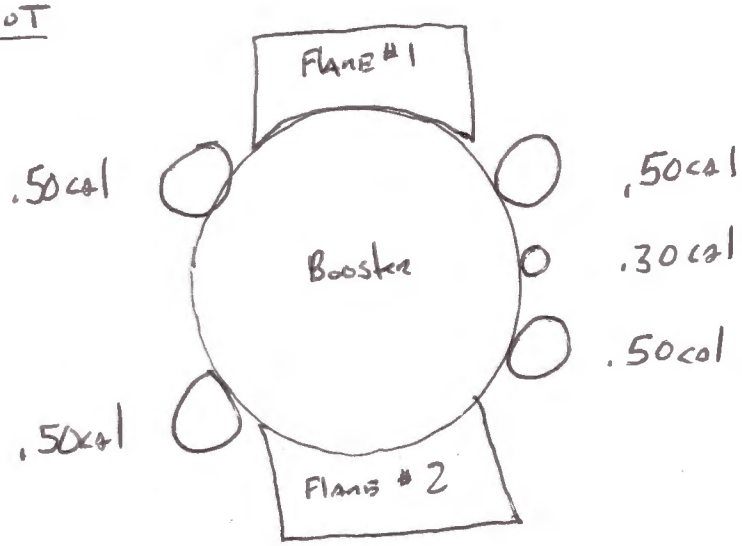
Primary Shot

MEC

1. 1 EA .30 cal
2. 4 EA .50 cal
3. 2 EA Flame IR

Donor Charge

1.) 1 EA Trojan Booster
2.) 2 EA Nonel 40 ft
3.) 5 ft Primaline (100 grain)
4.) 1200 ft Nonel Leadline
5.) Connectors & Tape, Sandbags



Firing Device / Leadline / MS 40 ft caps / Detcord / Booster (See Above)

Backup Shot

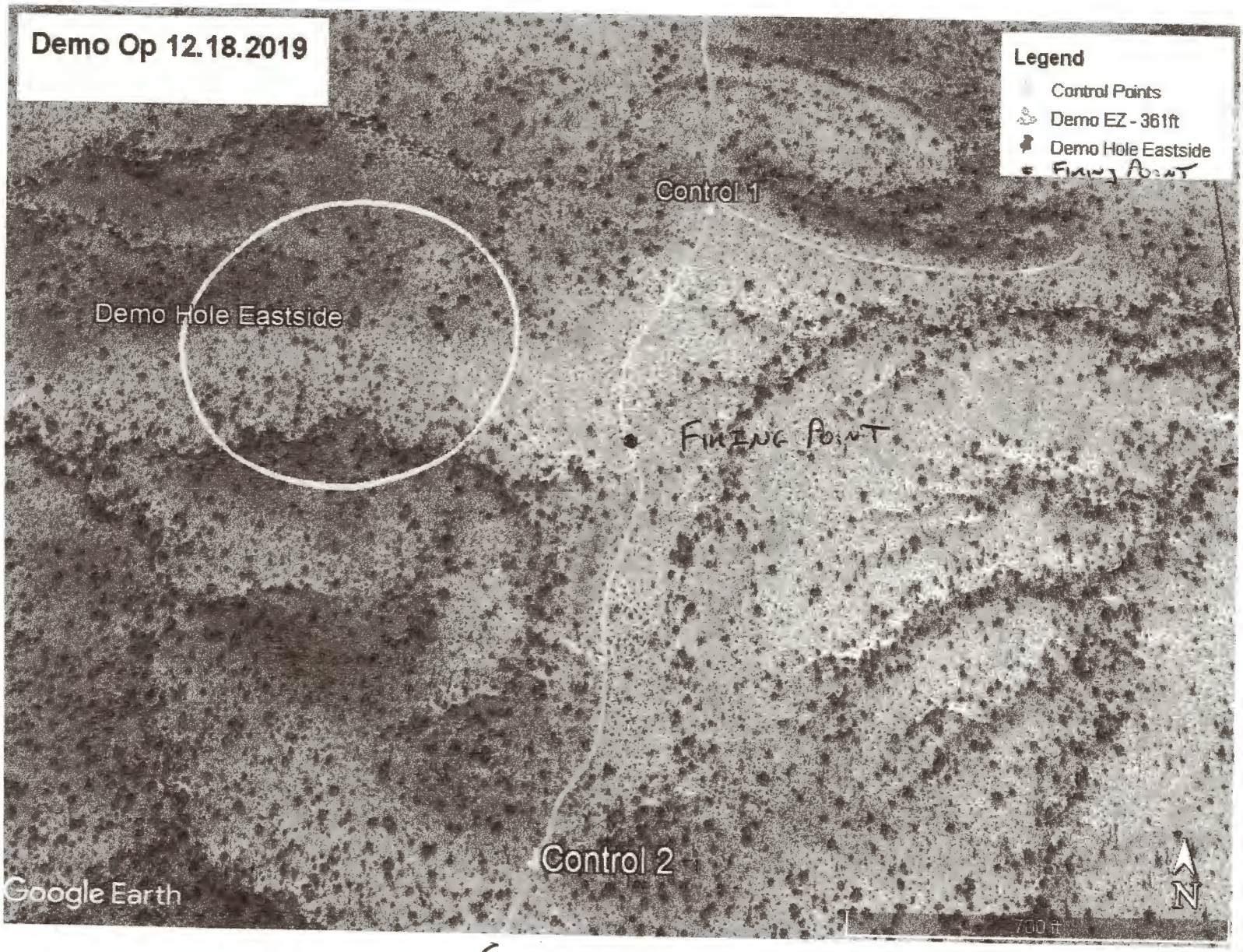
MEC

1.) TBD

Design As Needed

Donor Charge

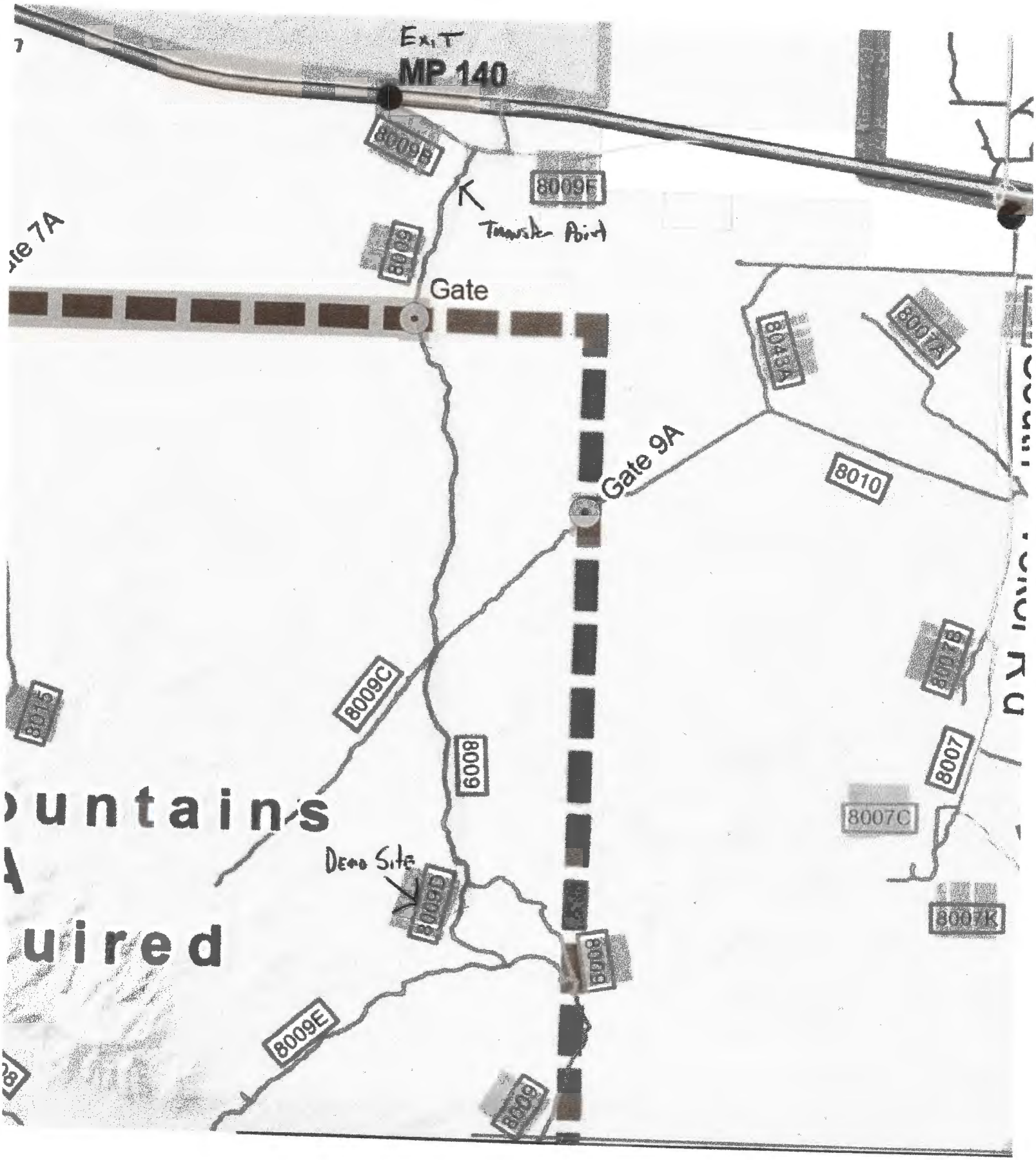
1.) 1 EA Trojan Booster
2.) 2 EA Nonel 40 ft
3.) 5 ft Primaline (100 grain)
4.) 1200 ft Nonel Leadline



COORDINATES

CONTROL POINT # 1	0376356 / 3625643
DEMO HOLE	0376120 / 3625990
FIRING POINT	0376307 / 3625910
CONTROL POINT # 2	0376255 / 3625643

Explosives Route & Egress Map, Demo OP 18 DEC 2019



Demo Op
18 Dec 19

MEC Disposal

Quanty	Item	NEW	Total NEW
1	.30 cal	0.0095	0.0095
4	.50 cal	0.0356	0.1424
2	Flare Counter Measure	0.0783	0.1566
	Total NEW		0.3085

Donor Explosives

Quanty	Item	NEW	Total NEW
1	Trojan 450G	1	1
5	Pima Cord	0.007	0.035
	Total NEW		1.035
	Combineed NEW		1.3435

BURIED EXPLOSION MODULE

(Version 7.1)

Note: White cells require input. All other cells are calculated.

Based on DDESB Technical Paper 16, Revision 5
(ENGLISH UNITS)

BURIAL CHARACTERISTIC INPUTS

BURIAL MEDIUM	SOIL TYPE	DEPTH OF BURIAL (ft)
Soil	Dry Sand	0.00

(See TP 16, Revision 5 for soil details)

EXPLOSIVE CHARGE INPUTS

ITEM DESCRIPTION: Non-fragmenting (User Defined)

NUMBER OF ITEMS: 1

DESCRIPTION: MJU-7/.50 cal

DONOR CHARGE EXPLOSIVE TYPE: PETN

TOTAL WEIGHT OF DONOR CHARGES (lbs): 1.00

HORIZONTAL DISTANCE (for pressure calcs):

ENTER NON-FRAGMENTING DETONATION PROPERTIES

EXPLOSIVE TYPE: TNT

SINGLE ITEM NET EXPLOSIVE WEIGHT (lbs): 0.30

VALUES USED IN BEM CALCULATIONS

SINGLE ITEM NEW (lbs)	0.30	TOTAL TNT WEIGHT USED (lbs)	1.57
ITEM DIAMETER (in)	0.100		
SINGLE ITEM MAXIMUM FRAG. WEIGHT (lbs)	0.0000	FRAGMENT WEIGHT USED IN CALCULATIONS (lbs)	0.0000
SINGLE ITEM MAXIMUM FRAG. VELOCITY (ft/s)	0	FRAGMENT VELOCITY USED IN CALCULATIONS (ft/s)	0

BURIED EXPLOSION MODULE OUTPUTS

CRATER OR CAMOUFLET?

CRATER

TRUE CRATER RADIUS (ft)	1	
MAX. SOIL EJECTA DISTANCE (ft)	97	See Note 7
MAX. FRAGMENT DISTANCE (ft)	0	

Surface K328 Distance (ft)	381.2	
Buried Equiv. K328 (0.066 psi)	381.2	ft
Buried Equiv. K24 (2.3 psi)	22.5	ft

NON-ESSENTIAL PERSONNEL DISTANCE (ft): 381

Note: Provide essential personnel equivalent K24 overpressure distance and protection from all fragments.

Pressure Values

Distance	(psi)	(dB)	
Greater of Soil Ejecta and Max. Frag. (97 ft)	0.4403	163.6	
User-Entered Horizontal Distance (ft)	-N/A-	-N/A-	See Note 4

WARNING MESSAGES

Note 4: User-Entered Distance Out of Limits -- Extrapolated - Ref. TP 16

Note 7: Fragmentation Distance is controlled by soil ejecta.

MOTOR VEHICLE INSPECTION (TRANSPORTING HAZARDOUS MATERIALS)

(Read instructions before completing this form.)

This form applies to all vehicles which must be marked or placarded in accordance with Title 49 CFR.

1. BILL OF LADING/TRANSPORTATION CONTROL NUMBER: 24373

SECTION I - DOCUMENTATION	ORIGIN a.	DESTINATION b.
2. CARRIER/GOVERNMENT ORGANIZATION	PANSONS	PANSONS
3. DATE/TIME OF INSPECTION	18 DEC/19	18 DEC 19
4. LOCATION OF INSPECTION	Exit 190 I8	UTM 12S 3625990/0376120
5. OPERATOR(S) NAME(S)	JAMES COON	SCOTT PHILLIPS
6. OPERATOR(S) LICENSE NUMBER(S)	TX 27126330	TX 42215715
7. MEDICAL EXAMINER'S CERTIFICATE*	N/A	N/A

8. (X if satisfactory at origin)

a. HAZMAT ENDORSEMENT		d. ERG OR EQUIVALENT COMMERCIAL:	YES	NO	
b. VALID LEASE*		e. DRIVER'S VEHICLE INSPECTION REPORT*			X
c. ROUTE PLAN	X	f. COPY OF 49 CFR PART 397			

9. CVSA DECAL DISPLAYED ON COMMERCIAL EQUIPMENT*

	YES	NO
a. TRUCK/TRACTOR		
b. TRAILER		

SECTION II - MECHANICAL INSPECTION

All items shall be checked on empty equipment prior to loading. Items with an asterisk shall be checked on all incoming loaded equipment.

10. TYPE OF VEHICLE(S): F250 4x4

11. VEHICLE NUMBER(S): 1FT7W2BT4EEB67987

12. PART INSPECTED (X as applicable)	ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT		ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT	COMMENTS (3)
a. SPARE ELECTRICAL FUSES	X				k. EXHAUST SYSTEM	X				
b. HORN OPERATIVE	X				l. BRAKE SYSTEM*	X				
c. STEERING SYSTEM	X				m. SUSPENSION	X				
d. WINDSHIELD WIPERS	X				n. COUPLING DEVICES	X				
e. MIRRORS	X				o. CARGO SPACE	X				
f. WARNING EQUIPMENT	X				p. LANDING GEAR*					
g. FIRE EXTINGUISHER*	X				q. TIRES, WHEELS, RIMS	X				
h. ELECTRICAL WIRING	X				r. TAILGATE/DOORS*					
i. LIGHTS AND REFLECTORS	X				s. TARPAULIN*	X				
j. FUEL SYSTEM*	X				t. OTHER (Specify)					

13. INSPECTION RESULTS (X one) ACCEPTED: X REJECTED:

(If rejected give reason under "Remarks". Equipment will be approved if deficiencies are corrected prior to loading.)

14. SATELLITE MOTOR SURVEILLANCE SYSTEM: (X one) ACCEPTED: REJECTED:

15. REMARKS

16. INSPECTOR SIGNATURE (Origin)

17. INSPECTOR SIGNATURE (Destination)

SECTION III - POST LOADING INSPECTION

This section applies to Commercial and Government/Military vehicles. All items will be checked prior to release of loaded equipment and shall be checked on all incoming loaded equipment.

	ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT	COMMENTS (3)
18. LOADED IAW APPLICABLE SEGREGATION/COMPATIBILITY TABLE OF 49 CFR	X				
19. LOAD PROPERLY SECURED TO PREVENT MOVEMENT	X				
20. SEALS APPLIED TO CLOSED VEHICLE; TARPAULIN APPLIED ON OPEN EQUIPMENT	X				
21. PROPER PLACARDS APPLIED	X				
22. SHIPPING PAPERS/DD FORM 2890 FOR GOVERNMENT VEHICLE SHIPMENTS	—				
23. COPY OF DD FORM 626 FOR DRIVER	X				
24. SHIPPED UNDER DOT SPECIAL PERMIT 868	—				

25. INSPECTOR SIGNATURE (Origin)

26. DRIVER(S) SIGNATURE (Origin)

27. INSPECTOR SIGNATURE (Destination)

28. DRIVER(S) SIGNATURE (Destination)

Explosives Usage Record

Contract Number: 100138, 0255, 110081, 0200

Team Number: #2 / DTL Date: 18 DEC 19 Project Name: Area 'A' Response Sites Barry M. Goldwater

Team Leader: Robin Morgan Work Areas & Grid Numbers: UTM 12S 3625990 / 0376120

Explosives Issued Signature Of Team Leader: [signature]

Item	Quantity	Lot Number	Checkers Initials
40 Ft x 0 ms Caps	4 Ea	11FE19X1	SPP
Spartan 450 Trunkline	2 Ea	06MY19J2	SPP
Primaline 21 (100 gr)	10 Ft	10TY15G1	SPP
Noel Leadline	2500 Ft	140C19W1	SPP

Explosives Expended Signature Of Team Leader [signature]

Item	Quantity	Lot Number	Checkers Initials
40 Ft x 0 ms Caps	4 ea	11FE19X1	SPP
Spartan 450 Trunkline	2 ea	06MY19J2	SPP
Primaline 21 (100 gr)	10 Ft	10TY15G1	SPP
Noel Leadline	2500 Ft	140C19W1	SPP

Explosives Returned Signature Of SUXOS: [signature]

Item	Quantity	Lot Number	Checkers Initials
None	—	—	—

The signatures in each section of this document indicate that the items listed in that section were in fact issued, expended, or returned to storage and that the quantities listed were verified through a physical count.

DEMOLITION SHOT RECORD

Site Name/Location:		Date:
Area "A" Response Site Barry M. Goldwater AZ		18 Dec 19
Shot Location (Anomaly ID No./GPS Coord.)	Demolition Supervisor:	State License # (if applicable):
IR Flare, 50cal, 30cal	Robin Morgan	5-TX-453-20-2D 0299
Type of UXO/MEC Destroyed, Vented, or Burned:	Firing Method:	Time of Shot:
UTM 12S 3625490 / 0376120	Novel / Percussion	1035 / 1115
Direction and Distance to Nearest Building, Road, Utility Line, etc.: North, 5 miles to I8 Exit 140	Temp: 44 Wind Dir./Speed: 9 Ceiling: 5000 Clouds/Sun: Sunny	
Type and Amount of Tamping Used: Open Detonation	Mat or Other Protection Used (list):	
Seismographic/Sound Level Meter Used: Yes ☐ No ☒	Readings/Results:	

Demolition Materials Used

Description	Amount	Description	Amount
Perforator	—	Time Fuze	—
Det Cord	10 Ft	Squibs	—
Electric Detonator	—	Black/Smokeless Powder	—
Non-Electric Detonator	—	Two Component	—
Non-El Detonator	4 EA	Other (list) Spartan 450 Tungsten	2 lbs

Certification

I certify that the explosives listed were used for their intended purpose, and that the UXO/MEC listed were rendered inert/destroyed.

Signature of Demolition supervisor: [signature] Date: 18 Dec 19

DEMOLITION SHOT RECORD

Site Name/Location:		Date:
Shot Location (Anomaly ID No./GPS Coord.)	Demolition Supervisor:	State License # (if applicable):
Type of UXO/MEC Destroyed, Vented, or Burned:	Firing Method:	Time of Shot:
Direction and Distance to Nearest Building, Road, Utility Line, etc.:	Temp: _____ Wind Dir./Speed: _____ Ceiling: _____ Clouds/Sun: _____	
Type and Amount of Tamping Used:	Mat or Other Protection Used (list):	
Seismographic/Sound Level Meter Used: Yes ☐ No ☐	Readings/Results:	

Demolition Materials Used

Description	Amount	Description	Amount
Perforator		Time Fuze	
Det Cord		Squibs	
Electric Detonator		Black/Smokeless Powder	
Non-Electric Detonator		Two Component	
Non-El Detonator		Other (list)	

Certification

I certify that the explosives listed were used for their intended purpose, and that the UXO/MEC listed were rendered inert/destroyed.

Signature of Demolition supervisor: _____ Date: _____

PARSONS

☑ **MEC Disposal:**
Type and Quantity SEE Attached Sheet

☑ **Donor Explosives:**
Type, Placement and Quantity SEE Attached Sheet

☑ **Initiation Method:** ☒ NonEl (Shock Tube) ☐ Electric ☐ Non-Electric

☑ Explosives Transportation: ☒ Route Map SEE Attached Sheet

☑ Frag Data Sheet has been reviewed and attached SEE BEM Sheet

☑ The demo plan will contain the appropriate engineering controls OPEN DETONATION

- ☑ The number of required sandbags has been properly calculated based on the MEC to be destroyed
- ☑ The amount of material has been calculated using the Buried Explosives Module (BEM)
- ☐ The requirements for water barricades detailed in HNC-ED-CS-S-00-3 been followed

☐ Other considerations _____

☑ The following pubs are available on-site: 1) TP16, 2) HNC-ED-CS-S-00-3 Water Mitigation, 3) HNC-ED-CS-S-96-8 – Revision 1 Guide for Barricades, 4) HNC-ED-CS-S-98-7 Use of Sandbags for Mitigation, 5) Use of Sandbags Amend 1 – Double Sandbags, 6) Buried Explosion Module Current version)

Time of Operation 0900 - 1200

Team members assigned to demolition operations will follow the procedures found in the UFC-QAPP and Demo SOP. These documents will be available on-site during operations for review and clarification of issues or questions that may arise.

☑ **Demo Team Member Assignments:**

Site Preparation 2UXOS, UXOSO, UXCQC, UXODTL
Explosives Preparation UXODTL, UXOT2
Drivers 5UXOS, UXODTL
Firing Device Prep UXODTL, UXOT2
Other Task(s) _____

PARSONS

☑ **Demo TL has positive control of the firing device/key**

☑ **Safety Precautions**

MEC Precautions

Demolition Precautions

Area and Exclusion Zone (SEE Attached Sheet)

☑ **Misfire Procedures – See SOP MEC-01 for specific details**

○ **Electric**

60-minute wait after 2nd attempt and attempt with second firing device.

○ **Non-electric**

Safety Fuze time **PLUS** a 60-minute wait time

☑ **Shock Tube**

60-minute if shock tube has propagated. (See SOP MEC-01 Rev6)

60-minute wait time if **ANY** of the shock tube is known to fire (propagate). 60-minute wait time if unknown if shock tube has fired. If shock tube is **KNOWN** to not have fired, cut at least 6 inches from tube and attempt to re-fire (see SOP MEC-01 for details).

☑ **PPE Requirements**

☑ Modified Level D ○ Other: _____

☑ **Engineering Controls**

Purpose of Controls Ground Traffic & Aircraft Space

Type of Controls Physical, Visual & VOTAM

Required Material(s) for Controls Vehicles, Radios, Cell Phones

PARSONS

☑ **Notifications (Base security, Law Enforcement, Fire, EMS, FAA, other):**

#1	AIRSPACE (5 MINS)	JOHN PADILLA 623-856-5855	☑	0947 / 11:00 cleared
2	WEATHER STATION	623-856-5258	☑	0940
3	DAVID JOHNSON	402-290-5743	☑	0941 - ANSWERING M.
4	MARICOPA SHERIFF	602-876-1000	☑	0945
5	BLM (MARANO)	602-881-8664	☑	0950 - ANSWERING M.
6	WESCO		☐	
			☐	

Name	Signature
Benjamin Silvers	
Sean Collerd	
Richard Endress	Richard Endress
JAMES COON	
ERIC JOLLOTA	EJ
Iris Velez	
CHARLES M. WILRD	Charles M. Wild
SCOTT PIKELIS	
Matt BUSCH	
Sergio Moreno	

Demo Op
12 Mar 20

MEC Disposal

Quanty	Item	NEW	Total NEW
4	.50 cal	0.04	0.16
1	LUU2 Explosive Bolt	0.00038	0.00038
	Total NEW		0.16038

Donor Explosives

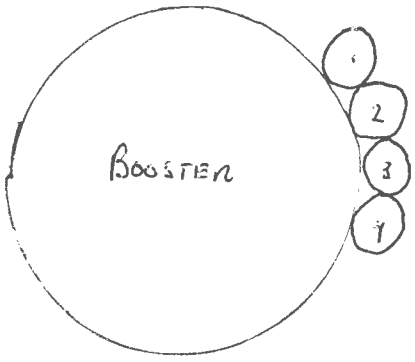
Quanty	Item	NEW	Total NEW
1	Trojan 450G	1	1
5	Pima Cord	0.007	0.035
	Total NEW		1.035
	Combineed NEW		1.19538

Primary Shot

MEC

1.) 4EA .50 cal

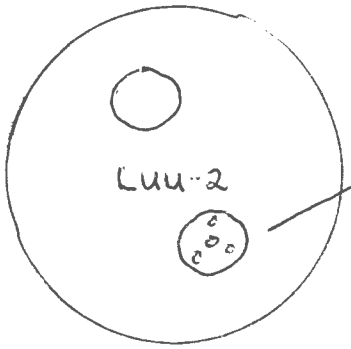
2.) 1EA LUU2 Explosive Bolt
DET MK59



.50 cal x4

Donor Charge

1.) 1EA Trojan Booster
2.) 2EA Nonel 40ft
3) 10ft Primaline (100 grain)
4.) 1200ft Nonel Leadline
5.) Connectors, Tape & Sandbags



Firing Device / Leadline x2 / MS 40ft Caps x2 / Detcord 5ft / Booster (See Above)

Detcord "ULI KNOT" → ON MK59 DET
5ft (See Above)

Back Up Shot

MEC

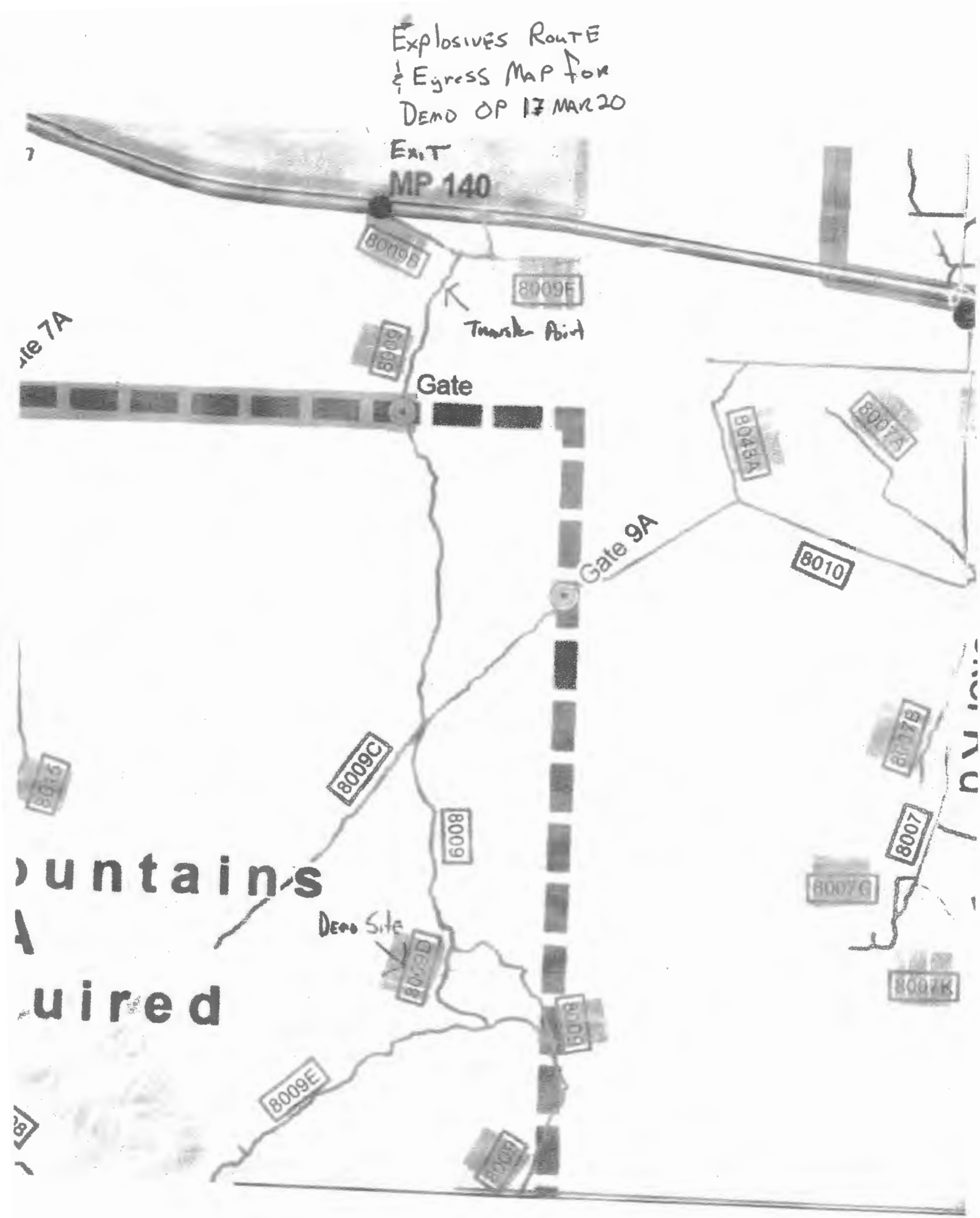
1.) TBD

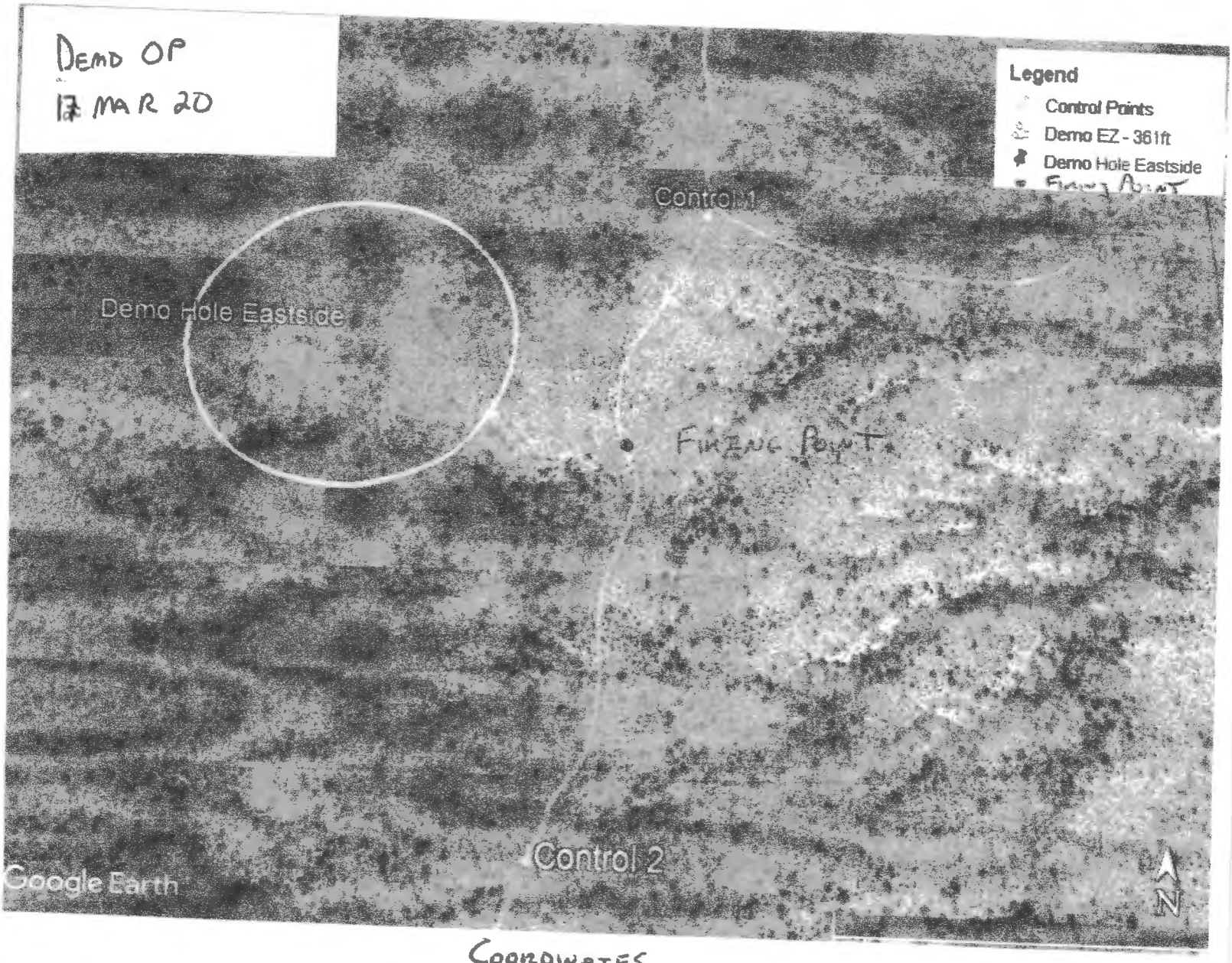
Donor Charges

1.) 1EA Trojan Booster
2.) 2EA Nonel 40ft.
3.) 10ft Primaline (100 grain)
4) 1300ft Nonel Leadline

DESIGN AS NEEDED

Explosives Route
& Egress Map for
Demo OP 17 MAR 20





COORDINATES

CONTROL POINT # 1	0376356 / 3625643
DEMO HOLE	0376120 / 3625990
FIRING POINT	0376307 / 3625910
CONTROL POINT # 2	0376255 / 3625643

MOTOR VEHICLE INSPECTION (TRANSPORTING HAZARDOUS MATERIALS)

(Read instructions before completing this form.)

This form applies to all vehicles which must be marked or placarded in accordance with Title 49 CFR.

1. BILL OF LADING/TRANSPORTATION CONTROL NUMBER: x 50596

SECTION I – DOCUMENTATION	ORIGIN a.	DESTINATION b.
2. CARRIER/GOVERNMENT ORGANIZATION	PARSONS	PARSONS
3. DATE/TIME OF INSPECTION	17 MAR 20	17 MAR 20
4. LOCATION OF INSPECTION	Ext. 140 / I8	UTM 12S 3625996/0376120
5. OPERATOR(S) NAME(S)	JAMES COON	SCOTT PHILLIPS
6. OPERATOR(S) LICENSE NUMBER(S)	TX 27126330	TX 42215715
7. MEDICAL EXAMINER'S CERTIFICATE*	N/A	N/A

8. (X if satisfactory at origin)

a. HAZMAT ENDORSEMENT		d. ERG OR EQUIVALENT COMMERCIAL:	YES	NO	
b. VALID LEASE*		e. DRIVER'S VEHICLE INSPECTION REPORT*			X
c. ROUTE PLAN	X	f. COPY OF 49 CFR PART 397			

9. CVSA DECAL DISPLAYED ON COMMERCIAL EQUIPMENT*

	YES	NO
a. TRUCK/TRACTOR		
b. TRAILER		

SECTION II – MECHANICAL INSPECTION

All items shall be checked on empty equipment prior to loading. Items with an asterisk shall be checked on all incoming loaded equipment.

10. TYPE OF VEHICLE(S): F250 4x4

11. VEHICLE NUMBER(S): 1FT7W2BT4EEB67987

12. PART INSPECTED (X as applicable)	ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT		ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT	COMMENTS (3)
a. SPARE ELECTRICAL FUSES	X				k. EXHAUST SYSTEM	X				
b. HORN OPERATIVE	X				l. BRAKE SYSTEM*	X				
c. STEERING SYSTEM	X				m. SUSPENSION	X				
d. WINDSHIELD WIPERS	X				n. COUPLING DEVICES	X				
e. MIRRORS	X				o. CARGO SPACE	X				
f. WARNING EQUIPMENT	X				p. LANDING GEAR*	–				
g. FIRE EXTINGUISHER*	X				q. TIRES, WHEELS, RIMS	X				
h. ELECTRICAL WIRING	X				r. TAILGATE/DOORS*	–				
i. LIGHTS AND REFLECTORS	X				s. TARPAULIN*	X				
j. FUEL SYSTEM*	X				t. OTHER (Specify)					

13. INSPECTION RESULTS (X one) ACCEPTED: X REJECTED:

(If rejected give reason under "Remarks". Equipment will be approved if deficiencies are corrected prior to loading.)

14. SATELLITE MOTOR SURVEILLANCE SYSTEM: (X one) ACCEPTED: REJECTED:

15. REMARKS

16. INSPECTOR SIGNATURE (Origin)

17. INSPECTOR SIGNATURE (Destination)

SECTION III – POST LOADING INSPECTION

This section applies to Commercial and Government/Military vehicles. All items will be checked prior to release of loaded equipment and shall be checked on all incoming loaded equipment.

	ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT	COMMENTS (3)
18. LOADED IAW APPLICABLE SEGREGATION/COMPATIBILITY TABLE OF 49 CFR	X				
19. LOAD PROPERLY SECURED TO PREVENT MOVEMENT	X				
20. SEALS APPLIED TO CLOSED VEHICLE; TARPAULIN APPLIED ON OPEN EQUIPMENT	X				
21. PROPER PLACARDS APPLIED	X				
22. SHIPPING PAPERS/DD FORM 2890 FOR GOVERNMENT VEHICLE SHIPMENTS	–				
23. COPY OF DD FORM 626 FOR DRIVER	X				
24. SHIPPED UNDER DOT SPECIAL PERMIT 868	–				

25. INSPECTOR SIGNATURE (Origin)

26. DRIVER(S) SIGNATURE (Origin)

27. INSPECTOR SIGNATURE (Destination)

28. DRIVER(S) SIGNATURE (Destination)

DEMOLITION SHOT RECORD

Site Name/Location: Barry Goldwater Area "A"			Date: 17 Mar 20
Shot Location (Anomaly ID No./GPS Coord.) UTM 12S 0376120 / 3625990	Demolition Supervisor: Ben Silvers	State License # (if applicable): 5-TX-755-20-D-0299	
Type of UXO/MEC Destroyed, Vented, or Burned: 50cal, LUU 2 Explosive Bell	Firing Method: Naval / Percussion	Time of Shot: 10,00 / 1050	
Direction and Distance to Nearest Building, Road, Utility Line, etc.: North, 5 miles to I8 Exit 140	Temp: 70 Wind Dir./Speed: 10 mph Ceiling: Clear Clouds/Sun: 80% sunny		
Type and Amount of Tamping Used: Open Detonation	Mat or Other Protection Used (list):		
Seismographic/Sound Level Meter Used: Yes ☐ No ☒	Readings/Results:		

Demolition Materials Used

Description	Amount	Description	Amount
Perforator	—	Time Fuze	—
Det Cord	20 ft	Squibs	—
Electric Detonator	—	Black/Smokeless Powder	—
Non-Electric Detonator	—	Two Component	—
Non-El Detonator	4 ea	Other (list) Trojan 450G	2 lbs

Certification

I certify that the explosives listed were used for their intended purpose, and that the UXO/MEC listed were rendered inert/destroyed.

Signature of Demolition supervisor: for [illegible] Date: 17 Mar 20

DEMOLITION SHOT RECORD

Site Name/Location:			Date:
Shot Location (Anomaly ID No./GPS Coord.)	Demolition Supervisor:	State License # (if applicable):	
Type of UXO/MEC Destroyed, Vented, or Burned:	Firing Method:	Time of Shot:	
Direction and Distance to Nearest Building, Road, Utility Line, etc.:	Temp: _____ Wind Dir./Speed: _____ Ceiling: _____ Clouds/Sun: _____		
Type and Amount of Tamping Used:	Mat or Other Protection Used (list):		
Seismographic/Sound Level Meter Used: Yes ☐ No ☐	Readings/Results:		

Demolition Materials Used

Description	Amount	Description	Amount
Perforator		Time Fuze	
Det Cord		Squibs	
Electric Detonator		Black/Smokeless Powder	
Non-Electric Detonator		Two Component	
Non-El Detonator		Other (list)	

Certification

I certify that the explosives listed were used for their intended purpose, and that the UXO/MEC listed were rendered inert/destroyed.

Signature of Demolition supervisor: _____ Date: _____

Explosives Usage Record

Contract Number: W912DY-16-D-0024

Team Number: 1 Date: 17 MAR 2020 Project Name: BARRY GOLDWATER A2, AREA A

Team Leader: BEN SILVERS Work Areas & Grid Numbers: UTM 12S 0376120 / 3625770

Explosives Issued Signature Of Team Leader: for

Item	Quantity	Lot Number	Checkers Initials
TROJAN TWINPLEX 450G	2 ea	06/449J2	SAP
NONEL MS0 40FT	4 ea	11FE19X1/23JY18X1	SAP
PRIMLINE 100 SHOCK	20 FT	10J41561	SAP
NONEL LEADLINE	2500 FT.	13JH20W1	SAP

Explosives Expended Signature Of Team Leader for

Item	Quantity	Lot Number	Checkers Initials
TROJAN TWINPLEX 450G	2 ea	06/449J2	SAP
NONEL MS0 40FT	4 ea	11FE19X1/23JY18X1	SAP
PRIMLINE 100 SHOCK	20 FT	10J41561	SAP
NONEL LEADLINE	2500 FT	13JH20W1	SAP

Explosives Returned Signature Of SUXOS:

Item	Quantity	Lot Number	Checkers Initials

The signatures in each section of this document indicate that the items listed in that section were in fact issued, expended, or returned to storage and that the quantities listed were verified through a physical count.

BURIED EXPLOSION MODULE

(Version 7.1)

Note: White cells require input. All other cells are calculated.

Based on DDESB Technical Paper 16, Revision 5

(ENGLISH UNITS)

BURIAL CHARACTERISTIC INPUTS

BURIAL MEDIUM	SOIL TYPE	DEPTH OF BURIAL (ft)
Soil	Dry Sand	0.00

(See TP 16, Revision 5 for soil details)

EXPLOSIVE CHARGE INPUTS

ITEM DESCRIPTION: Non-fragmenting (User Defined)

NUMBER OF ITEMS: 1

DESCRIPTION: .50 cal/LUU-2 explosive bolt

DONOR CHARGE EXPLOSIVE TYPE: TNT

TOTAL WEIGHT OF DONOR CHARGES (lbs): 1.00

HORIZONTAL DISTANCE (for pressure calcs):

ENTER NON-FRAGMENTING DETONATION PROPERTIES

EXPLOSIVE TYPE: TNT

SINGLE ITEM NET EXPLOSIVE WEIGHT (lbs): 0.26

VALUES USED IN BEM CALCULATIONS

SINGLE ITEM NEW (lbs)	0.26	TOTAL TNT WEIGHT USED (lbs)	1.26
ITEM DIAMETER (in)	0.100		
SINGLE ITEM MAXIMUM FRAG. WEIGHT (lbs)	0.0000	FRAGMENT WEIGHT USED IN CALCULATIONS (lbs)	0.0000
SINGLE ITEM MAXIMUM FRAG. VELOCITY (ft/s)	0	FRAGMENT VELOCITY USED IN CALCULATIONS (ft/s)	0

BURIED EXPLOSION MODULE OUTPUTS

CRATER OR CAMOUFLET?

CRATER

TRUE CRATER RADIUS (ft)	1	
MAX. SOIL EJECTA DISTANCE (ft)	91	See Note 7
MAX. FRAGMENT DISTANCE (ft)	0	

Surface K328 Distance (ft)	354.3	
Buried Equiv. K328 (0.066 psi)	354.3	ft
Buried Equiv. K24 (2.3 psi)	20.9	ft

NON-ESSENTIAL PERSONNEL DISTANCE (ft): 354

Pressure Values

Distance	(psi)	(dB)	
Greater of Soil Ejecta and Max. Frag. (91 ft)	0.4321	163.5	
User-Entered Horizontal Distance (ft)	-N/A-	-N/A-	See Note 4

Note: Provide essential personnel equivalent K24 overpressure distance and protection from all fragments.

WARNING MESSAGES

Note 4: User-Entered Distance Out of Limits -- Extrapolated - Ref. TP 16

Note 7: Fragmentation Distance is controlled by soil ejecta.

BURIED EXPLOSION MODULE

(Version 7.1)

Note: White cells require input. All other cells are calculated.

Based on DDESB Technical Paper 16, Revision 5
(ENGLISH UNITS)

BURIAL CHARACTERISTIC INPUTS

BURIAL MEDIUM	SOIL TYPE	DEPTH OF BURIAL (ft)
Soil	Dry Sand	0.00

(See TP 16, Revision 5 for soil details)

EXPLOSIVE CHARGE INPUTS

ITEM DESCRIPTION: Non-fragmenting (User Defined)

NUMBER OF ITEMS: 1

DESCRIPTION: .50 cal/LUU-2 explosive bolt

DONOR CHARGE EXPLOSIVE TYPE: TNT

TOTAL WEIGHT OF DONOR CHARGES (lbs): 1.00

HORIZONTAL DISTANCE (for pressure calcs):

ENTER NON-FRAGMENTING DETONATION PROPERTIES

EXPLOSIVE TYPE: TNT

SINGLE ITEM NET EXPLOSIVE WEIGHT (lbs): 0.26

VALUES USED IN BEM CALCULATIONS

SINGLE ITEM NEW (lbs)	0.26	TOTAL TNT WEIGHT USED (lbs)	1.26
ITEM DIAMETER (in)	0.100		
SINGLE ITEM MAXIMUM FRAG. WEIGHT (lbs)	0.0000	FRAGMENT WEIGHT USED IN CALCULATIONS (lbs)	0.0000
SINGLE ITEM MAXIMUM FRAG. VELOCITY (ft/s)	0	FRAGMENT VELOCITY USED IN CALCULATIONS (ft/s)	0

BURIED EXPLOSION MODULE OUTPUTS

CRATER OR CAMOUFLET?

CRATER

TRUE CRATER RADIUS (ft)	1	
MAX. SOIL EJECTA DISTANCE (ft)	91	See Note 7
MAX. FRAGMENT DISTANCE (ft)	0	

Surface K328 Distance (ft)	354.3	
Buried Equiv. K328 (0.066 psi)	354.3	ft
Buried Equiv. K24 (2.3 psi)	20.9	ft

NON-ESSENTIAL PERSONNEL DISTANCE (ft): 354

Note: Provide essential personnel equivalent K24 overpressure distance and protection from all fragments.

Pressure Values

Distance	(psi)	(dB)	
Greater of Soil Ejecta and Max. Frag. (91 ft)	0.4321	163.5	
User-Entered Horizontal Distance (ft)	-N/A-	-N/A-	See Note 4

WARNING MESSAGES

Note 4: User-Entered Distance Out of Limits -- Extrapolated - Ref. TP 16

Note 7: Fragmentation Distance is controlled by soil ejecta.

Explosives Delivery ...
↳ Location

Location of Shot – In place
– Range.
– Other in MSR

Consolidate other items.

Sizemore AOC'd Barry Goldwater (ISR)

timothy.berry@.3 2os.af.mil

Explosive List
→ Boosters
Perfs

22 MAR
09:00 – 16:00

2K
Grid/Location "UTM"

RMO: 623, 856, 8813 Tim Barry
(Mission Support Ops)

→ NonEl Firing Device w/ T connectors
→ Cutters / NonEl splice/Bench block

Soil Sampling

Tom Tedsco

Mr. Wieland

Contact List for Demo Developed with → Snake Eye: 623-856-8818 ("Rich" mission phone)
(Possible AOC Kevin [redacted] 623-856-3976)

→ Snake Eye (Airspace)
→ BLM
→ Maricopa Sheriff
- ECC
- Fire Department
- Weather

Air Field
623-856-5258
↳ 623-856-5289

ECC: 623-856-5241

Truck - Wade Lived
Windshield Glue

Call Snakeye 623-856-8818

↳ Recall Roster

↳ Timeline to schedule demo

↳ Grid Coordinates WP 275" 12S UTM 0358748 / 3626188
HE. 275" 12S UTM 0357432 / 3626001

KEN. BARNES @ WESCOEXPLOSIVES.COM
928-301-1158 m
~~WESCO~~ WESCO
Ken Barns

RFP Issued
Quote
Product Sheet
Shipment
Delivery

3 hrs - 2.95 ~~per~~ mile/placed mile

1/4 lb HE w/ 2.2 lbs WI

Grid
New
Exclusion Zones

BLM
Call Maricopa PD
623-856-8813
Tim Barry / Scott Hanson
Timothy.Barry.3@us.af.mil

ECC ~~5241~~ / 5200

BLM
ECC - Fire Chief Chris Hoseman 623-856-1734
- Rural Metro / Gila Bnd Rescue - 480-945-6311
~~5241~~

Dispatch P.D

PARSONS

Demolition Operation Safety and Operational Brief/Checklist

Project Name Barry Goldwater Project 2021 Date 2 April 2021

Demo Team Leader Adam Russac

SUXOS Dale G. Moon

UXOSO Spencer Smith

UXOQCS Rich Endress

- Care and handling of explosive materials
- Personal hygiene
- Two-man rule and approved exceptions
- Potential trip/fall hazards
- Horseplay on the range
- Stay alert for any explosive hazards
- Location of emergency shelter (if available)
- Vehicle parking (vehicles must be oriented out of the site for immediate departure, with keys in the ignition)
- Location of emergency vehicle (keep engine running)
- Wind direction (to assess potential toxic fumes)
- Location of first aid kit and fire extinguisher
- Route to nearest hospital or emergency aid station
- Type of communications in event of an emergency
- Storage location of demolition materials and MEC awaiting disposal.

Pre-Demo/Disposal Operational Briefing

SUXOS or UXOSO will designate other team/personnel locations during operations for safety observer or road guard functions.

UXOSO will maintain control of the site during demo operations. Ingress, egress, rally points, and safe locations will be designated prior to operations.

☑ The disposal site selected and reviewed by the management team

Northing 0364784 Easting 363454

☑ MSD has been established for the disposal operation based on:

○ Max Frag Distance 3461 Feet

○ Overpressure – K Value 328 2443 Feet

PARSONS

☑ **MEC Disposal:**
Type and Quantity M117 (750lb) Bomb

☐ **Donor Explosives:**
Type, Placement and Quantity N/A

☑ **Initiation Method:** ☒ NonEl (Shock Tube) ☐ Electric ☐ Non-Electric

☑ Explosives Transportation: ☐ Route Map

☑ Frag Data Sheet has been reviewed and attached

☐ The demo plan will contain the appropriate engineering controls

- ☐ The number of required sandbags has been properly calculated based on the MEC to be destroyed
- ☐ The amount of material has been calculated using the Buried Explosives Module (BEM)
- ☐ The requirements for water barricades detailed in HNC-ED-CS-S-00-3 been followed

☐ Other considerations

☑ The following pubs are available on-site: 1) TP16, 2) HNC-ED-CS-S-00-3 Water Mitigation, 3) HNC-ED-CS-S-96-8 – Revision 1 Guide for Barricades, 4) HNC-ED-CS-S-98-7 Use of Sandbags for Mitigation, 5) Use of Sandbags Amend 1 – Double Sandbags, 6) Buried Explosion Module Current version)

Time of Operation 0700 -

Team members assigned to demolition operations will follow the procedures found in the UFC-QAPP and Demo SOP. These documents will be available on-site during operations for review and clarification of issues or questions that may arise.

☑ **Demo Team Member Assignments:**
Site Preparation SUXOS, UXOS, UXOQC, UXODTL
Explosives Preparation UXODTL, UXOT2's
Drivers SUXOS, UXOQC
Firing Device Prep UXO DTL, UXOT2's
Other Task(s) Road Guard / Swippers 6 ea

PARSONS

☑ **Demo TL has positive control of the firing device/key**

☑ **Safety Precautions**

MEC Precautions

Demolition Precautions

Area and Exclusion Zone See MAP

☑ **Misfire Procedures – See SOP MEC-01 for specific details**

○ **Electric**

60-minute wait after 2nd attempt and attempt with second firing device.

○ **Non-electric**

Safety Fuze time **PLUS** a 60-minute wait time

● **Shock Tube**

60-minute if shock tube has propagated. (See SOP MEC-01 Rev6)

60-minute wait time if **ANY** of the shock tube is known to fire (propagate). 60-minute wait time if unknown if shock tube has fired. If shock tube is **KNOWN** to not have fired, cut at least 6 inches from tube and attempt to re-fire (see SOP MEC-01 for details).

☑ **PPE Requirements** Level D

☑ Modified Level D ○ Other: _____

☐ **Engineering Controls**

Purpose of Controls Ground Traffic / Aim Space

Type of Controls Physical, Visual

Required Material(s) for Controls Vehicel, Radios, Cell Phone

PARSONS

☐ **Notifications (Base security, Law Enforcement, Fire, EMS, FAA, other):**

Air Space	John Potelli 623-856-8813	☑	1124
Weather Station	623-856-5250	☑	1120
Mara ops Sheriff	602-876-~~1000~~ 1934	☐	1146
BLM (Mariano)	602-881-8664	☑	Onsite
~~J. Johansen BLM PM~~ Johansen	402-290-5743	☑	UN Lead
		☐	
		☐	

Name	Signature
Dale G. Moon	Dale G Moon
Matthew Lanter	Matt Lanter
Christian Linkous	
Nathaniel Lewis	
Sergio Moreno	
Adam Russac	
ERIC JOLLOTA	
Jade Klinger	Jade Klinger
Dylan Vazquez	Dylan Vazquez
Luis Vazquez	
Alicia Hughes	
Francisco Molina	
Brian Sibrian	Brian Sibrian
Richard Endres	PHILLIP A COUCH
Jacob Limpus	
Spencer Smith	
M. Lanka	
R. Fawcett - BLM LE	

MOTOR VEHICLE INSPECTION (TRANSPORTING HAZARDOUS MATERIALS)

(Read instructions before completing this form.)

This form applies to all vehicles which must be marked or placarded in accordance with Title 49 CFR.

1. BILL OF LADING/TRANSPORTATION CONTROL NUMBER

SECTION 1 - DOCUMENTATION	ORIGIN a.	DESTINATION b.
2. CARRIER/GOVERNMENT ORGANIZATION	Parson	0364784 - 3630454
3. DATE/TIME OF INSPECTION	4/2/21 7:50 A.M.	0840 AK
4. LOCATION OF INSPECTION	Goldwater exit 136.5	Firing Point
5. OPERATOR(S) NAME(S)	Dale Moon / Adam Russac	Dale G. Moon
6. OPERATOR(S) LICENSE NUMBER(S)	MOON~~EE~~ & 4980F	MOON~~EDG~~ 4980F
7. MEDICAL EXAMINER'S CERTIFICATE*	N/A	N/A

8. *(X if satisfactory at origin)*

a. HAZMAT ENDORSEMENT	X	d. ERG OR EQUIVALENT COMMERCIAL:	X	YES		NO	X
b. VALID LEASE*	X	e. DRIVER'S VEHICLE INSPECTION REPORT*					X
c. ROUTE PLAN	X	f. COPY OF 49 CFR PART 397					

9. CVSA DECAL DISPLAYED ON COMMERCIAL EQUIPMENT*

	YES	NO
a. TRUCK/TRACTOR		
b. TRAILER		

SECTION II - MECHANICAL INSPECTION

All items shall be checked on empty equipment prior to loading. Items with an asterisk shall be checked on all incoming loaded equipment.

10. TYPE OF VEHICLE(S): Chevrolet 2500 4x4

11. VEHICLE NUMBER(S): 2097395 (LO)

12. PART INSPECTED *(X as applicable)*	ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT		ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT	COMMENTS (3)
a. SPARE ELECTRICAL FUSES					k. EXHAUST SYSTEM	✓				
b. HORN OPERATIVE	✓				l. BRAKE SYSTEM*	✓				
c. STEERING SYSTEM	✓				m. SUSPENSION	✓				
d. WINDSHIELD/WIPERS	✓				n. COUPLING DEVICES	✓				
e. MIRRORS	✓				o. CARGO SPACE	✓				
f. WARNING EQUIPMENT					p. LANDING GEAR*					
g. FIRE EXTINGUISHER*	✓				q. TIRES, WHEELS, RIMS	✓				
h. ELECTRICAL WIRING	✓				r. TAILGATE/DOORS*	✓				
i. LIGHTS AND REFLECTORS	✓				s. TARPAULIN*					
j. FUEL SYSTEM*	✓				t. OTHER *(Specify)*					

13. INSPECTION RESULTS *(X one)* ACCEPTED [ ] REJECTED [ ]

(If rejected give reason under "Remarks". Equipment will be approved if deficiencies are corrected prior to loading.)

14. SATELLITE MOTOR SURVEILLANCE SYSTEM: *(X one)* ACCEPTED [ ] REJECTED [ ] N/A

15. REMARKS

16. INSPECTOR SIGNATURE *(Origin)*: Richard Endress

17. INSPECTOR SIGNATURE *(Destination)*:

SECTION III - POST LOADING INSPECTION

This section applies to Commercial and Government/Military vehicles. All items will be checked prior to release of loaded equipment and shall be checked on all incoming loaded equipment.

	ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT	COMMENTS (3)
18. LOADED IAW APPLICABLE SEGREGATION/COMPATIBILITY TABLE OF 49 CFR					
19. LOAD PROPERLY SECURED TO PREVENT MOVEMENT					
20. SEALS APPLIED TO CLOSED VEHICLE; TARPAULIN APPLIED ON OPEN EQUIPMENT					
21. PROPER PLACARDS APPLIED					
22. SHIPPING PAPERS/DD FORM 2890 FOR GOVERNMENT VEHICLE SHIPMENTS					
23. COPY OF DD FORM 626 FOR DRIVER					
24. SHIPPED UNDER DOT SPECIAL PERMIT 868					

25. INSPECTOR SIGNATURE *(Origin)*:

26. DRIVER(S) SIGNATURE *(Origin)*: Dale G Moon

27. INSPECTOR SIGNATURE *(Destination)*:

28. DRIVER(S) SIGNATURE *(Destination)*: Dale G Moon

Explosives Usage Record

Contract Number:

Team Number: 1 Date: 2 April 2021 Project Name: Barry Goldwater

Team Leader: Adam Russoc Work Areas & Grid Numbers: Area A
UTM 0364784 3630454

Explosives Issued 2 April 2021 Signature Of Team Leader: [signature]

Item	Quantity	Lot Number	Checkers Initials
19.5 ct RDX	8	18 Feb 2015	[initials]
Primer Line	70 Feet	30 AP 2061	[initials]
NONEL Lead Line	8,200	01FE 21W1	[initials]
NONEL Lead Line	5,000	15 FE 2401	[initials]
50 X OMS	6	30 MA 20X1	[initials]
20 X 9MS EZTL	4	06AY19X1	[initials]

Explosives Expended 2 April 2021 Signature Of Team Leader [signature]

Item	Quantity	Lot Number	Checkers Initials
19.5 ct RDX	8	18 Feb 2015	[initials]
Primer Line	70 Feet	30 Ap 2061	[initials]
NONEL Lead Line	8,200	01FE 21W1	[initials]
NONEL Lead Line	5,000	15 FE 2401	[initials]
50 X OMS	6	30 MA 20X1	[initials]
20 X 9 MS EZTL	4	06AY19X1	[initials]

Explosives Returned Signature Of SUXOS:

Item	Quantity	Lot Number	Checkers Initials

The signatures in each section of this document indicate that the items listed in that section were in fact issued, expended, or returned to storage and that the quantities listed were verified through a physical count.

For fragmenting munitions when public access is possible to the demolition range area. **$D = 634(AUW)^{1/5}$** *For fragmenting munitions when public access is denied to the demolition range area.* **$D = 444(AUW)^{1/5}$** *For bare exposed explosive only.* **$D = 130(AUW)^{1/3}$**	D = Distance (m) AUW = All Up Weight of Ammunition or Bare Explosives (kg)

Table 24: Simple Range Safety Distances

9.2 Basic equations (alternative)

The Australian Defence Science and Technology Organisation (DSTO) conducted research in March 1997 into multi-item demolition of ammunition and explosives. They concluded that fragmentation explosion danger areas for multi-item demolitions can be reduced to that of the largest Net Explosive Quantity single munition in the demolition provided. Results from the equation in Table 25 compare favourably with those for the *public access denied* equation in Table 24:

a) the ordnance is arranged in a linear array and NOT a stack;

b) the ordnance is detonated simultaneously; and

c) the items are GREATER than one charge diameter apart.

$D = 370(AUW)^{1/5}$	losives

Table 25: Simple Rang

$D = 130(13.7)^{1/3}$

$D = 130(13.7)^{(1/3)}$

$311\ m$

$311\ m = 1010\ feet$

$\approx 0.2\ miles$

9.3 Vertical danger areas

The equations to estimate the vertical dang tions taking place on the ground differ slightly from ds to be taken into account.

For single ammunition item only. **$D = 314(AUW)^{1/3}$** *For multi-item fragmenting munitions.* **$D = 470(AUW)^{1/5}$**	sives

Table 26: Vertical danger Areas

9.4 Simple noise prediction

The following equation[26] can be used to predict the distance at which 140dB[27] of sound could be expected to be achieved:

---

[26] Source: OinetiQ Shoeburyness, UK, 1999

DEMOLITION SHOT RECORD

Site Name/Location: Barry M Goldwater Range Area A		Date: 2 April 2021
Shot Location (Anomaly ID No./GPS Coord.) utm 0364794 3636454	Demolition Supervisor: Adam Russow	State License # (if applicable): S-TX-453-20-20-0299
Type of UXO/MEC Destroyed, Vented, or Burned: Penetrator	Firing Method: Navel	Time of Shot: 1340
Direction and Distance to Nearest Building, Road, Utility Line, etc.: 4 Mile North	Temp: 74 Wind Dir./Speed: 3 Ceiling: Unl Clouds/Sun: Sun	
Type and Amount of Tamping Used: N/A	Mat or Other Protection Used (list): N/A	
Seismographic/Sound Level Meter Used: Yes ☐ No ☑	Readings/Results:	

Demolition Materials Used

Description	Amount	Description	Amount
Perforator	2	~~Time Fuze~~ Navel Line	1320c
Det Cord	70 ft	Squibs	
Electric Detonator		Black/Smokeless Powder	
Non-Electric Detonator	~~16~~	Two Component	
Non-El Detonator	10	Other (list)	

Certification

I certify that the explosives listed were used for their intended purpose, and that the UXO/MEC listed were rendered inert/destroyed.

Signature of Demolition supervisor: _____ Date: 2 April 2021

DEMOLITION SHOT RECORD

Site Name/Location:		Date:
Shot Location (Anomaly ID No./GPS Coord.)	Demolition Supervisor:	State License # (if applicable):
Type of UXO/MEC Destroyed, Vented, or Burned:	Firing Method:	Time of Shot:
Direction and Distance to Nearest Building, Road, Utility Line, etc.:	Temp: _____ Wind Dir./Speed: _____ Ceiling: _____ Clouds/Sun: _____	
Type and Amount of Tamping Used:	Mat or Other Protection Used (list):	
Seismographic/Sound Level Meter Used: Yes ☐ No ☐	Readings/Results:	

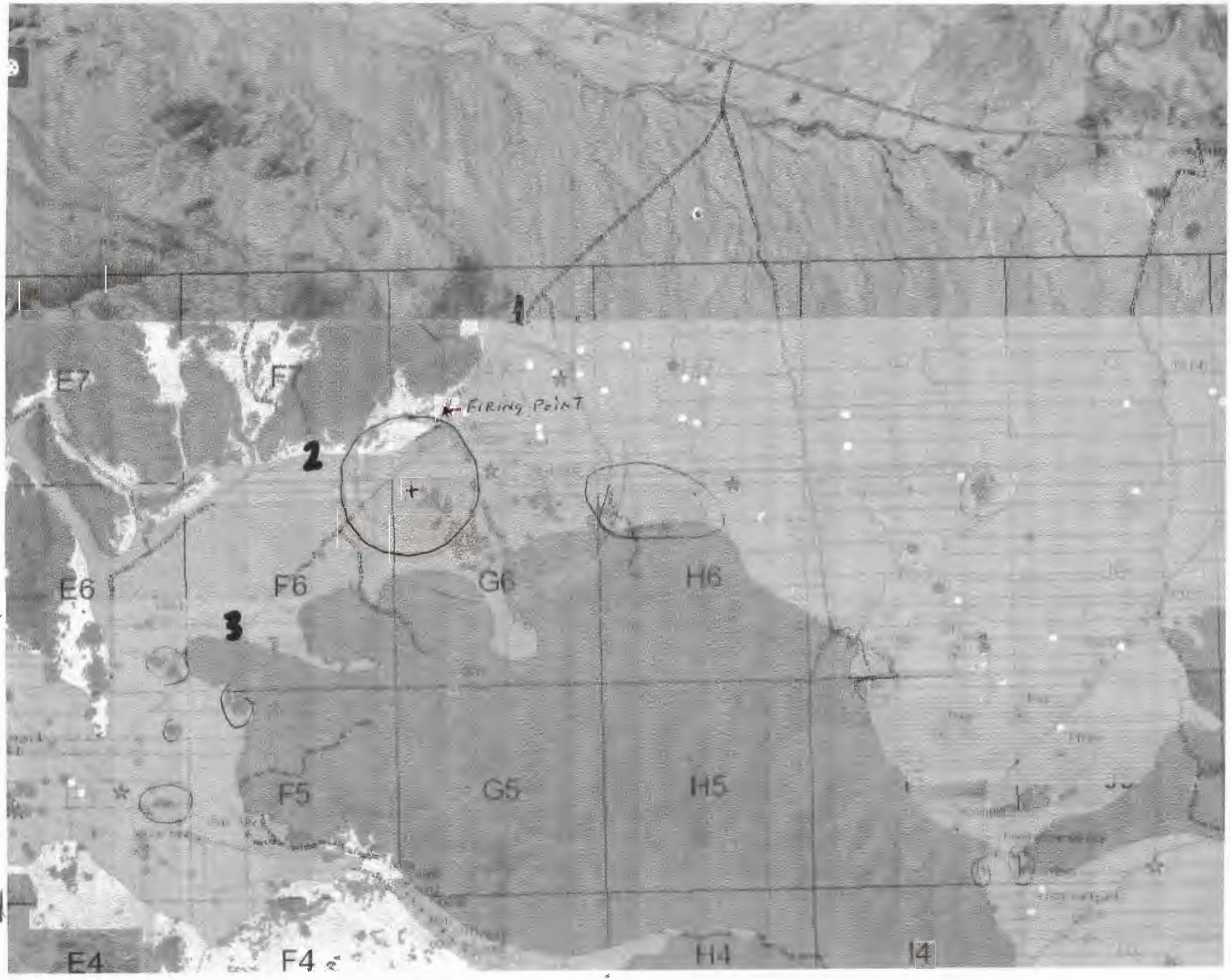
Demolition Materials Used

Description	Amount	Description	Amount
Perforator		Time Fuze	
Det Cord		Squibs	
Electric Detonator		Black/Smokeless Powder	
Non-Electric Detonator		Two Component	
Non-El Detonator		Other (list)	

Certification

I certify that the explosives listed were used for their intended purpose, and that the UXO/MEC listed were rendered inert/destroyed.

Signature of Demolition supervisor: _____ Date: _____


E7
F7
FIRING POINT
2
E6
F6
G6
H6
3
F5
G5
H5
E4
F4
H4
4

M117 750 lb- Bomb

Loc'n. 0363585 N 32° 48 13.45
3629010 W 112 24 39.24

Fragmentation Data Review Form

Database Revision Date 6/5/2020

Category:	Air-Launched HE Rounds
Munition:	750 lb M117
Case Material:	Steel, Mild
Fragmentation Method:	Naturally Fragmenting
Secondary Database Category:	Bomb
Munition Case Classification:	Robust

DODIC:	F114
Date Record Created:	7/18/2012
Record Created By:	SDH
Last Date Record Updated:	
Individual Last Updated Record:	
Date Record Retired:	

Munition Information and Fragmentation Characteristics

Explosive Type:	Tritonal
Explosive Weight (lb):	386
Diameter (in):	16.1250
Cylindrical Case Weight (lb):	260.96652
Maximum Fragment Weight (Intentional) (lb):	0.9978
Design Fragment Weight (95%) (Unintentional) (lb):	0.1491
Critical Fragment Velocity (fps):	7797

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse):	0.96
TNT Equivalent Weight - Impulse (lbs):	370.560
Kinetic Energy 10^6 (lb-ft²/s²):	25.3208

Single Sandbag Mitigation

Required Wall & Roof Thickness (in)	Not Permitted
Expected Max. Throw Distance (ft):	Not Permitted
Minimum Separation Distance (ft):	Not Permitted

Double Sandbag Mitigation

Required Wall & Roof Thickness (in)	Not Permitted
Expected Max. Throw Distance (ft):	Not Permitted
Minimum Separation Distance (ft):	Not Permitted

Water Mitigation

Minimum Separation Distance (ft):	Not Permitted
Water Containment System:	Not Permitted

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft):	709
MFD-H [Maximum Fragment Distance, Horizontal] (ft):	3401
MFD-V [Maximum Fragment Distance, Vertical] (ft):	2686

Overpressure Distances

TNT Equivalent (Pressure):	1.07
TNT Equivalent Weight - Pressure (lbs):	413.020
3.5 psi, K18 Distance (ft):	134
2.3 psi; K24 Distance (ft):	179
1.2 psi, K40 Distance (ft):	298
0.0655 psi, K328 Distance (ft):	2443

"NOTE: Values shown within this section only address overpressure hazards and do not account for applicable distance values for fragments and debris as required per DoD 6055.09-M."

Minimum Thickness to Prevent Perforation (in)

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	37.06	14.53
Mild Steel:	5.87	2.43
Hard Steel:	4.82	1.99
Aluminum:	11.23	4.90
LEXAN:	16.03	9.31
Plexi-glass:	16.09	7.82
Bullet Resist Glass:	15.18	6.81

Item Notes

Distribution Statement D. Distribution authorized to the Department of Defense and U.S. DoD contractors only for Administrative-Operational Use (7 January 2020). Other requests shall be referred to the Department of Defense Explosives Safety Board, 4800 Mark Center Drive, Suite 16E12, Alexandria, VA 22350.

For fragmenting munitions when public access is possible to the demolition range area. **$D = 634(AUW)^{1/6}$** *For fragmenting munitions when public access is denied to the demolition range area.* **$D = 444(AUW)^{1/6}$** *For bare exposed explosive only.* **$D = 130(AUW)^{1/3}$**	D = Distance (m) AUW = All Up Weight of Ammunition or Bare Explosives (kg)

Table 24: Simple Range Safety Distances

9.2 Basic equations (alternative)

The Australian Defence Science and Technology Organisation (DSTO) conducted research in March 1997 into multi-item demolition of ammunition and explosives. They concluded that fragmentation explosion danger areas for multi-item demolitions can be reduced to that of the largest Net Explosive Quantity single munition in the demolition provided. Results from the equation in Table 25 compare favourably with those for the *public access denied* equation in Table 24:

a) the ordnance is arranged in a linear array and NOT a stack;

b) the ordnance is detonated simultaneously; and

c) the items are GREATER than one charge diameter apart.

$D = 370(AUW)^{1/5}$	D = Distance (m) AUW = All Up Weight of Ammunition or Bare Explosives (kg)

Table 25: Simple Range Safety Distances (Alternative)

9.3 Vertical danger areas

The equations to estimate the vertical danger areas necessary to warn air traffic of demolitions taking place on the ground differ slightly from Clauses 9.1 and 9.2 as no ballistic parabola needs to be taken into account.

For single ammunition item only. **$D = 314(AUW)^{1/3}$** *For multi-item fragmenting munitions.* **$D = 470(AUW)^{1/5}$**	D = Distance (m) AUW = All Up Weight of Ammunition or Bare Explosives (kg)

Table 26: Vertical danger Areas

9.4 Simple noise prediction

The following equation[26] can be used to predict the distance at which 140dB[27] of sound could be expected to be achieved:

[26] Source: QinetiQ Shoeburyness, UK, 1999

Explosive [20]	Density (kg/m^3)	Detonation Velocity [21] (m/s)	Gurney Constant $\sqrt{2E}$ (m/s)
Octol 75/25	1.81	8,640	2,896
PETN	1.78	8,260	2,926
RDX	1.81	8,700	2,926
RDX / TNT 60/40 (Cyclotol)	1.68	7,800	2,402
Tetryl	1.71	7,570	2,499
TNT	1.61	6,900	2,438
Tritonal	1.70	5,480	2,316

Table 22: Gurney Constants

8.2 Simple fragment range estimation[22]

A simple equation to predict the range of a fragment is at Table 23, but as it does not reflect any of the characteristics of the munition, nor account for drag, it should be used with great caution:

$R = (V_0/g) . \sin 2\theta$	R = Range (m) V_0 = Initial Fragment Velocity (m/s) g = Gravity (m/s^2) θ = Launch Angle (Radians)

Table 23: Simple Range Prediction

More accurate predictions rely on a range of complex ballistic equations[23] due to the large number of variables involved.[24] Therefore more detailed range analysis should only be used by qualified personnel and hence are not discussed further in this IATG.

9 Simple range safety distances[25]

9.1 Basic equations

The following simple safety distances can be used to estimate range danger areas when planning the destruction of ammunition by open detonation. They may be used for 'quick planning' on demolition ranges with existing danger areas. If used on demolition areas with no formal danger areas the user should remember that the distance produced by these equations is that distance outside which no more than one fragment would be expected to fly. They are NOT absolutely safe.

---

[22] See Technical Note for Mine Action (TNMA) 10.20/01 *Estimation of Explosion Danger Areas* (Version 2.0). Geneva. GICHD. Further details on their use are available there.

[23] Air Drag, Fragment Slow Down, Mott Fragmentation etc.

[24] For example: 1) fragment size; 2) fragment shape; 3) material density; 4) initial velocity; 5) drag coefficient; 6) effects of gravity; 7) ballistic flight stability; 8) target composition etc.

[25] These equations are based on work conducted by Mr Pilgrim, AWE Foulness, UK. QinetiQ uses derivatives of these

PARSONS

Demolition Operation Safety and Operational Brief/Checklist

Project Name Barry Goldwater Project 2021 Date 4 May 21

Demo Team Leader Adam Rassoc

SUXOS Dale G. Moon

UXOSO Spencer Smith

UXOQCS Rich Endres

- Care and handling of explosive materials
- Personal hygiene
- Two-man rule and approved exceptions
- Potential trip/fall hazards
- Horseplay on the range
- Stay alert for any explosive hazards
- Location of emergency shelter (if available)
- Vehicle parking (vehicles must be oriented out of the site for immediate departure, with keys in the ignition)
- Location of emergency vehicle (keep engine running)
- Wind direction (to assess potential toxic fumes)
- Location of first aid kit and fire extinguisher
- Route to nearest hospital or emergency aid station
- Type of communications in event of an emergency
- Storage location of demolition materials and MEC awaiting disposal.

Pre-Demo/Disposal Operational Briefing

SUXOS or UXOSO will designate other team/personnel locations during operations for safety observer or road guard functions.

UXOSO will maintain control of the site during demo operations. Ingress, egress, rally points, and safe locations will be designated prior to operations.

☑ The disposal site selected and reviewed by the management team

Northing 0370646 Easting 3630895

☑ MSD has been established for the disposal operation based on:

○ Max Frag Distance 1140 Feet

○ Overpressure – K Value 328 1146 Feet

PARSONS

☐ **MEC Disposal:**
Type and Quantity Lucu 19

☐ **Donor Explosives:**
Type, Placement and Quantity C-4 Mil Sheet

☐ **Initiation Method:** ☑ NonEI (Shock Tube) ☐ Electric ☐ Non-Electric

☐ Explosives Transportation: ☑ Route Map

☑ Frag Data Sheet has been reviewed and attached

☐ The demo plan will contain the appropriate engineering controls

- ☑ The number of required sandbags has been properly calculated based on the MEC to be destroyed
- ☑ The amount of material has been calculated using the Buried Explosives Module (BEM)
- ☑ The requirements for water barricades detailed in HNC-ED-CS-S-00-3 been followed

☑ Other considerations Trenching ops

☑ The following pubs are available on-site: 1) TP16, 2) HNC-ED-CS-S-00-3 Water Mitigation, 3) HNC-ED-CS-S-96-8 – Revision 1 Guide for Barricades, 4) HNC-ED-CS-S-98-7 Use of Sandbags for Mitigation, 5) Use of Sandbags Amend 1 – Double Sandbags, 6) Buried Explosion Module Current version)

Time of Operation 0700-

Team members assigned to demolition operations will follow the procedures found in the UFC-QAPP and Demo SOP. These documents will be available on-site during operations for review and clarification of issues or questions that may arise.

☐ **Demo Team Member Assignments:**
Site Preparation SUXOS UXOS UXOQC UXODTL
Explosives Preparation UXOTL+ UXO T2 (4)3
Drivers SUXOS UXOQC
Firing Device Prep Real Good

PARSONS

Other Task(s) _____

☑ **Demo TL has positive control of the firing device/key**

☑ **Safety Precautions**

MEC Precautions

Demolition Precautions

Area and Exclusion Zone See Map

☑ **Misfire Procedures – See SOP MEC-01 for specific details**

○ **Electric**

60-minute wait after 2nd attempt and attempt with second firing device.

○ **Non-electric**

Safety Fuze time **PLUS** a 60-minute wait time

◉ **Shock Tube**

60-minute if shock tube has propagated. (See SOP MEC-01 Rev6)

60-minute wait time if **ANY** of the shock tube is known to fire (propagate). 60-minute wait time if unknown if shock tube has fired. If shock tube is **KNOWN** to not have fired, cut at least 6 inches from tube and attempt to re-fire (see SOP MEC-01 for details).

☑ **PPE Requirements** Level D

◉ Modified Level D ○ Other: _____

☐ **Engineering Controls**

Purpose of Controls Ground Traffic / Limit Space

Type of Controls Physical / Caution

Required Material(s) for Controls Vehicles, Radios, Phone

PARSONS

☐ **Notifications (Base security, Law Enforcement, Fire, EMS, FAA, other):**

Chris PM	303-653-7428	☑	0830 0944
BLM (Monitoring)	602 987-9664	☑	0943 0929 0945
Air Operations	623 950-9913	☑	0935 0942 0946
Johnson USACE PM	402-240-5743	☑	0950 925
Maricopa Sheriff	602-876-1854	☐	0930 0950
		☐	
		☐	

Name	Signature

DEMOLITION SHOT RECORD

Site Name/Location: Barry M. Goldwater Range Cell A		Date: 4 MAY 2021
Shot Location (Anomaly ID No./GPS Coord.) 0370646 3630885	Demolition Supervisor: Adam Russoc	State License # (if applicable): 5-TX-452-20-2D-0299
Type of UXO/MEC Destroyed, Vented, or Burned: ~~C-4 Shoot~~ Live 19	Firing Method: Nonel	Time of Shot:
Direction and Distance to Nearest Building, Road, Utility Line, etc.: 5 Miles North	Temp: 79 Wind Dir./Speed: 3 Ceiling: UN Clouds/Sun: Sun	
Type and Amount of Tamping Used: Dirt. 90 bags	Mat or Other Protection Used (list): N/A	
Seismographic/Sound Level Meter Used: Yes ☐ No ☐	Readings/Results:	

Demolition Materials Used

Description	Amount	Description	Amount
Perforator		Time Fuze	
Det Cord	50 ft	~~Squibs~~	
~~Electric Detona~~tor		~~Black/Smokeless Powder~~	
Non-Electric Detonator	4	~~Two Compon~~ent	
Non-El Detonator	5,000 feet	Other (list) C-4 Mini Shoot	20 lbs

Certification

I certify that the explosives listed were used for their intended purpose, and that the UXO/MEC listed were rendered inert/destroyed.

Signature of Demolition supervisor: _____ Date: 4 May 2021

DEMOLITION SHOT RECORD

Site Name/Location:		Date:
Shot Location (Anomaly ID No./GPS Coord.)	Demolition Supervisor:	State License # (if applicable):
Type of UXO/MEC Destroyed, Vented, or Burned:	Firing Method:	Time of Shot:
Direction and Distance to Nearest Building, Road, Utility Line, etc.:	Temp: _____ Wind Dir./Speed: _____ Ceiling: _____ Clouds/Sun: _____	
Type and Amount of Tamping Used:	Mat or Other Protection Used (list):	
Seismographic/Sound Level Meter Used: Yes ☐ No ☐	Readings/Results:	

Demolition Materials Used

Description	Amount	Description	Amount
Perforator		Time Fuze	
Det Cord		Squibs	
Electric Detonator		Black/Smokeless Powder	
Non-Electric Detonator		Two Component	
Non-El Detonator		Other (list)	

Certification

I certify that the explosives listed were used for their intended purpose, and that the UXO/MEC listed were rendered inert/destroyed.

Signature of Demolition supervisor: _____ Date: _____

Explosives Usage Record

Contract Number:

Team Number: 1 Date: 4 MAY 2024 Project Name: Barry Goldwater Area A

Team Leader: Adam Russo Work Areas & Grid Numbers:

Explosives Issued Signature Of Team Leader:

Item	Quantity	Lot Number	Checkers Initials
Cord Det	50 feet	30AP2061	DM
Detonator Non el	4	30MA20X1	DM
C-4 Millsheet	20 lbs	7-14-2016	DM
Non el Leadline	5000	15MA21WL	DM

Explosives Expended Signature Of Team Leader

Item	Quantity	Lot Number	Checkers Initials
Cord Det	50 ft	30AP2061	DM
Detonator Non el	4	30MA-20X1	DM
C-4 Millsheet	20 lbs	7-14-2016	DM
Non el Leadline	5,000	15MA21-WL	DM

Explosives Returned Signature Of SUXOS:

Item	Quantity	Lot Number	Checkers Initials

The signatures in each section of this document indicate that the items listed in that section were in fact issued, expended, or returned to storage and that the quantities listed were verified through a physical count.

MOTOR VEHICLE INSPECTION (TRANSPORTING HAZARDOUS MATERIALS)

(Read instructions before completing this form.)

This form applies to all vehicles which must be marked or placarded in accordance with Title 49 CFR.

1. BILL OF LADING/TRANSPORTATION CONTROL NUMBER

SECTION 1 - DOCUMENTATION	ORIGIN a.	DESTINATION b.
2. CARRIER/GOVERNMENT ORGANIZATION	Parsons	Parsons
3. DATE/TIME OF INSPECTION	0650 4 May 2021	0900 4 May 2021
4. LOCATION OF INSPECTION	Hwy 8 Mile Mkr 136	Hwy 8 Mile Mkr 136
5. OPERATOR(S) NAME(S)	Dale G. Moon	Richard Endres
6. OPERATOR(S) LICENSE NUMBER(S)	MOONDG 490QF	D10505619
7. MEDICAL EXAMINER'S CERTIFICATE*		

8. *(X if satisfactory at origin)*

a. HAZMAT ENDORSEMENT		d. ERG OR EQUIVALENT COMMERCIAL:		YES		NO	
b. VALID LEASE*		e. DRIVER'S VEHICLE INSPECTION REPORT*					
c. ROUTE PLAN		f. COPY OF 49 CFR PART 397					

9. CVSA DECAL DISPLAYED ON COMMERCIAL EQUIPMENT*

	YES	NO
a. TRUCK/TRACTOR		✓
b. TRAILER		N/A

SECTION II - MECHANICAL INSPECTION

All items shall be checked on empty equipment prior to loading. Items with an asterisk shall be checked on all incoming loaded equipment.

10. TYPE OF VEHICLE(S)

11. VEHICLE NUMBER(S)

12. PART INSPECTED *(X as applicable)*	ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT		ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT	COMMENTS (3)
a. SPARE ELECTRICAL FUSES	✓				k. EXHAUST SYSTEM	✓				
b. HORN OPERATIVE	✓				l. BRAKE SYSTEM*	✓				
c. STEERING SYSTEM	✓				m. SUSPENSION	✓				
d. WINDSHIELD/WIPERS	✓				n. COUPLING DEVICES	N/A				
e. MIRRORS	✓				o. CARGO SPACE	N/A				
f. WARNING EQUIPMENT	✓				p. LANDING GEAR*	N/A				
g. FIRE EXTINGUISHER*	✓				q. TIRES, WHEELS, RIMS	✓				
h. ELECTRICAL WIRING	✓				r. TAILGATE/DOORS*	✓				
i. LIGHTS AND REFLECTORS	✓				s. TARPAULIN*	✓				
j. FUEL SYSTEM*	✓				t. OTHER *(Specify)*					

13. INSPECTION RESULTS *(X one)* ACCEPTED [ ] REJECTED [ ]

(If rejected give reason under "Remarks". Equipment will be approved if deficiencies are corrected prior to loading.)

14. SATELLITE MOTOR SURVEILLANCE SYSTEM: *(X one)* ACCEPTED [ ] REJECTED [ ]

15. REMARKS

16. INSPECTOR SIGNATURE *(Origin)*

Dale G Moon

17. INSPECTOR SIGNATURE *(Destination)*

SECTION III - POST LOADING INSPECTION

This section applies to Commercial and Government/Military vehicles. All items will be checked prior to release of loaded equipment and shall be checked on all incoming loaded equipment.

	ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT	COMMENTS (3)
18. LOADED IAW APPLICABLE SEGREGATION/COMPATIBILITY TABLE OF 49 CFR					
19. LOAD PROPERLY SECURED TO PREVENT MOVEMENT					
20. SEALS APPLIED TO CLOSED VEHICLE; TARPAULIN APPLIED ON OPEN EQUIPMENT					
21. PROPER PLACARDS APPLIED					
22. SHIPPING PAPERS/DD FORM 2890 FOR GOVERNMENT VEHICLE SHIPMENTS					
23. COPY OF DD FORM 626 FOR DRIVER					
24. SHIPPED UNDER DOT SPECIAL PERMIT 868					

25. INSPECTOR SIGNATURE *(Origin)*

Dale G Moon

26. DRIVER(S) SIGNATURE *(Origin)*

27. INSPECTOR SIGNATURE *(Destination)*

28. DRIVER(S) SIGNATURE *(Destination)*

Dale G Moon

Appendix E – Project Photograph Log

AREA A MUNITIONS RESPONSE SITE

BARRY M. GOLDWATER RANGE/ LUKE AIR FORCE BASE, ARIZONA

Prepared for:

U.S. Air Force Civil Engineer Center
485 Quentin Roosevelt Rd.,
San Antonio, TX 78226

Luke Air Force Base
14185 Falcon St.,
Luke AFB, AZ 85309

Prepared by:

U.S. Army Corps of Engineers,
Omaha District
1616 Capitol Ave., Ste. 9000
Omaha, NE 68102

Parsons
1776 Lincoln St., Ste. 600
Denver, Colorado

Contract No. W912DY-16-D-0024
Task Order No. W9128F17F0255

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APPENDIX E: PROJECT PHOTOGRAPH LOGS

Some attachments will be provided separately in electronic format. The Project Photograph Log attachments are:

- Attachment 1: Photograph Log Representative of RI
- Attachment 2: Site Photographs (Separate Electronic Delivery Only)
- Attachment 3: Photos from 5/22/2019 Demolition Operations (Separate Electronic Delivery Only)



SUXOS and Tech IIs and IIIs preparing a demo shot.



Fully prepared demo shot.



Sorted MD after surface clearance in a Target Area.



MD found during a surface clearance of Target Area.



Team members traversing tough terrain in grid E6/F6.



Team Lead and QC checking GPS equipment.



Team sweeping a washout.



MEC item that was disposed of during 5/22/2019 demolition.



Team preparing to start surface inspection after safety meeting.



Sweeper maneuvering through foliage during surface inspection.



Navigating rough and rocky terrain.



Parking a UTV on the side of a BLM route.



Geophysicist running PDM8® through IVS.



Geophysicist getting ready for data collection.



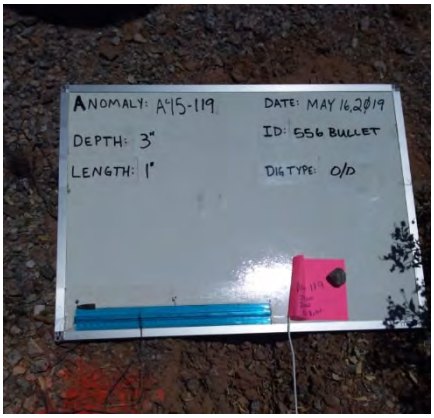
Measuring and placing an ISO in the IVS.



Geophysicist collecting data along a transect.



50 caliber bullet found during intrusive investigation.



556 bullet found at a depth of 3 inches during intrusive investigation.



Sweepers taking a quick break before starting a sweep transect pass.



Large impassable wall.



Evidence of trespassers in Area A.



UTV driving on a BLM path.



Soil samples being taken after a demolition operation.



UTV packed with equipment for field operations.

Appendix F – Field Documentation

AREA A MUNITIONS RESPONSE SITE

BARRY M. GOLDWATER RANGE/ LUKE AIR FORCE BASE, ARIZONA

Prepared for:

U.S. Air Force Civil Engineer Center
485 Quentin Roosevelt Rd.,
San Antonio, TX 78226

Luke Air Force Base
14185 Falcon St.,
Luke AFB, AZ 85309

Prepared by:

U.S. Army Corps of Engineers,
Omaha District
1616 Capitol Ave., Ste. 9000
Omaha, NE 68102

Parsons
1776 Lincoln St., Ste. 600
Denver, Colorado

Contract No. W912DY-16-D-0024
Task Order No. W9128F17F0255

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APPENDIX F: FIELD DOCUMENTATION

- These attachments will provided separately in electronic format. Field Documentation attachments are:

- Attachment 1: Results: Target Surface Removal, DGM-Dig, Visual Inspection (Separate Electronic Delivery Only)
- Attachment 2: Daily Reports (Separate Electronic Delivery Only)
- Attachment 3: Daily QC Inspection Forms (Separate Electronic Delivery Only)
- Attachment 4: Field Logbooks (Separate Electronic Delivery Only)
- Attachment 5: Waypoint QC Checks (Separate Electronic Delivery Only)

Appendix G – MEC Hazard Assessment Tool

AREA A MUNITIONS RESPONSE SITE

BARRY M. GOLDWATER RANGE/ LUKE AIR FORCE BASE, ARIZONA

Prepared for:

U.S. Air Force Civil Engineer Center
485 Quentin Roosevelt Rd.,
San Antonio, TX 78226

Luke Air Force Base
14185 Falcon St.,
Luke AFB, AZ 85309

Prepared by:

U.S. Army Corps of Engineers,
Omaha District
1616 Capitol Ave., Ste. 9000
Omaha, NE 68102

Parsons
1776 Lincoln St., Ste. 600
Denver, Colorado

Contract No. W912DY-16-D-0024
Task Order No. W9128F17F0255

USAF MHAT Summary Information

		Comments
MRS ID:	Area A MRS Accessible Area	
Date:	8/24/2022	

Please identify the MRS to be assessed in this USAF MHAT.

A. Enter the MRS name:

Area A - MRS	Parsons (2021)

Provide a list of information sources used for this USAF MHAT. As you are completing the worksheets, use the "Select Ref(s)" buttons at the ends of each subsection to select the applicable information sources from the list below.

Ref. No.	Title (include version, publication date)	
1	Remedial Investigation of Area A Munitions Response Site, Barry M. Goldwater Range / Luke Air Force Base, Arizona (2021)	
2	Munitions and Explosives of Concern Pilot Study Report, Former Area A, Barry M. Goldwater Range, Luke Air Force Base, Arizona. (Weston, 2005a)	
3	Site Inspection Report, Former Area A, Barry M. Goldwater Range, Luke Air Force Base, Arizona. (Weston, 2005b)	
4	Investigation of Area A Roads – Phase II, Former Area A, Barry M. Goldwater Range, Luke Air Force Base, Arizona. (Weston, 2008a)	
5	Area A Targets Investigation, Former Area A, Barry M. Goldwater Range, Luke Air Force Base, Arizona. (Weston, 2008b)	
6	URS, 2002. Phase 1 Environmental Baseline Survey of Lands Identified as Unnecessary for Military Purposes At Barry M. Goldwater Range for Luke Air Force Base, 56th Range Management Office, March	
7		
8		
9		
10		
11		
12		

B. Briefly describe the MRS:

1. Area (include units):	77,703 acres		Parsons (2021)
2. Past munitions-related use:			
Safety Buffer Areas			Parsons (2021)
3. Current land/water use activities (list all that occur):			
Is there a known activity?	Yes		Parsons (2021)
Agricultural	No		Parsons (2021)
Commercial	No		Parsons (2021)
Educational	No		Parsons (2021)
Industrial	No		Parsons (2021)
Recreational	Yes		Parsons (2021)
Residential	No		Parsons (2021)
Other (Describe)	Site accessible by permit only. Activities include site workers (BLM employees), trespassing, hunting, and visitors.		Parsons (2021)
4. Has MEC been identified during previous investigations?		Yes	Parsons (2021)
5. Has Munitions Debris (MD) been identified during previous investigations?			
6. If only MD was found, please describe the MD.			

If MEC has been identified at the MRS, then complete the USAF MHAT.

7. Are changes to the future land/water use planned?	No	Parsons (2021)

8. What is the basis for the MRS boundaries?	
Historical maps, aerial photographs, existing documentation, and field investigations completed as part of the USAF Remedial Investigation.	Parsons (2021)
Reference(s) for Part B: **Remedial Investigation of Area A Munitions Response Site, Barry M. Goldwater Range / Luke Air Force Base, Arizona (2021)** [redacted]	

C. Historical Clearances		
1. Have there been any historical clearances at the MRS?	Yes, subsurface clearance	Parsons (2021)
2. If a clearance occurred:		
a. What year was the clearance performed?	2001, 2005, 2019	Parsons (2021)
b. Provide a description of the clearance activity (e.g., extent, depth, amount of munitions-related items removed, types and sizes of removed items, and type of metal detectors used):	2002 Inspection to support Env. Baseline Study: removed the following munitions debris from Bridge and Convoy target areas: M117 750# bomb (practice), 2.25" SCAR (4), BDU-33 (1), M38 practice (1), M23 parts (1), 20MM TP (3), 2.75" Rocket warhead frag (5). 2005 MEC Pilot Study: Three UXO items (BDU 33 practice bomb with a live spotting charge, unexpended MK 13 distress signal flare, and 2.25-inch (in.) sub-caliber aerial rocket (SCAR) with blocked motor nozzle) were recovered and disposed of during the surface clearance. 2019: Visual inspection identified UXO/DMM on the surface. Each subsurface anomaly investigated with geophysics in the known target areas; therefore, no remaining subsurface UXO in those areas. Recovered materiel included .30 cal; .50 cal; counter measure flare; LUU2 illumination flare; White Phosphorous 2.75" warhead; M117,750lb, Practice, with spotting charge; 7.62 mm; 5.56mm; 20mm TP cartridge; 2.75" rocket (with propellant); AN-MK23 3-lb bomb. 2019 Remedial Investigation: .30 cal; 48 x .50 cal bullet as deep as 23 feet; counter measure flare; LUU2 illumination flare; White Phosphorous 2.75" warhead; M117,750lb, Practice, with spotting charge; 7.62 mm; 5.56mm; 20mm TP cartridge; 2.75" rocket (with propellant) on surface; AN-MK23 3-lb bomb.	Parsons (2021)
Reference(s) for Part C:		
Remedial Investigation of Area A Munitions Response Site, Barry M. Goldwater Range / Luke Air Force Base, Arizona (2021)	[redacted]	

D. Attach a map of the MRS.

See **Figure 1.2** in the Remedial Investigation Report (Parsons, 2021)

MRS ID: **Area A MRS Accessible Area**
Date: **8/24/2022**

Cased Munitions Information

Item No.	Munition Type	Munition Size	Munition Size Units	Mark/ Model	Energetic Material Type	Is Munition Fuzed?	Fuzing Type	Fuze Condition	Minimum Depth for Munition (ft)	Location of Munitions	Comments (include rationale for munitions that are "subsurface only")
1	Pyrotechnics: Flares, Signals, and Markers			Counter measure	Pyrotechnic				0		
2	Bombs	750	lb	M117	Spotting Charge	UNK			0		
3	Bombs	25	lb	BDU-33	Spotting Charge	UNK			0		
4	Rockets: Warheads and Motors	5	inches	Zuni	High Explosive	UNK			0		Conservatively assumed. Heavy-cased HE frag documented in EBS
5	Rockets: Warheads and Motors	2.25	inches	SCAR	Propellant	No			0		Conservatively assumed.
6	Artillery: Gun Fired Projectiles	20	mm	HE	High Explosive	No			0		
7	Rockets: Warheads and Motors			M257	White Phosphorus				0		
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

Reference(s) for table above:
Remedial Investigation of Area A Munitions Response Site, Barry M. Goldwater Range / Luke Air Force Base, Arizona (2021)

Bulk Explosive Information

Item No.	Explosive Type	Comments
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Reference(s) for table above:

MRS ID: **Area A MRS Accessible Area**
Date: **8/24/2022**

Activities Currently Occurring at the MRS

Activity No.	Activity	Number of human receptors per year who participate in the activity	Number of hours per year a single human receptor spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Site Workers (BLM Employees)	10	45	**450**	2	BLM workers doing scientific work and/or fence repairs (2' depth)
2	Visitors/Recreational (hiking, 4WD, hunting)	1,000	4	**4,000**	0	Surface use only
3	Visitors/Recreational (Campling)	10	40	**400**	1	Assumes 40 hrs per person per year. Camping may drive stakes or dig cat holes
4	Trespasser	100	10	**1,000**	0	Surface use only
5						
6						
7						
8						

Total Potential Contact Time (receptor hrs/yr): **5,850**
Maximum intrusive depth at MRS (ft): **2**

Reference(s) for table above:
Remedial Investigation of Area A Munitions Response Site, Barry M. Goldwater Range / Luke Air Force Base, Arizona (2021)

MRS ID: **Area A MRS Accessible Area**
Date: **8/24/2022**

Energetic Material Type Input Factor Categories

The following table is used to determine scores associated with the energetic materials. Materials are listed in order from most hazardous to least hazardous.

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
High Explosive and Low Explosive Filler in Fragmenting Rounds	100	100	100
White Phosphorus	70	70	70
Pyrotechnic	60	60	60
Propellant	50	50	50
Spotting Charge	40	40	40
Incendiary	30	30	30

The most hazardous type of energetic material listed in the 'Munitions, Bulk Explosive Info' Worksheet falls under the category 'High Explosive and Low Explosive Filler in Fragmenting Rounds'.

	Score
Baseline Conditions:	**100**
Surface Cleanup:	**100**
Subsurface Cleanup:	**100**

Location of Additional Human Receptors Input Factor Categories

1. What is the Explosive Safety Quantity Distance (ESQD) from the Explosive Siting Plan or the Explosive Safety Submission for the MRS?	298	feet
2. Are there currently any features or facilities where human receptors may congregate within the MRS, or within the ESQD arc?	No	
3. Please describe the facility or feature.		

MEC Item(s) used to calculate the ESQD for current use activities

Bomb, 750 lb Demolition, M117

The following table is used to determine scores associated with the location of additional human receptors (current use activities):

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Inside the MRS or inside the ESQD arc	30	30	30
Outside of the ESQD arc	0	0	0

4. Current use activities are 'Outside of the ESQD arc', based on Question 2.'

	Score
Baseline Conditions:	**0**
Surface Cleanup:	**0**
Subsurface Cleanup:	**0**

5a. Will current features or facilities within the MRS or within the ESQD arc be utilized by future human receptors?	
5b. Are there future plans to locate or construct features or facilities where human receptors may congregate within the MRS, or within the ESQD arc?	
5c. Please describe the facility or feature.	

The following table is used to determine scores associated with the location of additional human receptors (future use activities):

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Inside the MRS or inside the ESQD arc	30	30	30
Outside of the ESQD arc	0	0	0

6. Please answer Questions 5a and 5b above to determine the scores.

	Score
Baseline Conditions:	
Surface Cleanup:	
Subsurface Cleanup:	

Comments

Conservatively, assume 5" zuni HE or 20mm HE may be present

MRS ID: **Area A MRS Accessible Area**
Date: **8/24/2022**

MRS Accessibility Input Factor Categories

The following table is used to determine scores associated with MRS accessibility:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Full Accessibility	An MRS with no barriers to entry, including MRSs with signage but no fencing and MRSs with water depth less than 6 feet deep.	80	80	80
Moderate Accessibility	An MRS with some barriers to entry, such as barbed wire fencing, rough terrain, or water depth between 6 and 12 feet deep.	55	55	55
Limited Accessibility	An MRS with significant barriers to entry, such as unguarded chain-link fences, requirements for special transportation (e.g., boats or all-terrain vehicles) to reach the MRS, or water depth between 12 and 20 feet deep.	15	15	15
Very Limited Accessibility	An MRS with guarded chain-link fences, terrain that requires special skills and equipment (e.g., mountain climbing) to access, or water depth greater than 20 feet deep.	5	5	5

Current Use Activities ***Score***

Select the category that best describes the MRS accessibility under the current use scenario:

Limited Accessibility

Baseline Conditions: **15**
Surface Cleanup: **15**
Subsurface Cleanup: **15**

Future Use Activities

Select the category that best describes the MRS accessibility under the future use scenario:

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Reference(s) for above information:

Remedial Investigation of Area A Munitions Response Site, Barry M. Goldwater Range / Luke Air Force Base, Arizona (2021)

Munitions Response Alternative No. 1:

Please enter MRS accessibility information in the 'Munitions Response Alternatives' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 2:

Please enter MRS accessibility information in the 'Munitions Response Alternatives' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 3:

Please enter MRS accessibility information in the 'Munitions Response Alternatives' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 4:

Please enter MRS accessibility information in the 'Munitions Response Alternatives' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 5:

Please enter MRS accessibility information in the 'Munitions Response Alternatives' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 6:

Please enter MRS accessibility information in the 'Munitions Response Alternatives' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Comments

4-wheel drive access and BLM permit necessary. Rugged, undeveloped desert terrain

MRS ID: **Area A MRS Accessible Area**
Date: **8/24/2022**

Potential Contact Hours Input Factor Categories

The following table is used to determine scores associated with the total potential contact time:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Many Hours	≥1,000,000 receptor-hrs/yr	120	90	30
Some Hours	100,000 to 999,999 receptor hrs/yr	70	50	20
Few Hours	10,000 to 99,999 receptor-hrs/yr	40	20	10
Very Few Hours	1,000 to 9,999 receptor-hrs/yr	15	10	5
Minimal Hours	<1,000 receptor-hrs/yr	5	5	5

Current Use Activities :

Input factors are only determined for baseline conditions for current use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is: **5,850** hrs/yr
Based on the table above, this corresponds to a input factor score for baseline conditions of: **15** Score

Future Use Activities :

Input factors are only determined for baseline conditions for future use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is: hrs/yr
Based on the table above, this corresponds to a input factor score of: Score

Munitions Response Alternative No. 1:

Not enough information has been entered in the 'Munitions Response Alternatives' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: *Score*
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 2:

Not enough information has been entered in the 'Munitions Response Alternatives' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: *Score*
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 3:

Not enough information has been entered in the 'Munitions Response Alternatives' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: *Score*
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 4:

Not enough information has been entered in the 'Munitions Response Alternatives' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: *Score*
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 5:

Not enough information has been entered in the 'Munitions Response Alternatives' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: **Score**
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 6:

Not enough information has been entered in the 'Munitions Response Alternatives' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: **Score**
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Comments

MRS ID: **Area A MRS Accessible Area**
Date: **8/24/2022**

Amount of MEC Input Factor Categories

The following table is used to determine scores associated with the Amount of MEC:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Target Area	Areas at which munitions fire was directed	180	120	30
OB/OD Area	Sites where munitions were disposed of by open burn or open detonation methods. This category refers to the core activity area of an OB/OD area. See the "Safety Buffer Areas" category for safety fans and kick-outs.	180	110	30
Function Test Range	Areas where the serviceability of stored munitions or weapons systems are tested. Testing may include components, partial functioning or complete functioning of stockpile or developmental items.	165	90	25
Burial Pit	The location of a burial of large quantities of MEC items.	140	140	10
Maneuver Areas	Areas used for conducting military exercises in a simulated conflict area or war zone	115	15	5
Firing Points	The location from which a projectile, grenade, ground signal, rocket, guided missile, or other device is to be ignited, propelled, or released.	75	10	5
Safety Buffer Areas	Areas outside of target areas, test ranges, or OB/OD areas that were designed to act as a safety zone to contain munitions that do not hit targets or to contain kick-outs from OB/OD areas.	30	10	5
Storage	Any facility used for the storage of military munitions, such as earth-covered magazines, above-ground magazines, and open-air storage areas.	25	10	5
Explosive-Related Industrial Facility	Former munitions manufacturing or demilitarization sites and TNT production plants	20	10	5

Select the category that best describes the ***most hazardous*** amount of MEC: ***Score***

`Safety Buffer Areas`

Baseline Conditions: **30**
Surface Cleanup: **10**
Subsurface Cleanup: **5**

Minimum MEC Depth Relative to the Maximum Intrusive Depth Input Factor Categories

Current Use Activities

The shallowest minimum MEC depth, based on the 'Munitions, Bulk Explosives Info' Worksheet: **0** ft
The deepest intrusive depth: **2** ft

The table below is used to determine scores associated with the minimum MEC depth relative to the maximum intrusive depth:

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240	150	95
Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.	240	50	25
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.	150	N/A	95
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth does not overlap with minimum MEC depth.	50	N/A	25

Comments

MRS ID: **Area A MRS Accessible Area**
Date: **8/24/2022**

Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth will overlap after cleanup. MEC are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.' For 'Current Use Activities', only Baseline Conditions are considered.

240 *Score*

Future Use Activities
Deepest intrusive depth: **2** ft

Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth overlaps. MEC are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC. For 'Future Use Activities', only Baseline Conditions are considered.

240 *Score*

Munitions Response Alternative No. 1:
Expected minimum MEC depth (from the 'Munitions Response Alternatives' Worksheet): ft
Not enough information has been entered in the 'Munitions Response Alternatives' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 2:
Expected minimum MEC depth (from the 'Munitions Response Alternatives' Worksheet): ft
Not enough information has been entered in the 'Munitions Response Alternatives' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 3:
Expected minimum MEC depth (from the 'Munitions Response Alternatives' Worksheet): ft
Not enough information has been entered in the 'Munitions Response Alternatives' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 4:
Expected minimum MEC depth (from the 'Munitions Response Alternatives' Worksheet): ft
Not enough information has been entered in the 'Munitions Response Alternatives' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Comments

MRS ID: **Area A MRS Accessible Area**
Date: **8/24/2022**

Migration Potential Input Factor Categories

Is there any physical or historical evidence that indicates it is possible for natural physical forces in the area (e.g., frost heave, erosion, tidal action) to expose subsurface MEC items, or move surface or subsurface MEC items? **Yes**

If "yes", describe the nature of natural forces.

Area prone to extreme weather (e.g., monsoons and flooding) that may result in increased possibility of erosion or tree upheaval resulting in exposure of subsurface items.

The following table is used to determine scores associated with the migration potential:

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Possible	30	30	10
Unlikely	10	10	10

Based on the question above, migration potential is 'Possible.'

	Score
Baseline Conditions:	**30**
Surface Cleanup:	**30**
Subsurface Cleanup:	**10**

Reference(s) for above information:
Remedial Investigation of Area A Munitions Response Site, Barry M. Goldwater Range / Luke Air Force Base, Arizona (2021)

MEC Classification Input Factor Categories

Cased munitions information has been entered into the 'Munitions, Bulk Explosive Info' Worksheet; therefore, bulk explosives do not comprise all MEC for this MRS.

Is the Safety Buffer Area for an OB/OD area? **No**
Has a technical assessment shown that MEC in the OB/OD Area is DMM?
Are any of the munitions listed in the 'Munitions, Bulk Explosive Info' Worksheet: **Yes**

- Submunitions
- 40mm grenades
- Munitions with white phosphorus filler
- High explosive anti-tank (HEAT) rounds
- Hand grenades
- Fuzes
- Mortars

At least one item listed in the 'Munitions, Bulk Explosive Info' Worksheet was identified as 'fuzed'.

The following table is used to determine scores associated with MEC classification categories:

Sensitive UXO	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Sensitive UXO	180	180	180
UXO	110	110	110
Fuzed Sensitive DMM	105	105	105
Fuzed DMM	55	55	55
Unfuzed DMM	45	45	45
Bulk Explosives	45	45	45

Based on your answers above, the MEC classification is 'Sensitive UXO'.

	Score
Baseline Conditions:	**180**
Surface Cleanup:	**180**
Subsurface Cleanup:	**180**

MEC Size Input Factor Categories

The following table is used to determine scores associated with MEC Size:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Small	Any munitions (from the 'Munitions, Bulk Explosive Info' Worksheet) weigh less than 90 lbs; small enough for a receptor to be able to move and initiate a detonation	40	40	40
Large	All munitions weigh more than 90 lbs; too large to move without equipment	0	0	0

Based on the definitions above and the types of munitions at the MRS (see 'Munitions, Bulk Explosive Info' Worksheet), the MEC Size Input Factor is: **Small**

	Score
Baseline Conditions:	**40**
Surface Cleanup:	**40**
Subsurface Cleanup:	**40**

Comments

WP rocket warhead recovered during RI

Scoring Summary

MRS ID:	Area A MRS Accessible Area
Date:	8/24/2022

a. Scoring Summary for Current Use Activities

Munitions Response Alternative: No Response Action

Input Factor	Input Factor Category	Score
I. Energetic Material Type	High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors	Outside of the ESQD arc	0
III. MRS Accessibility	Limited Accessibility	15
IV. Potential Contact Hours	1,000 to 9,999 receptor-hrs/yr	15
V. Amount of MEC	Safety Buffer Areas	30
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		240
VII. Migration Potential		30
VIII. MEC Classification	Sensitive UXO	180
IX. MEC Size	Small	40
	Total Score	**650**
	Hazard Level Category	**3**

MRS ID:	Area A MRS Accessible Area
Date:	8/24/2022

b. Scoring Summary for Future Use Activities

Munitions Response Alternative: No Response Action

Input Factor	Input Factor Category	Score
I. Energetic Material Type	High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors	Outside of the ESQD arc	0
III. MRS Accessibility	Limited Accessibility	15
IV. Potential Contact Hours	1,000 to 9,999 receptor-hrs/yr	15
V. Amount of MEC	Safety Buffer Areas	30
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		240
VII. Migration Potential		30
VIII. MEC Classification	Sensitive UXO	180
IX. MEC Size	Small	40
	Total Score	**650**
	Hazard Level Category	**3**

USAF MHAT Hazard Level Determination		
MRS ID: Area A MRS Accessible Area **Date: 8/24/2022**	**Hazard Level Category**	**Score**
a. Current Use Activities	**3**	**650**
b. Future Use Activities	**3**	**650**
c. Munitions Response Alternative 1:	**--**	**--**
d. Munitions Response Alternative 2:	**--**	**--**
e. Munitions Response Alternative 3:	**--**	**--**
f. Munitions Response Alternative 4:	**--**	**--**
Alternate Hazard Rating		
Alternate Hazard Rating	**--**	
Characteristics of the MRS		
Is critical infrastructure located within the MRS or within the ESQD arc?	No	
Are cultural resources located within the MRS or within the ESQD arc?	Yes	
Are significant ecological resources located within the MRS or within the ESQD arc?	Yes	

USAF MHAT Summary Information

		Comments
MRS ID:	Area A MRS_Steep and Rugged Terrain	
Date:	1/10/2022	

Please identify the MRS to be assessed in this USAF MHAT.

A. Enter the MRS name:

Area A - MRS	Parsons (2021)

Provide a list of information sources used for this USAF MHAT. As you are completing the worksheets, use the "Select Ref(s)" buttons at the ends of each subsection to select the applicable information sources from the list below.

Ref. No.	Title (include version, publication date)	
1	Remedial Investigation of Area A Munitions Response Site, Barry M. Goldwater Range / Luke Air Force Base, Arizona (2021)	
2	Munitions and Explosives of Concern Pilot Study Report, Former Area A, Barry M. Goldwater Range, Luke Air Force Base, Arizona. (Weston, 2005a)	
3	Site Inspection Report, Former Area A, Barry M. Goldwater Range, Luke Air Force Base, Arizona. (Weston, 2005b)	
4	Investigation of Area A Roads – Phase II, Former Area A, Barry M. Goldwater Range, Luke Air Force Base, Arizona. (Weston, 2008a)	
5	Area A Targets Investigation, Former Area A, Barry M. Goldwater Range, Luke Air Force Base, Arizona. (Weston, 2008b)	
6	URS, 2002. Phase 1 Environmental Baseline Survey of Lands Identified as Unnecessary for Military Purposes At Barry M. Goldwater Range for Luke Air Force Base, 56th Range Management Office, March	
7		
8		
9		
10		
11		
12		

B. Briefly describe the MRS:

1. Area (include units):	77,703 acres		Parsons (2021)
2. Past munitions-related use:			
Safety Buffer Areas			Parsons (2021)
3. Current land/water use activities (list all that occur):			
Is there a known activity?	Yes		Parsons (2021)
Agricultural	No		Parsons (2021)
Commercial	No		Parsons (2021)
Educational	No		Parsons (2021)
Industrial	No		Parsons (2021)
Recreational	Yes		Parsons (2021)
Residential	No		Parsons (2021)
Other (Describe)	Site accessible by permit only. Activities include site workers (BLM employees), trespassing, hunting, and visitors.		Parsons (2021)
4. Has MEC been identified during previous investigations?		Yes	Parsons (2021)
5. Has Munitions Debris (MD) been identified during previous investigations?			
6. If only MD was found, please describe the MD.			

If MEC has been identified at the MRS, then complete the USAF MHAT.		
7. Are changes to the future land/water use planned?	No	Parsons (2021)
8. What is the basis for the MRS boundaries?		
Historical maps, aerial photographs, existing documentation, and field investigations completed as part of the USAF Remedial Investigation.		Parsons (2021)
Reference(s) for Part B: **Remedial Investigation of Area A Munitions Response Site, Barry M. Goldwater Range / Luke Air Force Base, Arizona (2021)**	[redacted]	

C. Historical Clearances		
1. Have there been any historical clearances at the MRS?	Yes, subsurface clearance	Parsons (2021)
2. If a clearance occurred:		
a. What year was the clearance performed?	2005 - 2019	Parsons (2021)
b. Provide a description of the clearance activity (e.g., extent, depth, amount of munitions-related items removed, types and sizes of removed items, and type of metal detectors used):	2001 Inspection to support Env. Baseline Study: removed the following munitions debris from Bridge and Convoy target areas: M117 750# bomb (practice), 2.25" SCAR (4), BDU-33 (1), M38 practice (1), M23 parts (1), 20MM TP (3), 2.75" Rocket warhead frag (5). 2005 MEC Pilot Study: Three UXO items (BDU 33 practice bomb with a live spotting charge, unexpended MK 13 distress signal flare, and 2.25-inch (in.) sub-caliber aerial rocket (SCAR) with blocked motor nozzle) were recovered and disposed of during the surface clearance. 2019: Visual inspection identified UXO/DMM on the surface. Each subsurface anomaly investigated with geophysics in the known target areas; therefore, no remaining subsurface UXO in those areas. Recovered materiel included .30 cal; .50 cal; counter measure flare; LUU2 illumination flare; White Phosphorous 2.75" warhead; M117,750lb, Practice, with spotting charge; 7.62 mm; 5.56mm; 20mm TP cartridge; 2.75" rocket (with propellant); AN-MK23 3-lb bomb. 2019 Remedial Investigation: .30 cal; 48 x .50 cal bullet as deep as 23 feet; counter measure flare; LUU2 illumination flare; White Phosphorous 2.75" warhead; M117,750lb, Practice, with spotting charge; 7.62 mm; 5.56mm; 20mm TP cartridge; 2.75" rocket (with propellant) on surface; AN-MK23 3-lb bomb.	Parsons (2021)
Reference(s) for Part C:		
Remedial Investigation of Area A Munitions Response Site, Barry M. Goldwater Range / Luke Air Force Base, Arizona (2021)	[redacted]	

D. Attach a map of the MRS.

See **Figure 1.2** in the Remedial Investigation Report (Parsons, 2021)

MRS ID: **Area A MRS_Steep and Rugged Terrain**
Date: **1/10/2022**

Cased Munitions Information

Item No.	Munition Type	Munition Size	Munition Size Units	Mark/ Model	Energetic Material Type	Is Munition Fuzed?	Fuzing Type	Fuze Condition	Minimum Depth for Munition (ft)	Location of Munitions	Comments (include rationale for munitions that are "subsurface only")
1	Pyrotechnics: Flares, Signals, and Markers			Counter measure					0		
2	Bombs	750	lb	M117	Spotting Charge	UNK			0		
3	Bombs	25	lb	BDU-33	Spotting Charge	UNK			0		
4	Rockets: Warheads and Motors	5	inches	Zuni	High Explosive	UNK			0		Conservatively assumed.
5	Rockets: Warheads and Motors	2.25	inches	SCAR	Propellant	No			0		Conservatively assumed.
6	Artillery: Gun Fired Projectiles	20	mm	HE	High Explosive	No			0		
7	Rockets: Warheads and Motors			M257	White Phosphorus				0		
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

Reference(s) for table above:
Remedial Investigation of Area A Munitions Response Site, Barry M. Goldwater Range / Luke Air Force Base, Arizona (2021)

[redacted]

Bulk Explosive Information

Item No.	Explosive Type	Comments
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Reference(s) for table above:

[redacted]

MRS ID: **Area A MRS_Steep and Rugged Terrain**
Date: **1/10/2022**

Activities Currently Occurring at the MRS

Activity No.	Activity	Number of human receptors per year who participate in the activity	Number of hours per year a single human receptor spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Site Workers (BLM Employees)	10	20	**200**	0	BLM workers doing limited scientific work in steep terrain
2	Trespassers	50	12	**600**	0	possible drug smugglers and illegal immigrants traversing the area
3						
4						
5						
6						
7						
8						

Total Potential Contact Time (receptor hrs/yr): **800**
Maximum intrusive depth at MRS (ft): **0**

Reference(s) for table above:
Remedial Investigation of Area A Munitions Response Site, Barry M. Goldwater Range / Luke Air Force Base, Arizona (2021)

MRS ID: **Area A MRS_Steep and Rugged Terrain**
Date: **1/10/2022**

Energetic Material Type Input Factor Categories

The following table is used to determine scores associated with the energetic materials. Materials are listed in order from most hazardous to least hazardous.

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
High Explosive and Low Explosive Filler in Fragmenting Rounds	100	100	100
White Phosphorus	70	70	70
Pyrotechnic	60	60	60
Propellant	50	50	50
Spotting Charge	40	40	40
Incendiary	30	30	30

The most hazardous type of energetic material listed in the 'Munitions, Bulk Explosive Info' Worksheet falls under the category 'High Explosive and Low Explosive Filler in Fragmenting Rounds'.

	Score
Baseline Conditions:	**100**
Surface Cleanup:	**100**
Subsurface Cleanup:	**100**

Location of Additional Human Receptors Input Factor Categories

1. What is the Explosive Safety Quantity Distance (ESQD) from the Explosive Siting Plan or the Explosive Safety Submission for the MRS? 298 feet
2. Are there currently any features or facilities where human receptors may congregate within the MRS, or within the ESQD arc? No
3. Please describe the facility or feature.

MEC Item(s) used to calculate the ESQD for current use activities

Bomb, 750 lb Demolition, M117

The following table is used to determine scores associated with the location of additional human receptors (current use activities):

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Inside the MRS or inside the ESQD arc	30	30	30
Outside of the ESQD arc	0	0	0

4. Current use activities are 'Outside of the ESQD arc', based on Question 2.'

	Score
Baseline Conditions:	**0**
Surface Cleanup:	**0**
Subsurface Cleanup:	**0**

5a. Will current features or facilities within the MRS or within the ESQD arc be utilized by future human receptors?
5b. Are there future plans to locate or construct features or facilities where human receptors may congregate within the MRS, or within the ESQD arc?
5c. Please describe the facility or feature.

The following table is used to determine scores associated with the location of additional human receptors (future use activities):

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Inside the MRS or inside the ESQD arc	30	30	30
Outside of the ESQD arc	0	0	0

6. Please answer Questions 5a and 5b above to determine the scores.

	Score
Baseline Conditions:	
Surface Cleanup:	
Subsurface Cleanup:	

Comments

Conservatively, assume 5" zuni HE or 20mm HE may be present

MRS ID: **Area A MRS_Steep and Rugged Terrain**
Date: **1/10/2022**

MRS Accessibility Input Factor Categories

The following table is used to determine scores associated with MRS accessibility:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Full Accessibility	An MRS with no barriers to entry, including MRSs with signage but no fencing and MRSs with water depth less than 6 feet deep.	80	80	80
Moderate Accessibility	An MRS with some barriers to entry, such as barbed wire fencing, rough terrain, or water depth between 6 and 12 feet deep.	55	55	55
Limited Accessibility	An MRS with significant barriers to entry, such as unguarded chain-link fences, requirements for special transportation (e.g., boats or all-terrain vehicles) to reach the MRS, or water depth between 12 and 20 feet deep.	15	15	15
Very Limited Accessibility	An MRS with guarded chain-link fences, terrain that requires special skills and equipment (e.g., mountain climbing) to access, or water depth greater than 20 feet deep.	5	5	5

Current Use Activities ***Score***

Select the category that best describes the MRS accessibility under the current use scenario:

Very Limited Accessibility

Baseline Conditions: **5**
Surface Cleanup: **5**
Subsurface Cleanup: **5**

Future Use Activities

Select the category that best describes the MRS accessibility under the future use scenario:

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Reference(s) for above information:
Remedial Investigation of Area A Munitions Response Site, Barry M. Goldwater Range / Luke Air Force Base, Arizona (2021)

Munitions Response Alternative No. 1:
Please enter MRS accessibility information in the 'Munitions Response Alternatives' Worksheet to continue.
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 2:
Please enter MRS accessibility information in the 'Munitions Response Alternatives' Worksheet to continue.
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 3:
Please enter MRS accessibility information in the 'Munitions Response Alternatives' Worksheet to continue.
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 4:
Please enter MRS accessibility information in the 'Munitions Response Alternatives' Worksheet to continue.
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 5:
Please enter MRS accessibility information in the 'Munitions Response Alternatives' Worksheet to continue.
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 6:
Please enter MRS accessibility information in the 'Munitions Response Alternatives' Worksheet to continue.
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Comments

4-wheel drive access and BLM permit necessary. Very rugged and steep, undeveloped desert terrain

MRS ID: **Area A MRS_Steep and Rugged Terrain**
Date: **1/10/2022**

Potential Contact Hours Input Factor Categories

The following table is used to determine scores associated with the total potential contact time:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Many Hours	≥1,000,000 receptor-hrs/yr	120	90	30
Some Hours	100,000 to 999,999 receptor hrs/yr	70	50	20
Few Hours	10,000 to 99,999 receptor-hrs/yr	40	20	10
Very Few Hours	1,000 to 9,999 receptor-hrs/yr	15	10	5
Minimal Hours	<1,000 receptor-hrs/yr	5	5	5

Current Use Activities :

Input factors are only determined for baseline conditions for current use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is:
800 receptor hrs/yr
Based on the table above, this corresponds to a input factor score for baseline conditions of:
5 Score

Future Use Activities :

Input factors are only determined for baseline conditions for future use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is:
receptor hrs/yr
Based on the table above, this corresponds to a input factor score of:
Score

Munitions Response Alternative No. 1:

Not enough information has been entered in the 'Munitions Response Alternatives' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: *Score*
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 2:

Not enough information has been entered in the 'Munitions Response Alternatives' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: *Score*
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 3:

Not enough information has been entered in the 'Munitions Response Alternatives' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: *Score*
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 4:

Not enough information has been entered in the 'Munitions Response Alternatives' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: *Score*
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 5:

Not enough information has been entered in the 'Munitions Response Alternatives' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: **Score**
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 6:

Not enough information has been entered in the 'Munitions Response Alternatives' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: **Score**
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Comments

MRS ID: **Area A MRS_Steep and Rugged Terrain**
Date: **1/10/2022**

Amount of MEC Input Factor Categories

The following table is used to determine scores associated with the Amount of MEC:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Target Area	Areas at which munitions fire was directed	180	120	30
OB/OD Area	Sites where munitions were disposed of by open burn or open detonation methods. This category refers to the core activity area of an OB/OD area. See the "Safety Buffer Areas" category for safety fans and kick-outs.	180	110	30
Function Test Range	Areas where the serviceability of stored munitions or weapons systems are tested. Testing may include components, partial functioning or complete functioning of stockpile or developmental items.	165	90	25
Burial Pit	The location of a burial of large quantities of MEC items.	140	140	10
Maneuver Areas	Areas used for conducting military exercises in a simulated conflict area or war zone	115	15	5
Firing Points	The location from which a projectile, grenade, ground signal, rocket, guided missile, or other device is to be ignited, propelled, or released.	75	10	5
Safety Buffer Areas	Areas outside of target areas, test ranges, or OB/OD areas that were designed to act as a safety zone to contain munitions that do not hit targets or to contain kick-outs from OB/OD areas.	30	10	5
Storage	Any facility used for the storage of military munitions, such as earth-covered magazines, above-ground magazines, and open-air storage areas.	25	10	5
Explosive-Related Industrial Facility	Former munitions manufacturing or demilitarization sites and TNT production plants	20	10	5

Select the category that best describes the ***most hazardous*** amount of MEC: ***Score***

`Safety Buffer Areas`

Baseline Conditions: **30**
Surface Cleanup: **10**
Subsurface Cleanup: **5**

Minimum MEC Depth Relative to the Maximum Intrusive Depth Input Factor Categories

Current Use Activities

The shallowest minimum MEC depth, based on the 'Munitions, Bulk Explosives Info' Worksheet: **0** ft
The deepest intrusive depth: **0** ft

The table below is used to determine scores associated with the minimum MEC depth relative to the maximum intrusive depth:

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240	150	95
Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.	240	50	25
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.	150	N/A	95
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth does not overlap with minimum MEC depth.	50	N/A	25

Comments

MRS ID: **Area A MRS_Steep and Rugged Terrain**
Date: **1/10/2022**

Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth will overlap after cleanup. MEC are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.' For 'Current Use Activities', only Baseline Conditions are considered.

240 *Score*

Future Use Activities
Deepest intrusive depth: **1** ft

Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth overlaps. MEC are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC. For 'Future Use Activities', only Baseline Conditions are considered.

240 *Score*

Munitions Response Alternative No. 1:
Expected minimum MEC depth (from the 'Munitions Response Alternatives' Worksheet): ft
Not enough information has been entered in the 'Munitions Response Alternatives' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 2:
Expected minimum MEC depth (from the 'Munitions Response Alternatives' Worksheet): ft
Not enough information has been entered in the 'Munitions Response Alternatives' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 3:
Expected minimum MEC depth (from the 'Munitions Response Alternatives' Worksheet): ft
Not enough information has been entered in the 'Munitions Response Alternatives' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Munitions Response Alternative No. 4:
Expected minimum MEC depth (from the 'Munitions Response Alternatives' Worksheet): ft
Not enough information has been entered in the 'Munitions Response Alternatives' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Comments

MRS ID: **Area A MRS_Steep and Rugged Terrain**
Date: **1/10/2022**

Migration Potential Input Factor Categories

Is there any physical or historical evidence that indicates it is possible for natural physical forces in the area (e.g., frost heave, erosion, tidal action) to expose subsurface MEC items, or move surface or subsurface MEC items? **Yes**

If "yes", describe the nature of natural forces.

Area prone to extreme weather (e.g., monsoons and flooding) that may result in increased possibility of erosion or tree upheaval resulting in exposure of subsurface items.

The following table is used to determine scores associated with the migration potential:

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Possible	30	30	10
Unlikely	10	10	10

Based on the question above, migration potential is 'Possible.'

	Score
Baseline Conditions:	**30**
Surface Cleanup:	**30**
Subsurface Cleanup:	**10**

Reference(s) for above information:
Remedial Investigation of Area A Munitions Response Site, Barry M. Goldwater Range / Luke Air Force Base, Arizona (2021)

MEC Classification Input Factor Categories

Cased munitions information has been entered into the 'Munitions, Bulk Explosive Info' Worksheet; therefore, bulk explosives do not comprise all MEC for this MRS.

Is the Safety Buffer Area for an OB/OD area? **No**
Has a technical assessment shown that MEC in the OB/OD Area is DMM?
Are any of the munitions listed in the 'Munitions, Bulk Explosive Info' Worksheet? **Yes**

- Submunitions
- 40mm grenades
- Munitions with white phosphorus filler
- High explosive anti-tank (HEAT) rounds
- Hand grenades
- Fuzes
- Mortars

At least one item listed in the 'Munitions, Bulk Explosive Info' Worksheet was identified as 'fuzed'.

The following table is used to determine scores associated with MEC classification categories:

Sensitive UXO	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Sensitive UXO	180	180	180
UXO	110	110	110
Fuzed Sensitive DMM	105	105	105
Fuzed DMM	55	55	55
Unfuzed DMM	45	45	45
Bulk Explosives	45	45	45

Based on your answers above, the MEC classification is 'Sensitive UXO'.

	Score
Baseline Conditions:	**180**
Surface Cleanup:	**180**
Subsurface Cleanup:	**180**

MEC Size Input Factor Categories

The following table is used to determine scores associated with MEC Size:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Small	Any munitions (from the 'Munitions, Bulk Explosive Info' Worksheet) weigh less than 90 lbs; small enough for a receptor to be able to move and initiate a detonation	40	40	40
Large	All munitions weigh more than 90 lbs; too large to move without equipment	0	0	0

Based on the definitions above and the types of munitions at the MRS (see 'Munitions, Bulk Explosive Info' Worksheet), the MEC Size Input Factor is: **Small**

	Score
Baseline Conditions:	**40**
Surface Cleanup:	**40**
Subsurface Cleanup:	**40**

Comments

WP rocket warhead recovered during RI

Scoring Summary

MRS ID:	Area A MRS_Steep and Rugged Terrain	a. Scoring Summary for Current Use Activities	
Date:	1/10/2022	Munitions Response Alternative: No Response Action	
Input Factor		**Input Factor Category**	**Score**
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Outside of the ESQD arc	0
III. MRS Accessibility		Very Limited Accessibility	5
IV. Potential Contact Hours		<1,000 receptor-hrs/yr	5
V. Amount of MEC		Safety Buffer Areas	30
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth			240
VII. Migration Potential			30
VIII. MEC Classification		Sensitive UXO	180
IX. MEC Size		Small	40
		Total Score	**630**
		Hazard Level Category	**3**

MRS ID:	Area A MRS_Steep and Rugged Terrain	b. Scoring Summary for Future Use Activities	
Date:	1/10/2022	Munitions Response Alternative: No Response Action	
Input Factor		**Input Factor Category**	**Score**
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Outside of the ESQD arc	0
III. MRS Accessibility		Very Limited Accessibility	5
IV. Potential Contact Hours		<1,000 receptor-hrs/yr	5
V. Amount of MEC		Safety Buffer Areas	30
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth			240
VII. Migration Potential			30
VIII. MEC Classification		Sensitive UXO	180
IX. MEC Size		Small	40
		Total Score	**630**
		Hazard Level Category	**3**

USAF MHAT Hazard Level Determination		
MRS ID: Area A MRS_Steep and Rugged Terrain Date: 1/10/2022	Hazard Level Category	Score
a. Current Use Activities	3	630
b. Future Use Activities	3	630
c. Munitions Response Alternative 1:	--	--
d. Munitions Response Alternative 2:	--	--
e. Munitions Response Alternative 3:	--	--
f. Munitions Response Alternative 4:	--	--
Alternate Hazard Rating		
Alternate Hazard Rating	--	
Characteristics of the MRS		
Is critical infrastructure located within the MRS or within the ESQD arc?	No	
Are cultural resources located within the MRS or within the ESQD arc?	Yes	
Are significant ecological resources located within the MRS or within the ESQD arc?	Yes	

Appendix H – MRSPP Scores

AREA A MUNITIONS RESPONSE SITE

BARRY M. GOLDWATER RANGE/ LUKE AIR FORCE BASE, ARIZONA

Prepared for:

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485 Quentin Roosevelt Rd.,
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Luke Air Force Base
14185 Falcon St.,
Luke AFB, AZ 85309

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Contract No. W912DY-16-D-0024
Task Order No. W9128F17F0255

Table 1

EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the scores that correspond with **all** the munitions types known or suspected to be present at the MRS.

Note: The terms *practice munitions, small arms ammunition, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Sensitive	◆ UXO that are considered most likely to function upon any interaction with exposed persons (e.g., submunitions, 40mm high-explosive [HE] grenades, white phosphorus [WP] munitions, high-explosive antitank [HEAT] munitions, and practice munitions with sensitive fuzes, but excluding all other practice munitions). ◆ Hand grenades containing energetic filler. ◆ Bulk primary explosives, or mixtures of these with environmental media, such that the mixture poses an explosive hazard.	(30)
High explosive (used or damaged)	◆ UXO containing a high-explosive filler (e.g., RDX, Composition B), that are not considered "sensitive." ◆ DMM containing a high-explosive filler that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	25
Pyrotechnic (used or damaged)	◆ UXO containing a pyrotechnic filler other than white phosphorus (e.g., flares, signals, simulators, smoke grenades). ◆ DMM containing a pyrotechnic filler other than white phosphorus (e.g., flares, signals, simulators, smoke grenades) that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	(20)
High explosive (unused)	◆ DMM containing a high-explosive filler that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	15
Propellant	◆ UXO containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor) that are: ▪ Damaged by burning or detonation ▪ Deteriorated to the point of instability.	(15)
Bulk secondary high explosives, pyrotechnics, or propellant	◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM that are bulk secondary high explosives, pyrotechnic compositions, or propellant (not contained in a munition), or mixtures of these with environmental media such that the mixture poses an explosive hazard.	10
Pyrotechnic (not used or damaged)	◆ DMM containing a pyrotechnic filler (i.e., red phosphorus), other than white phosphorus filler, that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	10
Practice	◆ UXO that are practice munitions that are not associated with a sensitive fuze. ◆ DMM that are practice munitions that are not associated with a sensitive fuze and that have not: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	(5)
Riot control	◆ UXO or DMM containing a riot control agent filler (e.g., tear gas).	3
Small arms	◆ Used munitions or DMM that are categorized as small arms ammunition. (Physical evidence or historical evidence that no other types of munitions [e.g., grenades, subcaliber training rockets, demolition charges] were used or are present on the MRS is required for selection of this category.)	(2)
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
MUNITIONS TYPE	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	30

DIRECTIONS: Document any MRS-specific data used in selecting the ***Munitions Type*** classifications in the space provided.

.30 cal; .50 cal; counter measure flare; LUU2 illumination flare; White Phosphorous 2.75" warhead; M117,750lb, Practice, with spotting charge; 7.62 mm; 5.56mm; 20mm TP cartridge; 2.75" rocket (with propellant); AN-MK23 3-lb bomb (Parsons 2021 RI Report, Table 4.2). BDU-33; 2.25" SCAR; MK 13 flare (2005 MEC Pilot Study, Weston).

Table 2

EHE Module: Source of Hazard Data Element Table

DIRECTIONS: Below are 11 classifications describing sources of explosive hazards. Circle the scores that correspond with **all** the sources of explosive hazards known or suspected to be present at the MRS.

Note: The terms *former range, practice munitions, small arms range, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Former range	◆ The MRS is a former military range where munitions (including practice munitions with sensitive fuzes) have been used. Such areas include impact or target areas and associated buffer and safety zones.	(10)
Former munitions treatment (i.e., OB/OD) unit	◆ The MRS is a location where UXO or DMM (e.g., munitions, bulk explosives, bulk pyrotechnic, or bulk propellants) were burned or detonated for the purpose of treatment prior to disposal.	8
Former practice munitions range	◆ The MRS is a former military range on which only practice munitions without sensitive fuzes were used.	(6)
Former maneuver area	◆ The MRS is a former maneuver area where no munitions other than flares, simulators, smokes, and blanks were used. There must be evidence that no other munitions were used at the location to place an MRS into this category.	5
Former burial pit or other disposal area	◆ The MRS is a location where DMM were buried or disposed of (e.g., disposed of into a water body) without prior thermal treatment.	5
Former industrial operating facilities	◆ The MRS is a location that is a former munitions maintenance, manufacturing, or demilitarization facility.	4
Former firing points	◆ The MRS is a firing point, where the firing point is delineated as an MRS separate from the rest of a former military range.	4
Former missile or air defense artillery emplacements	◆ The MRS is a former missile defense or air defense artillery (ADA) emplacement not associated with a military range.	2
Former storage or transfer points	◆ The MRS is a location where munitions were stored or handled for transfer between different modes of transportation (e.g., rail to truck, truck to weapon system).	2
Former small arms range	◆ The MRS is a former military range where only small arms ammunition was used. (There must be evidence that no other types of munitions [e.g., grenades] were used or are present to place an MRS into this category.)	1
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that no UXO or DMM are present, or there is historical evidence indicating that no UXO or DMM are present.	0
SOURCE OF HAZARD	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 10).	10

DIRECTIONS: Document any MRS-specific data used in selecting the ***Source of Hazard*** classifications in the space provided.

Five historic target areas identified within Area A. 100% removal action completed at target areas in 2008, no MEC found. Evidence of munitions use throughout Area A, (albeit very low density beyond the target areas). (Parsons 2021 RI Report, Section 1.3.4 and Figure 4.1)

Table 3

EHE Module: Location of Munitions Data Element Table

DIRECTIONS: Below are eight classifications of munitions locations and their descriptions. Circle the scores that correspond with **all** the locations where munitions are known or suspected to be present at the MRS.

Note: The terms *confirmed, surface, subsurface, small arms ammunition, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Confirmed surface	◆ Physical evidence indicates that there are UXO or DMM on the surface of the MRS. ◆ Historical evidence (i.e., a confirmed report such as an explosive ordnance disposal [EOD], police, or fire department report that an incident or accident that involved UXO or DMM occurred) indicates there are UXO or DMM on the surface of the MRS.	(25)
Confirmed subsurface, active	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS, and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM.	20
Confirmed subsurface, stable	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed.	(15)
Suspected (physical evidence)	◆ There is physical evidence (e.g., munitions debris such as fragments, penetrators, projectiles, shell casings, links, fins), other than the documented presence of UXO or DMM, indicating that UXO or DMM may be present at the MRS.	10
Suspected (historical evidence)	◆ There is historical evidence indicating that UXO or DMM may be present at the MRS.	5
Subsurface, physical constraint	◆ There is physical or historical evidence indicating that UXO or DMM may be present in the subsurface, but there is a physical constraint (e.g., pavement, water depth over 120 feet) preventing direct access to the UXO or DMM.	2
Small arms (regardless of location)	◆ The presence of small arms ammunition is confirmed or suspected, regardless of other factors such as geological stability. (There must be evidence that no other types of munitions [e.g., grenades] were used or are present at the MRS to place an MRS into this category.)	1
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
LOCATION OF MUNITIONS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 25).	25

DIRECTIONS: Document any MRS-specific data used in selecting the ***Location of Munitions*** classifications in the space provided.

Visual inspection identified UXO/DMM on the surface (Parsons 2021 RI Report, Table 4.2). Subsurface anomalies removed from the known target areas (Weston 2008 Targets Investigation); therefore, no remaining subsurface UXO in the target areas.

Table 4

EHE Module: Ease of Access Data Element Table

DIRECTIONS: Below are four classifications of barrier types that can surround an MRS and their descriptions. The barrier type is directly related to the ease of public access to the MRS. Circle the score that corresponds with the ease of access to the MRS.

Note: The term *barrier* is defined in Appendix C of the Primer.

Classification	Description	Score
No barrier	◆ There is no barrier preventing access to any part of the MRS (i.e., all parts of the MRS are accessible).	10
Barrier to MRS access is incomplete	◆ There is a barrier preventing access to parts of the MRS, but not the entire MRS.	(8)
Barrier to MRS access is complete but not monitored	◆ There is a barrier preventing access to all parts of the MRS, but there is no surveillance (e.g., by a guard) to ensure that the barrier is effectively preventing access to all parts of the MRS.	5
Barrier to MRS access is complete and monitored	◆ There is a barrier preventing access to all parts of the MRS, and there is active, continual surveillance (e.g., by a guard, video monitoring) to ensure that the barrier is effectively preventing access to all parts of the MRS.	0
EASE OF ACCESS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 10).	8

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ease of Access*** classification in the space provided.

Area A is surrounded by barb-wire fencing, but it is not maintained throughout and road gates/fencing are no longer in place. Permits are required to access Area A, but trespassing is known to occur (Parsons 2021 RI Report, Section 1.2.11)

Table 5

EHE Module: Status of Property Data Element Table

DIRECTIONS: Below are three classifications of the status of a property within the Department of Defense (DoD) and their descriptions. Circle the score that corresponds with the status of property at the MRS.

Classification	Description	Score
Non-DoD control	◆ The MRS is at a location that is no longer owned by, leased to, or otherwise possessed or used by DoD. Examples are privately owned land or water bodies; land or water bodies owned or controlled by state, tribal, or local governments; and land or water bodies managed by other federal agencies. ◆ The MRS is at a location that is owned by DoD, but that DoD has leased to another entity and for which DoD does not control access 24 hours per day.	(5)
Scheduled for transfer from DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD, and DoD plans to transfer that land or water body to the control of another entity (e.g., a state, tribal, or local government; a private party; another federal agency) within 3 years from the date the Protocol is applied.	3
DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD. With respect to property that is leased or otherwise possessed, DoD must control access to the MRS 24 hours per day, every day of the calendar year.	0
STATUS OF PROPERTY	**DIRECTIONS:** Record **<u>the single highest score</u>** from above in the box to the right (maximum score = 5).	5

DIRECTIONS: Document any MRS-specific data used in selecting the ***Status of Property*** classification in the space provided.

Area A is managed by BLM as part of the Sonoran Desert National Monument (Parsons 2021 RI Report, Section 1.2.11)

Table 6

EHE Module: Population Density Data Element Table

DIRECTIONS: Below are three classifications for population density and their descriptions. Determine the population density per square mile that most closely corresponds with the population of the MRS, including the area within a two-mile radius of the MRS's perimeter. Circle the most appropriate score.

Note: Use the U.S. Census Bureau tract data available to capture the **highest** population density within a two-mile radius of the perimeter of the MRS.

Classification	Description	Score
> 500 persons per square mile	◆ There are more than 500 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	5
100–500 persons per square mile	◆ There are 100 to 500 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	3
< 100 persons per square mile	◆ There are fewer than 100 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	(1)
POPULATION DENSITY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	1

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Density*** classification in the space provided.

Area A is in a remote, rugged location. The closest towns of Gila Bend and Casa Grande are many miles away (Parsons 2021 RI Report, Section 1.2.10 and Figure 1.1)

Table 7

EHE Module: Population Near Hazard Data Element Table

DIRECTIONS: Below are six classifications describing the number of inhabited structures near the MRS. The number of inhabited buildings relates to the potential population near the MRS. Determine the number of inhabited structures within two miles of the MRS boundary and circle the score that corresponds with the number of inhabited structures.

Note: The term *inhabited structures* is defined in Appendix C of the Primer.

Classification	Description	Score
26 or more inhabited structures	◆ There are 26 or more inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	5
16 to 25 inhabited structures	◆ There are 16 to 25 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	4
11 to 15 inhabited structures	◆ There are 11 to 15 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	3
6 to 10 inhabited structures	◆ There are 6 to 10 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	2
1 to 5 inhabited structures	◆ There are 1 to 5 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	1
0 inhabited structures	◆ There are no inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	(0)
POPULATION NEAR HAZARD	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	0

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Near Hazard*** classification in the space provided.

(Parsons 2021 RI Report, Section 1.2.10 and Figure 1.1)

Table 8

EHE Module: Types of Activities/Structures Data Element Table

DIRECTIONS: Below are five classifications of activities and/or inhabited structures and their descriptions. Review the types of activities that occur and/or structures that are present within two miles of the MRS and circle the scores that correspond with **all** the activities/structure classifications at the MRS.

Note: The term *inhabited structure* is defined in Appendix C of the Primer.

Classification	Description	Score
Residential, educational, commercial, or subsistence	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with any of the following purposes: residential, educational, child care, critical assets (e.g., hospitals, fire and rescue, police stations, dams), hotels, commercial, shopping centers, playgrounds, community gathering areas, religious sites, or sites used for subsistence hunting, fishing, and gathering.	5
Parks and recreational areas	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with parks, nature preserves, or other recreational uses.	4
Agricultural, forestry	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with agriculture or forestry.	3
Industrial or warehousing	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with industrial activities or warehousing.	2
No known or recurring activities	◆ There are no known or recurring activities occurring up to two miles from the MRS's boundary or within the MRS's boundary.	(1)
TYPES OF ACTIVITIES/STRUCTURES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	1

DIRECTIONS: Document any MRS-specific data used in selecting the ***Types of Activities/Structures*** classifications in the space provided.

Although Area A is part of SDNM, there is a permit system in place for access.
(Parsons 2021 RI Report, Section 1.2.11 and Figure 1.1)

Table 9

EHE Module: Ecological and/or Cultural Resources Data Element Table

DIRECTIONS: Below are four classifications of ecological and/or cultural resources and their descriptions. Review the types of resources present and circle the score that corresponds with the ecological and/or cultural resources present on the MRS.

Note: The terms *ecological resources* and *cultural resources* are defined in Appendix C of the Primer.

Classification	Description	Score
Ecological and cultural resources present	◆ There are both ecological and cultural resources present on the MRS.	(5)
Ecological resources present	◆ There are ecological resources present on the MRS.	3
Cultural resources present	◆ There are cultural resources present on the MRS.	3
No ecological or cultural resources present	◆ There are no ecological resources or cultural resources present on the MRS.	0
ECOLOGICAL AND/OR CULTURAL RESOURCES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	5

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ecological and/or Cultural Resources*** classification in the space provided.

(Parsons 2021 RI Report, Section 1.2.7 and 1.2.9)

Table 10
Determining the EHE Module Rating

DIRECTIONS:

1. From Tables 1–9, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **EHE Module Total** box below.
4. Circle the appropriate range for the **EHE Module Total** below.
5. Circle the **EHE Module Rating** that corresponds to the range selected and record this value in the **EHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
Explosive Hazard Factor Data Elements			
Munitions Type	Table 1	30	40
Source of Hazard	Table 2	10	
Accessibility Factor Data Elements			
Location of Munitions	Table 3	25	38
Ease of Access	Table 4	8	
Status of Property	Table 5	5	
Receptor Factor Data Elements			
Population Density	Table 6	1	7
Population Near Hazard	Table 7	0	
Types of Activities/Structures	Table 8	1	
Ecological and/or Cultural Resources	Table 9	5	
EHE MODULE TOTAL			85

EHE Module Total	EHE Module Rating
92 to 100	A
82 to 91	(B)
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected Explosive Hazard
EHE MODULE RATING	B

Table 20
Determining the CHE Module Rating

DIRECTIONS:

1. From Tables 11–19, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **CHE Module Total** box below.
4. Circle the appropriate range for the **CHE Module Total** below.
5. Circle the **CHE Module Rating** that corresponds to the range selected and record this value in the **CHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
CWM Hazard Factor Data Elements			
CWM Configuration	Table 11		
Sources of CWM	Table 12		
Accessibility Factor Data Elements			
Location of CWM	Table 13		
Ease of Access	Table 14		
Status of Property	Table 15		
Receptor Factor Data Elements			
Population Density	Table 16		
Population Near Hazard	Table 17		
Types of Activities/Structures	Table 18		
Ecological and/or Cultural Resources	Table 19		
CHE MODULE TOTAL			

CHE Module Total	CHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected CWM Hazard
CHE MODULE RATING	

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's groundwater and their **comparison values** (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the contaminant **ratios** together, including any additional groundwater contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the groundwater, select the box at the bottom of the table.

Contaminant	Maximum Concentration (µg/L)	Comparison Value (µg/L)	Ratios
CHF Scale	**CHF Value**	**Sum The Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the groundwater is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in groundwater has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the groundwater to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater receptors at the MRS.

Classification	Description	Value
Identified	There is a threatened water supply well downgradient of the source and the groundwater is a current source of drinking water or source of water for other beneficial uses such as irrigation/agriculture (equivalent to Class I or IIA aquifer).	H
Potential	There is no threatened water supply well downgradient of the source and the groundwater is currently or potentially usable for drinking water, irrigation, or agriculture (equivalent to Class I, IIA, or IIB aquifer).	M
Limited	There is no potentially threatened water supply well downgradient of the source and the groundwater is not considered a potential source of drinking water and is of limited beneficial use (equivalent to Class IIIA or IIIB aquifer, or where perched aquifer exists only).	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Groundwater MC Hazard ☒

Table 22

HHE Module: Surface Water – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface water and their **comparison values** (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the contaminant **ratios** together, including any additional surface water contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard with human endpoints present in the surface water, select the box at the bottom of the table.

Contaminant	Maximum Concentration (µg/L)	Comparison Value (µg/L)	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Water (Human Endpoint) MC Hazard ☒

Table 23

HHE Module: Sediment – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's sediment and their **comparison values** (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the contaminant **ratios** together, including any additional sediment contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard with human endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L

MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L

RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Sediment (Human Endpoint) MC Hazard ☒

Table 24

HHE Module: Surface Water – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface water and their **comparison values** (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the contaminant **ratios** together, including any additional surface water contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard with ecological endpoints present in the surface water, select the box at the bottom of the table.

Contaminant	Maximum Concentration (µg/L)	Comparison Value (µg/L)	Ratios
CHF Scale	**CHF Value**	**Sum the Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Water (Ecological Endpoint) MC Hazard ☒

Table 25

HHE Module: Sediment – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's sediment and their **comparison values** (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the contaminant **ratios** together, including any additional sediment contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard with ecological endpoints present in the sediment, select the box at the bottom of the table.

.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
CHF Scale	**CHF Value**	**Sum the Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Sediment (Ecological Endpoint) MC Hazard ☒

Table 26

HHE Module: Surface Soil Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface soil and their **comparison values** (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the contaminant **ratios** together, including any additional surface soil contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.

.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratio
Barium	128	330	0.38
Copper	20.7	28	0.74
Lead	9.7	11	0.88
CHF Scale	**CHF Value**	**Sum the Ratios**	2
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		L

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface soil is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface soil has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface soil to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	(L)
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	L

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface soil to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface soil to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface soil to which contamination has moved or can move.	(L)
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	L

No Known or Suspected Surface Soil MC Hazard ❑

Table 27

HHE Module: Supplemental Contaminant Hazard Factor Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: **Only use this table if there are more than five contaminants in any given medium present at the MRS.** This is a supplemental table designed to hold information about contaminants that do not fit in the previous tables. Indicate the **media** in which these contaminants are present. Then record all **contaminants**, their **maximum concentrations** and their **comparison values** (from Appendix B of the Primer) in the table below. Calculate and record the **ratio** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** for each medium on the appropriate media-specific tables.

Note: Do not add ratios from different media.

Media	Contaminant	Maximum Concentration	Comparison Value	Ratio

Table 28
Determining the HHE Module Rating

DIRECTIONS:

1. Record the letter values (H, M, L) for the **Contaminant Hazard**, **Migration Pathway**, and **Receptor Factors** for the media (from Tables 21–26) in the corresponding boxes below.
2. Record the media's three-letter combinations in the **Three-Letter Combination** boxes below (three-letter combinations are arranged from Hs to Ms to Ls).
3. Using the **HHE Ratings** provided below, determine each media's rating (A–G) and record the letter in the corresponding **Media Rating** box below.

Media (Source)	Contaminant Hazard Factor Value	Migratory Pathway Factor Value	Receptor Factor Value	Three-Letter Combination (Hs-Ms-Ls)	Media Rating (A-G)
Groundwater (Table 21)					
Surface Water/Human Endpoint (Table 22)					
Sediment/Human Endpoint (Table 23)					
Surface Water/Ecological Endpoint (Table 24)					
Sediment/Ecological Endpoint (Table 25)					
Surface Soil (Table 26)	L	L	L	L L L	G

DIRECTIONS (cont.):

4. Select the single highest Media Rating (A is highest; G is lowest) and enter the letter in the **HHE Module Rating** box.

Note:

An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more media, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

HHE MODULE RATING	G

HHE Ratings (for reference only)

Combination	Rating
HHH	A
HHM	B
HHL	C
HMM	C
HML	D
MMM	D
HLL	E
MML	E
MLL	F
LLL	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected MC Hazard

Table 29
MRS Priority

DIRECTIONS: In the chart below, circle the letter **rating** for each module recorded in Table 10 (EHE), Table 20 (CHE), and Table 28 (HHE). Circle the corresponding numerical **priority** for each module. If information to determine the module rating is not available, choose the appropriate alternative module rating. The MRS Priority is the single highest priority; record this relative priority in the **MRS Priority or Alternative MRS Rating** at the bottom of the table.

Note: An MRS assigned Priority 1 has the highest relative priority; an MRS assigned Priority 8 has the lowest relative priority. Only an MRS with CWM known or suspected to be present can be assigned Priority 1; an MRS that has CWM known or suspected to be present cannot be assigned Priority 8.

EHE Rating	Priority	CHE Rating	Priority	HHE Rating	Priority
		A	1		
A	2	B	2	A	2
B	(3)	C	3	B	3
C	4	D	4	C	4
D	5	E	5	D	5
E	6	F	6	E	6
F	7	G	7	F	7
G	8			G	(8)
Evaluation Pending		Evaluation Pending		Evaluation Pending	
No Longer Required		No Longer Required		No Longer Required	
No Known or Suspected Explosive Hazard		(No Known or Suspected CWM Hazard)		No Known or Suspected MC Hazard	
MRS PRIORITY or ALTERNATIVE MRS RATING				3	

Table A
MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from Service and DoD databases. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the **MRS Summary**, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental nonmunitions-related contaminants (e.g., benzene, trichloroethylene) found at the MRS, and any potentially exposed human and ecological receptors. If possible, include a map of the MRS.

Munitions Response Site Name: Area A

Component: Air Force MMRP

Installation/Property Name: Barry M. Goldwater Range; Luke Air Force Base

Location (City, County, State): Gila Bend, Arizona.

Site Name/Project Name (Project No.): FFID AZ957152413900 Area A Buffer AOC BZ600

Date Information Entered/Updated: 8/9/2021

Point of Contact (Name/Phone): Chris tenBraak 303-653-7928

Project Phase (check only one):

❑ PA	❑ SI	❑ RI X	❑ FS	❑ RD
❑ RA-C	❑ RIP	❑ RA-O	❑ RC	❑ LTM

Media Evaluated (check all that apply):

❑ Groundwater	❑ Sediment (human receptor)
X❑ Surface soil	❑ Surface Water (ecological receptor)
❑ Sediment (ecological receptor)	❑ Surface Water (human receptor)

MRS Summary:

MRS Description: Describe the munitions-related activities that occurred at the installation, the dates of operation, and the UXO, DMM, or MC known or suspected to be present. When possible, identify munitions, CWM, and MC by type:

LAFB operated a T-6 Airborne Controller Course at or near Area A of the BMGR from May to August 1953.

Five target areas within Area A used in training for bombing, rocket, and air-to-ground gunnery. No known MC. MEC potentially present is presented in the 2021 RI Report, Table 4.2

Description of Pathways for Human and Ecological Receptors:

A description of pathways for human and ecological receptors and pathways are summarized in the CSM Table (Table 4.3) presented in the RI Report (2021, Parsons). Site workers (BLM employees), recreational users, and site visitors

Description of Receptors (Human and Ecological):

Site workers (BLM employees),recreational users, and site visitors. Table 4.3 2021 RI Report

Appendix I – GIS Deliverable

AREA A MUNITIONS RESPONSE SITE

BARRY M. GOLDWATER RANGE/ LUKE AIR FORCE BASE, ARIZONA

Prepared for:

U.S. Air Force Civil Engineer Center
485 Quentin Roosevelt Rd.,
San Antonio, TX 78226

Luke Air Force Base
14185 Falcon St.,
Luke AFB, AZ 85309

Prepared by:

U.S. Army Corps of Engineers,
Omaha District
1616 Capitol Ave., Ste. 9000
Omaha, NE 68102

Parsons
1776 Lincoln St., Ste. 600
Denver, Colorado

Contract No. W912DY-16-D-0024
Task Order No. W9128F17F0255

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APPENDIX I: GIS Deliverable

- The GIS Deliverable attachment will be provided separately in electronic format.

Appendix J – Geophysics Deliverable

AREA A MUNITIONS RESPONSE SITE

BARRY M. GOLDWATER RANGE/ LUKE AIR FORCE BASE, ARIZONA

Prepared for:

U.S. Air Force Civil Engineer Center
485 Quentin Roosevelt Rd.,
San Antonio, TX 78226

Luke Air Force Base
14185 Falcon St.,
Luke AFB, AZ 85309

Prepared by:

U.S. Army Corps of Engineers,
Omaha District
1616 Capitol Ave., Ste. 9000
Omaha, NE 68102

Parsons
1776 Lincoln St., Ste. 600
Denver, Colorado

Contract No. W912DY-16-D-0024
Task Order No. W9128F17F0255

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APPENDIX J: Geophysics Deliverable

- The Geophysics Deliverable attachment will be provided separately in electronic format.

Appendix K – Supporting Documents

AREA A MUNITIONS RESPONSE SITE

BARRY M. GOLDWATER RANGE/ LUKE AIR FORCE BASE, ARIZONA

Prepared for:

U.S. Air Force Civil Engineer Center
485 Quentin Roosevelt Rd.,
San Antonio, TX 78226

Luke Air Force Base
14185 Falcon St.,
Luke AFB, AZ 85309

Prepared by:

U.S. Army Corps of Engineers,
Omaha District
1616 Capitol Ave., Ste. 9000
Omaha, NE 68102

Parsons
1776 Lincoln St., Ste. 600
Denver, Colorado

Contract No. W912DY-16-D-0024
Task Order No. W9128F17F0255

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APPENDIX K: SUPPORTING DOCUMENTS

The Supporting Documents attachments are:

- Field Change Requests (FCRs)
- Root Cause Analyses (RCAs)
- Quality Assurance Report 6048 (6048s)

*6048-001 is included within 6048-002

FIELD CHANGE REQUEST

Project Name:	**BMGR RIF/S**	FCR No.:	01
Project Number:	**100138.0255.110081.02000**	Date:	**05/10/2019**
Subject:	**Target Selection Threshold**		

1. APPLICABLE DOCUMENT AND REQUIREMENT (*Include reference to relevant section[s]*)

Table 12.1 and Section 17.5 in the approved UFP-QAPP, lists that the detection threshold of ten times the site-specific background noise at the IVS will be used for the transect survey.

2. DESCRIPTION OF REQUESTED CHANGE

Change the selection threshold to 50 Counts on the Sum Channel.

3. REASON FOR REQUESTED CHANGE

The threshold based on the IVS noise is too low which is leading to false positives. The original IVS background collection had a noise result of 3.07 standard deviation. Per the QAPP, 10 times 3.07 of noise led to the threshold of 30.7counts. The initial intrusive results for the 50 randomly selected Trench Target anomalies found over a 50% rate for no contacts and hot rocks. The average initial target picked response is 49 for the no contacts, with the highest being in the 300s, though the later was at the end of a line and suspected user interference. Since the intrusive teams found nothing it is likely that the picked response was due to hot soil or geology. The intrusive team ground balances the PDM8® in a general area close to the targets which filters the local soil response compared to the initial DGM which ground balanced for the general area. Anomaly locations were verified as no contacts by the UXOQC with a separate PDM8®.

4. RECOMMENDED ACTION

The following QAPP worksheets changes will be made:

Worksheet 12: For Process Data and Document Anomaly Locations (Target Selection) Measurement Performance Criteria "A detection threshold of ten times the site-specific background noise will be used for the transect survey.

Revised to: "A detection threshold of 50 counts will be used for the transect survey."

Section 17.5.2: First sentence "The data processor will analyze the collected geophysical data and identify anomalies using a detection threshold of 10 times site-specific noise measured at the IVS."

revised to: "The data processor will analyze the collected geophysical data and identify anomalies using a detection threshold of 50 counts."

5. IMPACTS TO UPCOMING AND/OR COMPLETED WORK (*List positive or negative impacts*)

Adjusting the target lists to intrusively investigate anomalies above the 50 count threshold will increase data usability reducing geologic/soil false positive anomalies.

Uncontrolled Copy – Electronic documents, once printed, are uncontrolled and may become outdated.
Please verify the current, controlled copy before use.

FIELD CHANGE REQUEST

Project Name:	BMGR RIF/S	FCR No.:	01
Project Number:	100138.0255.110081.02000	Date:	05/10/2019
Subject:	Target Selection Threshold		

6. REQUESTED BY

	Chris TenBraak	5/10/2019
Parsons Project Manager	Print Name	Date

7. APPROVALS (*Client PM signature required, client technical lead may also sign if appropriate*)

MATHEW.SHIMI.J.1258799719 Digitally signed by MATHEW.SHIMI.J.1258799719 Date: 2019.05.31 15:42:45 -07'00'	Shimi J. Mathew	05/31/19
AFCEC	Print Name	Date
Wayne Miller	Wayne Miller	6-6-2019
Arizona Department of Environmental Quality	Print Name	Date
Thomas Mills For Mariano Lanza	Mariano Lanza	6/13/19
Bureau of Land Management	Print Name	Date
	David Johansen	6/14/19
Client Project Manager	Print Name	Date
Client Technical Lead (if applicable)	Print Name	Date

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Please verify the current, controlled copy before use.

From: Johansen, David R CIV USARMY CENWO (USA) <David.R.Johansen@usace.army.mil>
Sent: Monday, March 2, 2020 1:56 PM
To: TenBraak, Chris <Chris.TenBraak@parsons.com>
Cc: Phillips, Scott D <Scott.D.Phillips@parsons.com>; Coon, James <James.Coon@parsons.com>; Dotson, Eric M CIV USARMY CENWO (USA) <Eric.M.Dotson@usace.army.mil>; Kochefko, John A CIV USARMY CENWO (USA) <John.A.Kochefko@usace.army.mil>; Zorinsky, Jennifer L CIV USARMY CENWO (USA) <Jennifer.L.Zorinsky@usace.army.mil>; Bond, James R CIV USARMY CENWO (USA) <James.R.Bond@usace.army.mil>
Subject: [EXTERNAL] RE: BMGR FCR-03 Logbooks and FCR-04 Incremental Sampling Methodology Clarification

Chris,

The language in FCR-03 is approved but please add in a statement that that there will be no cost to the government and then we'll sign it when you return it.

For FCR-04, the language that is in section 17.9.4 is correct for IS sampling but please change the depth to read 0-6" in. bgs. Then use the same language for table 18.1. Also please add a statement that that there will be no cost to the government and then we'll review it again.

Thanks
Dave

David Johansen
Project Manager
Omaha District
402-995-2729 (Office)
402-290-5743 (Cell)

FIELD CHANGE REQUEST

Project Name:	**BMGR RI/FS**	**FCR No.:**	**03**
Project Number:	**100138.0255.110081.02000**	**Date:**	**02/18/2020**
Subject:	**Field Logbooks**		

1. APPLICABLE DOCUMENT AND REQUIREMENT (*Include reference to relevant section[s]*)

UFP-QAPP for Remedial Investigation/Feasibility Study at the Area A Munitions Response Site, Barry M. Goldwater Range/Luke Air Force Base, Arizona, December 2018. Worksheet #29; Table 29.1; First and second rows, fifth column. Both cells state:
Hard Copy/onsite during field-work, then Project File/Parsons, Denver Office.

2. DESCRIPTION OF REQUESTED CHANGE

Text revised to clarify Site Manager and Team Leader Logbooks may be either hard copy or electronic copy format.

3. REASON FOR REQUESTED CHANGE

To provide field teams flexibility in how field notes are recorded and stored. Electronic logbooks are easier to save and archive with less chance of losing information.

4. RECOMMENDED ACTION

The following QAPP worksheets changes will be made:

Worksheet #29; Table 29.1; First row, fifth column and second row, fifth column;
Hard Copy or electronic copy onsite during field-work, then Project File/Parsons, Denver Office.

5. IMPACTS TO UPCOMING AND/OR COMPLETED WORK (*List positive or negative impacts*)

The ability for field teams to use electronic logbooks in the field allows for more efficient and consistent data documentation, storage and QC. No negative impacts associated with the change. There will be no additional cost to the government.

6. REQUESTED BY

	Chris TenBraak	3/13/2020
Parsons Project Manager	*Print Name*	*Date*

7. APPROVALS (*Client PM signature required; client technical lead may also sign, if appropriate*)

Client Project Manager	*Print Name*	*Date*

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Please verify the current, controlled copy before use.

FIELD CHANGE REQUEST

Project Name:	**BMGR RI/FS**	**FCR No.:**	**03**
Project Number:	**100138.0255.110081.02000**	**Date:**	**02/18/2020**
Subject:	**Field Logbooks**		

Client Technical Lead (if applicable)	*Print Name*	*Date*

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FIELD CHANGE REQUEST

Project Name:	**BMGR RI/FS**	**FCR No.:**	**04**
Project Number:	**100138.0255.110081.02000**	**Date:**	**02/18/2020**
Subject:	**Incremental Sampling Methodology Clarification**		

1. APPLICABLE DOCUMENT AND REQUIREMENT (*Include reference to relevant section[s]*)

UFP-QAPP for Remedial Investigation/Feasibility Study at the Area A Munitions Response Site, Barry M. Goldwater Range/Luke Air Force Base, Arizona, December 2018. Worksheet #18; Table 18.1; Third row, fourth column under "***Sample Type"*** and fifth column under "***Depth"*** indicates discrete sampling methods will be collected from 0-6 in. bgs from locations where demolition operations occur.

2. DESCRIPTION OF REQUESTED CHANGE

Revise text to clarify that the incremental sampling method will be used to collect MC samples from 0-2 in. bgs from locations where demolition operations occur.

3. REASON FOR REQUESTED CHANGE

To clarify the conflicting text in Table 18.1 so it indicates the correct MC soil sampling method for locations where demolition operations occur.

4. RECOMMENDED ACTION

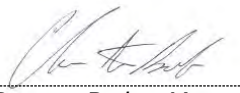
The following QAPP worksheets changes will be made:

Worksheet #18; Table 18.1; Third row, fourth column under "***Sample Type***" change *Discrete* to Incremental (50 increments) and fifth column under "***Depth"*** from *0-6* in. bgs to 0-2 in. bgs.

5. IMPACTS TO UPCOMING AND/OR COMPLETED WORK (*List positive or negative impacts*)

The revisions clarify the conflicting text, so the proper sampling methodology is conducted. No negative impacts associated with the change. There will be no additional cost to the government.

6. REQUESTED BY

	Chris TenBraak	3/13/2020
Parsons Project Manager	*Print Name*	*Date*

7. APPROVALS (*Client PM signature required; client technical lead may also sign, if appropriate*)

	David R Johansen	3/27/2020
Client Project Manager	*Print Name*	*Date*

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FIELD CHANGE REQUEST

Project Name:	**BMGR RI/FS**	**FCR No.:**	**04**
Project Number:	**100138.0255.110081.02000**	**Date:**	**02/18/2020**
Subject:	**Incremental Sampling Methodology Clarification**		

	Jennifer Zorinsky	3/27/2020
Client Technical Lead (if applicable)	*Print Name*	*Date*

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FIELD CHANGE REQUEST

Project Name:	**BMGR RI/FS**	**FCR No.:**	**05**
Project Number:	**100138.0255.110081.02000**	**Date:**	**03/09/2020**
Subject:	**Clarification of Demolition of Intact Small Arms Ammunition**		

1. APPLICABLE DOCUMENT AND REQUIREMENT (*Include reference to relevant section[s]*)

UFP-QAPP for Remedial Investigation/Feasibility Study at the Area A Munitions Response Site, Barry M. Goldwater Range/Luke Air Force Base, Arizona, December 2018. Appendix E – Explosives Management Plan, Section E.1.3.

2. DESCRIPTION OF REQUESTED CHANGE

Clarify how intact small arms ammunition (SAA) will be included in demolition operations. Intact SAA will be consolidated on site until then next demolition operation for a conventional MEC item is conducted or until the week prior to demobilizations when a demolition operation will be conducted for remaining intact SAA.

3. REASON FOR REQUESTED CHANGE

Intact SAA has a much lower explosive risk than conventional MEC. Including intact SAA with conventional MEC demolition operations or consolidating recovered intact SAA and conducting one final demolition shot prior to demobilization will increase productivity and be more cost efficient.

4. RECOMMENDED ACTION

In Appendix E, Section 1.3 add a sentence after the first sentence in the section stating:
"Intact small arms ammunition (SAA) will be consolidated on site until the next demolition operation for a conventional MEC item is conducted or until the week prior to demobilization when a demolition operation will be conducted for remaining intact SAA."

5. IMPACTS TO UPCOMING AND/OR COMPLETED WORK (*List positive or negative impacts*)

The change will reduce the amount of demolition operations that will need to be conducted. This will increase productivity and cost efficiency. No negative impacts anticipated. There will be no additional cost to the government.

6. REQUESTED BY

	Chris TenBraak	3/9/2020
Parsons Project Manager	*Print Name*	*Date*

7. APPROVALS (*Client PM signature required; client technical lead may also sign, if appropriate*)

	DAVID R. DOHANSEW	3-10-2020
Client Project Manager	*Print Name*	*Date*

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Please verify the current, controlled copy before use.

FIELD CHANGE REQUEST

Project Name:	**BMGR RI/FS**	**FCR No.:**	**05**
Project Number:	**100138.0255.110081.02000**	**Date:**	**03/09/2020**
Subject:	**Clarification of Demolition of Intact Small Arms Ammunition**		

DOTSON.ERIC.MICHAEL.1157472921 Digitally signed by DOTSON.ERIC.MICHAEL.1157472921
Date: 2020.03.10 08:25:42 -07'00'

Client Technical Lead (if applicable)	*Print Name*	*Date*

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Please verify the current, controlled copy before use.

ROOT CAUSE ANALYSIS/NONCONFORMANCE REPORT

Project Name:	**Barry M Goldwater Range/Luke AFB**	**RCA/NCR No.:**	**1**
Project No:	**W912DY-16-D-0024,TO W9128F-17-F-0255**	**Date:**	**2/15/2019**
Subject:	**Item Missed By Sweep Line**	**Revision:**	

1. PRODUCT OR PROCESS REQUIREMENT (*Include reference to relevant procedure/plan*)

As per Table 12.1 in the QAPP under MEC surface clearance, the measurement performance criteria is no MEC or metallic objects found larger than 2"X 2" on the surface.

2. DESCRIPTION OF NONCONFORMANCE

A steel can measuring approximately 5 inches by 2.5 inches was found on the surface by the UXOQCS in Artillery Targets 4 and 5.

3. ROOT CAUSE (*Describe the underlying reason for nonconformance rather than the symptoms*)

Large shrubs /trees were creating gaps in line that were not adequately swept around. Line was moving too fast on steep incline causing some team members to lag and thus create gaps.

4. CORRECTIVE ACTION (*Should address root cause of condition and prevent recurrence*)

Sweep team was advised item was missed and team leader conducted immediate remedial training. Team re-swept affected area by repeating sweep line where item was missed.

Assigned to:		**Due Date:**	

5. APPROVALS (*Undersigned concur above evaluation and approve the recommended corrective action*)

QC GEOPHYSICIST OR QUALITY MANAGER

Signature	Print Name	Date
Richard Endress	Richard Endress	2/15/2019

PROJECT MANAGER (for project nonconformances)

Signature	Print Name	Date
	Chris ten Braak	2/20/2019

*CUSTOMER REPRESENTATIVE (for project nonconformances - **OPTIONAL**)*

Signature	Print Name	Date

Electronic documents, once printed, may become outdated. Please verify the current, controlled copy before use.

ROOT CAUSE ANALYSIS/NONCONFORMANCE REPORT

Project Name:	**Barry M Goldwater Range/Luke AFB**	**RCA/NCR No.:**	**1**
Project No:	**W912DY-16-D-0024,TO W9128F-17-F-0255**	**Date:**	**2/15/2019**
Subject:	**Item Missed By Sweep Line**	**Revision:**	

6. CLOSE-OUT VERIFICATION

6a. Objective Evidence (*Evidence will be attached to RCA/NCR or reference will be provided below*)

6b. Approval (*Undersigned has verified implementation of recommended corrective action*)

QC GEOPHYSICIST, QUALITY MANAGER, OR DESIGNATED REPRESENTATIVE

Signature	*Print Name*	*Date*

Electronic documents, once printed, may become outdated. Please verify the current, controlled copy before use.

ROOT CAUSE ANALYSIS/NONCONFORMANCE REPORT

Project Name:	**Barry M Goldwater Range/Luke AFB**	**RCA/NCR No.:**	**2**
Project No:	**W912DY-16-D-0024,TO W9128F-17-F-0255**	**Date:**	**3/6/2019**
Subject:	**Item Missed By Sweep Line**	**Revision:**	

1. PRODUCT OR PROCESS REQUIREMENT (*Include reference to relevant procedure/plan*)

As per Table 12.1 in the QAPP under visual surveys, the measurement performance criteria is munitions related material recorded and marked by survey team.

2. DESCRIPTION OF NONCONFORMANCE

A steel fragment measuring approximately 12 inches long by 2 inches wide was found on the surface by the UXOQCS in grid D5.

3. ROOT CAUSE (*Describe the underlying reason for nonconformance rather than the symptoms*)

Due to the fact that the item was not on bare ground made item very difficult to see.

4. CORRECTIVE ACTION (*Should address root cause of condition and prevent recurrence*)

Sweep team was advised item was missed and team leader conducted immediate remedial training. Team repeated 200 feet of visual survey prior to the missed item.

Assigned to:		**Due Date:**	

5. APPROVALS (*Undersigned concur above evaluation and approve the recommended corrective action*)

QC GEOPHYSICIST OR QUALITY MANAGER

Signature	Print Name	Date
Richard Endress	Richard Endress	3/6/2019

PROJECT MANAGER (for project nonconformances)

Signature	Print Name	Date
	Chris ten Braak	3/11/2019

*CUSTOMER REPRESENTATIVE (for project nonconformances - **OPTIONAL**)*

Signature	Print Name	Date

Electronic documents, once printed, may become outdated. Please verify the current, controlled copy before use.

ROOT CAUSE ANALYSIS/NONCONFORMANCE REPORT

Project Name:	**Barry M Goldwater Range/Luke AFB**	**RCA/NCR No.:**	**2**
Project No:	**W912DY-16-D-0024,TO W9128F-17-F-0255**	**Date:**	**3/6/2019**
Subject:	**Item Missed By Sweep Line**	**Revision:**	

6. CLOSE-OUT VERIFICATION

6a. Objective Evidence (*Evidence will be attached to RCA/NCR or reference will be provided below*)

6b. Approval (*Undersigned has verified implementation of recommended corrective action*)

QC GEOPHYSICIST, QUALITY MANAGER, OR DESIGNATED REPRESENTATIVE

Signature	*Print Name*	*Date*

Electronic documents, once printed, may become outdated. Please verify the current, controlled copy before use.

ROOT CAUSE ANALYSIS/NONCONFORMANCE REPORT

Project Name:	**Barry M Goldwater Range/Luke AFB**	**RCA/NCR No.:**	**3**
Project No:	**W912DY-16-D-0024,TO W9128F-17-F-0255**	**Date:**	**3/7/2019**
Subject:	**Item Missed By Sweep Line**	**Revision:**	

1. PRODUCT OR PROCESS REQUIREMENT (*Include reference to relevant procedure/plan*)

As per Table 12.1 in the QAPP under visual surveys, the measurement performance criteria is munitions related material recorded and marked by survey team.

2. DESCRIPTION OF NONCONFORMANCE

An expended LUU-2 aircraft flare was found on the surface by the UXOQCS in grid E5.

3. ROOT CAUSE (*Describe the underlying reason for nonconformance rather than the symptoms*)

Part of the team was having to navigate around a steep hill, causing line spacing to deteriorate and creating gaps in the line.

4. CORRECTIVE ACTION (*Should address root cause of condition and prevent recurrence*)

Sweep team was advised item was missed and team leader conducted immediate remedial training. Team repeated 200 feet of visual survey prior to the missed item.

Assigned to:		**Due Date:**	

5. APPROVALS (*Undersigned concur above evaluation and approve the recommended corrective action*)

QC GEOPHYSICIST OR QUALITY MANAGER

Signature	*Print Name*	*Date*
Richard Endress	Richard Endress	3/7/2019

PROJECT MANAGER (for project nonconformances)

Signature	*Print Name*	*Date*
	Chris ten Braak	3/11/2019

*CUSTOMER REPRESENTATIVE (for project nonconformances - **OPTIONAL**)*

Signature	*Print Name*	*Date*

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ROOT CAUSE ANALYSIS/NONCONFORMANCE REPORT

Project Name:	**Barry M Goldwater Range/Luke AFB**	**RCA/NCR No.:**	**3**
Project No:	**W912DY-16-D-0024,TO W9128F-17-F-0255**	**Date:**	**3/7/2019**
Subject:	**Item Missed By Sweep Line**	**Revision:**	

6. CLOSE-OUT VERIFICATION

6a. Objective Evidence (*Evidence will be attached to RCA/NCR or reference will be provided below*)

6b. Approval (*Undersigned has verified implementation of recommended corrective action*)

QC GEOPHYSICIST, QUALITY MANAGER, OR DESIGNATED REPRESENTATIVE

Signature	*Print Name*	*Date*

Electronic documents, once printed, may become outdated. Please verify the current, controlled copy before use.

ROOT CAUSE ANALYSIS/NONCONFORMANCE REPORT

Project Name:	**Barry M Goldwater Range/Luke AFB**	**RCA/NCR No.:**	**4**
Project No:	**W912DY-16-D-0024,TO W9128F-17-F-0255**	**Date:**	**3/8/2019**
Subject:	**Item Missed By Sweep Line**	**Revision:**	

1. PRODUCT OR PROCESS REQUIREMENT (*Include reference to relevant procedure/plan*)

As per Table 12.1 in the QAPP under visual surveys, the measurement performance criteria is munitions related material recorded and marked by survey team.

2. DESCRIPTION OF NONCONFORMANCE

A BDU-33 25 pound practice bomb was found on the surface by the UXOQCS in grid D5.

3. ROOT CAUSE (*Describe the underlying reason for nonconformance rather than the symptoms*)

The team was having to navigate diagonally to the slope of a hill, causing line spacing to deteriorate and creating gaps in the line.

4. CORRECTIVE ACTION (*Should address root cause of condition and prevent recurrence*)

Sweep team was advised item was missed and team leader conducted immediate remedial training. Team repeated 200 feet of visual survey prior to the missed item.

Assigned to:		**Due Date:**	

5. APPROVALS (*Undersigned concur above evaluation and approve the recommended corrective action*)

QC GEOPHYSICIST OR QUALITY MANAGER

Signature	*Print Name*	*Date*
Richard Endress	Richard Endress	3/8/2019

PROJECT MANAGER (for project nonconformances)

Signature	*Print Name*	*Date*
	Chris ten Braak	3/11/2019

*CUSTOMER REPRESENTATIVE (for project nonconformances - **OPTIONAL**)*

Signature	*Print Name*	*Date*

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ROOT CAUSE ANALYSIS/NONCONFORMANCE REPORT

Project Name:	**Barry M Goldwater Range/Luke AFB**	**RCA/NCR No.:**	**4**
Project No:	**W912DY-16-D-0024,TO W9128F-17-F-0255**	**Date:**	**3/8/2019**
Subject:	**Item Missed By Sweep Line**	**Revision:**	

6. CLOSE-OUT VERIFICATION

6a. Objective Evidence (*Evidence will be attached to RCA/NCR or reference will be provided below*)

6b. Approval (*Undersigned has verified implementation of recommended corrective action*)

QC GEOPHYSICIST, QUALITY MANAGER, OR DESIGNATED REPRESENTATIVE

Signature	*Print Name*	*Date*

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US ARMY CORPS OF ENGINEERS (USACE)
MUNITIONS RESPONSE
QUALITY ASSURANCE REPORT (QAR) FORM
The proponent agency is CESO. *See instructions on page 2.*

1. REPORT NO. *(1,2,3, etc., for the Task Order (T.O.))*: 2

2. USACE REPRESENTATIVE'S NAME: Jeffery R. Young

3. DATE ACTIVITY COMPLETED: 2019-05-15

4. PROJECT NAME: RI/FS Area A BMGR

5. PROJECT LOCATION: Barry M. Goldwater (BMGR) Area A, AZ

6. WEATHER CONDITIONS: N/A

7. CONTRACTOR: Parsons

8. CONTRACT NUMBER: Contract No. W912DY-16-D-0024

9. T.O. NUMBER: W912DY-17-W9128F-17-F-0255

10. DISTRIBUTED TO (*check boxes and insert individual's name*)

- ☒ a. District Program/Project Manager: David Johansen (USACE PM)
- ☒ b. Design Center: Randal Schneider (USACE OESS Section Chief)
- ☐ c. Remedial Action District TM
- ☒ d. Contractor: Richard Endress (Parsons UXOQCS)

11. RESPONSE DUE DATE (*Based on type of nonconformance, IF REQUIRED)*

12. TYPE OF ACTIVITY CONDUCTED (*Include types of inspections/audits conducted, operations observed, etc.)*
Government Quality Assurance Inspection of Work Performed - Surface Clearance of MEC/MPPEH/MD.

13. RESULTS AND OBSERVATIONS
QA Inspection was performed on the listed grids. The following (82) grids were inspected A7-A3, A7-A4, A7-B2, A7-B3, A7-B4, A7-C1, A7-C2, A7-D1, B6-A4, E5-B3, E5-B4, E5-C2, E5-C3, E5-D1, E5-D2, E5-D3, E5-D4, F5-A1, F5-A2, G7-C3, G7-D2, G7-D3, H7-A2, H7-A3, H7-B2, H7-B3, H7-C1, H7-C2, H7-C3, H7-D1, H7-D2, H7-D3, I7-A1, I7-A2, I7-A3, I7-B1, I7-B2, I7-B3, I7-C1, I7-C2, I7-C3, I7-D1, I7-D2, I7-D3, J6-A1, J6-A2, J6-A3, J6-A4, J6-B1, J6-B2, J6-B3, J6-B4, J6-C1, J6-C2, J6-C3, J6-C4, J6-D3, J6-D4, J7-A1, J7-A2, J7-A3, J7-B1, J7-B2, J7-B3, J7-C1, J7-C2, J7-C3, J7-D1, J7-D2, J7-D3, K6-A3, K6-A4, K6-B1, K6-B2, K6-B3, K6-B4, K7-A1, K7-A2, K7-A3, K7-B1, K7-B2, and K7-B3, (10,151.13 acres total) and have passed government QA Inspection for Definable Feature of Work 2A Visual Surveys (Coverage/Detection), IAW REMEDIAL INVESTIGATION/FEASIBILITY STUDY UFP-QAPP for AREA A MUNITIONS RESPONSE SITE BARRY M. GOLDWATER RANGE/ LUKE AIR FORCE BASE, and are recommended for acceptance. See attached documents for a by grid list of acres and map.

14. DEFICIENCY TYPE (*select one*) ☒ a. Not Applicable ☐ b. Critical ☐ c. Major ☐ d. Minor

☐ e. Other, *Specify*

15. DATE: 2019-05-15

16. USACE REPRESENTATIVE'S SIGNATURE: YOUNG.JEFFERY.RAY.1179052004 Digitally signed by YOUNG.JEFFERY.RAY.1179052004 Date: 2019.05.15 19:33:20 -05'00'

17. CONTRACTOR REPRESENTATIVE'S NAME: Richard Endress (Parsons UXOQCS)

18. DATE: 2019-05-15

19. CONTRACTOR REPRESENTATIVE'S SIGNATURE (*indicating receipt of the QAR*)
Richard Endress Digitally signed by Richard Endress Date: 2019.05.20 04:13:38 -07'00'

20. **The Contractor will provide the following information to the Contract Specialist by the "Response Due" date above. Please contact the Contracting Officer's Representative (COR) or Project Manager if you have any questions.**

a. Contractor Response as to Cause and Actions Taken to Correct Current Condition and to Prevent Recurrence (*cite applicable quality control procedures or changes in plans, procedures, or practices*).

b. Contractor Representative's Authentication (*form must be signed before returning*)

(1) Printed Name	(2) Title	(3) Date Signed	(4) Signature

c. Government Evaluation (*acceptance, partial acceptance, etc.*)

d. Government Actions (*reduced payment, cure notice, show cause, other*)

e. Close Out	Name	Title	Date (*YYYY-MM-DD*)	Signature
(1) Contractor Notified				
(2) USACE PDT Representative				
(3) Contracting Officer or COR				

INSTRUCTIONS FOR ENG FORM 6048

Block 1. Report number.

Block 2. Name of USACE representative conducting the quality assurance (QA) activity.

Block 3. Date QA Activity completed.

Block 4. Project Name, i.e., "Camp Swampy (MRS-02).

Block 5. Project Location, i.e., "Smithville, Alaska".

Block 6. Weather conditions, if applicable.

Block 7. Contractor and/or subcontractor executing the work.

Block 8. Contract number.

Block 9. Task Order number.

Block 10. List by name all official recipients of the QAR. At a minimum, the District Program/Project Manager must be selected.

Block 11. Enter the date that the contractor is to respond, if applicable.

Block 12. List all QA-related activities, inspections, audits conducted, operations observed, etc. Include specific references to applicable government quality requirements, i.e., Quality Assurance Surveillance Plans, Department of Defense, Army, and/or USACE requirements, policy, guidance, etc., requiring the inspection/audit being conducted. For example: "Spot-checked inventory of demolition explosives as required by the project QASP and approved Explosives Safety Submission (ESS)."

Block 13. Describe results and observations of each QA activity conducted. Attach discipline-specific checklists/documentation used. All deficiencies noted must include reference to the specific regulation or requirement that was violated. For example: "Demolition explosives stored on site were not inventoried weekly in accordance with ESS paragraph 4.2 and Work Plan paragraph 5.4. Last inventory was conducted 3 weeks ago on xx Feb 2013."

Block 14. Select the type of deficiency, if any, observed. Use contract-specific definitions if available, or use the following general definitions:

a. Check the appropriate box.

b. Critical: A deficiency that is likely to result in hazardous or unsafe conditions for individuals using, maintaining, or depending upon the supplies or services; or is likely to prevent performance of a vital agency mission.

c. Major: A deficiency, other than critical, that is likely to result in failure of the supplies or services, or to materially reduce the usability of the supplies or services for their intended purpose.

d. Minor: A deficiency that is not likely to materially reduce the usability of the supplies or services for their intended purpose or is a departure from established standards having little bearing on the effective use or operation of the supplies or services.

Block 15. Date the USACE Representative signs.

Block 16. QA representative's signature.

Block 17. Contractor Representative's printed name.

Block 18. Date Contractor Representative signs.

Block 19. Contractor representative signature. Signature does not indicate concurrence with stated findings, only that contractor has received the report.

Block 20a. Contractor indicates action(s) taken to determine cause of the deficiency, action taken to correct immediate deficiency, and action taken to prevent a recurrence of the deficiency. Include dates of actions taken and a schedule for completion of planned actions.

Block 20b. Contractor representative's printed name, title, date signed, and signature.

Block 20c. Indicate government acceptance of contractor's actions to correct identified deficiencies.

Block 20d. Indicate negative government actions taken as a result of the deficiency.

Block 20e. Signature of contractor, PDT representative and contracting officer or COR indicating close out for all deficiencies indicated.

US ARMY CORPS OF ENGINEERS (USACE)
MUNITIONS RESPONSE
QUALITY ASSURANCE REPORT (QAR) FORM
The proponent agency is CESO. *See instructions on page 2.*

1. REPORT NO. *(1,2,3, etc., for the Task Order (T.O.))*: 3

2. USACE REPRESENTATIVE'S NAME: Jeffery R. Young

3. DATE ACTIVITY COMPLETED: 2019-05-21

4. PROJECT NAME: RI/FS Area A BMGR

5. PROJECT LOCATION: Barry M. Goldwater (BMGR) Area A, AZ

6. WEATHER CONDITIONS: N/A

7. CONTRACTOR: Parsons

8. CONTRACT NUMBER: Contract No. W912DY-16-D-0024

9. T.O. NUMBER: W912DY-17-W9128F-17-F-0255

10. DISTRIBUTED TO (*check boxes and insert individual's name*)

- ☒ a. District Program/Project Manager David Johansen (USACE PM)
- ☒ b. Design Center Randal Schneider (USACE OESS Section Chief)
- ☐ c. Remedial Action District TM
- ☒ d. Contractor Richard Endress (Parsons UXOQCS)

11. RESPONSE DUE DATE (*Based on type of nonconformance, IF REQUIRED)*

12. TYPE OF ACTIVITY CONDUCTED (*Include types of inspections/audits conducted, operations observed, etc.)*
Government Quality Assurance Inspection of Work Performed - INTRUSIVE INVESTIGATION.

13. RESULTS AND OBSERVATIONS
QA Inspection was performed on ~200 of the selected anomalies in the listed target areas. Trench Target, Artillery Targets 1, 2, and 3, Bridge Target, Wooden Structure Target, and Artillery Targets 4 and 5 have passed government QA Inspection for Definable Feature of Work 5. INTRUSIVE INVESTIGATION, IAW REMEDIAL INVESTIGATION/FEASIBILITY STUDY UFP-QAPP for AREA A MUNITIONS RESPONSE SITE BARRY M. GOLDWATER RANGE/ LUKE AIR FORCE BASE, and are recommended for acceptance.

14. DEFICIENCY TYPE (*select one*) ☒ a. Not Applicable ☐ b. Critical ☐ c. Major ☐ d. Minor

☐ e. Other, *Specify*

15. DATE: 2019-05-26

16. USACE REPRESENTATIVE'S SIGNATURE: YOUNG.JEFFERY.RAY.1179052004 Digitally signed by YOUNG.JEFFERY.RAY.1179052004 Date: 2019.05.26 12:24:16 -05'00'

17. CONTRACTOR REPRESENTATIVE'S NAME: Richard Endress (Parsons UXOQCS)

18. DATE: 2019-05-27

19. CONTRACTOR REPRESENTATIVE'S SIGNATURE (*indicating receipt of the QAR*)
Richard Endress Digitally signed by Richard Endress Date: 2019.05.27 09:41:19 -07'00'

20. **The Contractor will provide the following information to the Contract Specialist by the "Response Due" date above. Please contact the Contracting Officer's Representative (COR) or Project Manager if you have any questions.**

a. Contractor Response as to Cause and Actions Taken to Correct Current Condition and to Prevent Recurrence (*cite applicable quality control procedures or changes in plans, procedures, or practices*).

b. Contractor Representative's Authentication (*form must be signed before returning*)

(1) Printed Name	(2) Title	(3) Date Signed	(4) Signature

c. Government Evaluation (*acceptance, partial acceptance, etc.*)

d. Government Actions (*reduced payment, cure notice, show cause, other*)

e. Close Out	Name	Title	Date (*YYYY-MM-DD*)	Signature
(1) Contractor Notified				
(2) USACE PDT Representative				
(3) Contracting Officer or COR				

INSTRUCTIONS FOR ENG FORM 6048

Block 1. Report number.

Block 2. Name of USACE representative conducting the quality assurance (QA) activity.

Block 3. Date QA Activity completed.

Block 4. Project Name, i.e., “Camp Swampy (MRS-02).

Block 5. Project Location, i.e., “Smithville, Alaska”.

Block 6. Weather conditions, if applicable.

Block 7. Contractor and/or subcontractor executing the work.

Block 8. Contract number.

Block 9. Task Order number.

Block 10. List by name all official recipients of the QAR. At a minimum, the District Program/Project Manager must be selected.

Block 11. Enter the date that the contractor is to respond, if applicable.

Block 12. List all QA-related activities, inspections, audits conducted, operations observed, etc. Include specific references to applicable government quality requirements, i.e., Quality Assurance Surveillance Plans, Department of Defense, Army, and/or USACE requirements, policy, guidance, etc., requiring the inspection/audit being conducted. For example: “Spot-checked inventory of demolition explosives as required by the project QASP and approved Explosives Safety Submission (ESS).”

Block 13. Describe results and observations of each QA activity conducted. Attach discipline-specific checklists/documentation used. All deficiencies noted must include reference to the specific regulation or requirement that was violated. For example: “Demolition explosives stored on site were not inventoried weekly in accordance with ESS paragraph 4.2 and Work Plan paragraph 5.4. Last inventory was conducted 3 weeks ago on xx Feb 2013.”

Block 14. Select the type of deficiency, if any, observed. Use contract-specific definitions if available, or use the following general definitions:

a. Check the appropriate box.

b. Critical: A deficiency that is likely to result in hazardous or unsafe conditions for individuals using, maintaining, or depending upon the supplies or services; or is likely to prevent performance of a vital agency mission.

c. Major: A deficiency, other than critical, that is likely to result in failure of the supplies or services, or to materially reduce the usability of the supplies or services for their intended purpose.

d. Minor: A deficiency that is not likely to materially reduce the usability of the supplies or services for their intended purpose or is a departure from established standards having little bearing on the effective use or operation of the supplies or services.

Block 15. Date the USACE Representative signs.

Block 16. QA representative’s signature.

Block 17. Contractor Representative’s printed name.

Block 18. Date Contractor Representative signs.

Block 19. Contractor representative signature. Signature does not indicate concurrence with stated findings, only that contractor has received the report.

Block 20a. Contractor indicates action(s) taken to determine cause of the deficiency, action taken to correct immediate deficiency, and action taken to prevent a recurrence of the deficiency. Include dates of actions taken and a schedule for completion of planned actions.

Block 20b. Contractor representative’s printed name, title, date signed, and signature.

Block 20c. Indicate government acceptance of contractor’s actions to correct identified deficiencies.

Block 20d. Indicate negative government actions taken as a result of the deficiency.

Block 20e. Signature of contractor, PDT representative and contracting officer or COR indicating close out for all deficiencies indicated.

US ARMY CORPS OF ENGINEERS (USACE)
MUNITIONS RESPONSE
QUALITY ASSURANCE REPORT (QAR) FORM
The proponent agency is CESO. *See instructions on page 2.*

1. REPORT NO. *(1,2,3, etc., for the Task Order (T.O.))*: 4

2. USACE REPRESENTATIVE'S NAME: Eric M. Dotson

3. DATE ACTIVITY COMPLETED: 2019-12-19

4. PROJECT NAME: RI/FS Area A BMGR

5. PROJECT LOCATION: Barry M. Goldwater (BMGR) Area A, AZ

6. WEATHER CONDITIONS: N/A

7. CONTRACTOR: Parsons

8. CONTRACT NUMBER: W912DY-16-D-0024

9. T.O. NUMBER: W9128F-17-F-0255

10. DISTRIBUTED TO (*check boxes and insert individual's name*)

- ☒ a. District Program/Project Manager: David Johansen (USACE PM)
- ☒ b. Design Center: Jim Bond (USACE OESS Section Chief)
- ☐ c. Remedial Action District TM
- ☒ d. Contractor: Richard Endress (Parsons UXOQCS)

11. RESPONSE DUE DATE (*Based on type of nonconformance, IF REQUIRED)*

12. TYPE OF ACTIVITY CONDUCTED (*Include types of inspections/audits conducted, operations observed, etc.)*
Government Quality Assurance Inspection of Work Performed - Surface Clearance of MEC/MPPEH.

13. RESULTS AND OBSERVATIONS
QA Inspection was performed on the following grids K1, K2, K3 & K4 and have passed government QA Inspection for Definable Feature of Work 2A Visual Surveys (Coverage/Detection), IAW UFP-QAPP for Remedial Investigation/Feasibility Study at the Area A Munitions Response Site, Barry M. Goldwater Range/Luke Air Force Base, Arizona., dated December 2018, and are recommended for acceptance.

14. DEFICIENCY TYPE (*select one*) ☒ a. Not Applicable ☐ b. Critical ☐ c. Major ☐ d. Minor

☐ e. Other, *Specify*

15. DATE: 2019-12-30

16. USACE REPRESENTATIVE'S SIGNATURE: DOTSON.ERIC.MICHAEL.1157472921 Digitally signed by DOTSON.ERIC.MICHAEL.1157472921 Date: 2019.12.30 13:03:47 -07'00'

17. CONTRACTOR REPRESENTATIVE'S NAME: Richard Endress (Parsons UXOQCS)

18. DATE: 2019-12-30

19. CONTRACTOR REPRESENTATIVE'S SIGNATURE (*indicating receipt of the QAR*)
Richard Endress Digitally signed by Richard Endress Date: 2020.01.01 18:30:50 -07'00'

20. **The Contractor will provide the following information to the Contract Specialist by the "Response Due" date above. Please contact the Contracting Officer's Representative (COR) or Project Manager if you have any questions.**

a. Contractor Response as to Cause and Actions Taken to Correct Current Condition and to Prevent Recurrence (*cite applicable quality control procedures or changes in plans, procedures, or practices*).

b. Contractor Representative's Authentication (*form must be signed before returning*)

(1) Printed Name	(2) Title	(3) Date Signed	(4) Signature

c. Government Evaluation (*acceptance, partial acceptance, etc.*)

d. Government Actions (*reduced payment, cure notice, show cause, other*)

e. Close Out	Name	Title	Date (*YYYY-MM-DD*)	Signature
(1) Contractor Notified				
(2) USACE PDT Representative				
(3) Contracting Officer or COR				

INSTRUCTIONS FOR ENG FORM 6048

Block 1. Report number.

Block 2. Name of USACE representative conducting the quality assurance (QA) activity.

Block 3. Date QA Activity completed.

Block 4. Project Name, i.e., “Camp Swampy (MRS-02).

Block 5. Project Location, i.e., “Smithville, Alaska”.

Block 6. Weather conditions, if applicable.

Block 7. Contractor and/or subcontractor executing the work.

Block 8. Contract number.

Block 9. Task Order number.

Block 10. List by name all official recipients of the QAR. At a minimum, the District Program/Project Manager must be selected.

Block 11. Enter the date that the contractor is to respond, if applicable.

Block 12. List all QA-related activities, inspections, audits conducted, operations observed, etc. Include specific references to applicable government quality requirements, i.e., Quality Assurance Surveillance Plans, Department of Defense, Army, and/or USACE requirements, policy, guidance, etc., requiring the inspection/audit being conducted. For example: “Spot-checked inventory of demolition explosives as required by the project QASP and approved Explosives Safety Submission (ESS).”

Block 13. Describe results and observations of each QA activity conducted. Attach discipline-specific checklists/documentation used. All deficiencies noted must include reference to the specific regulation or requirement that was violated. For example: “Demolition explosives stored on site were not inventoried weekly in accordance with ESS paragraph 4.2 and Work Plan paragraph 5.4. Last inventory was conducted 3 weeks ago on xx Feb 2013.”

Block 14. Select the type of deficiency, if any, observed. Use contract-specific definitions if available, or use the following general definitions:

a. Check the appropriate box.

b. Critical: A deficiency that is likely to result in hazardous or unsafe conditions for individuals using, maintaining, or depending upon the supplies or services; or is likely to prevent performance of a vital agency mission.

c. Major: A deficiency, other than critical, that is likely to result in failure of the supplies or services, or to materially reduce the usability of the supplies or services for their intended purpose.

d. Minor: A deficiency that is not likely to materially reduce the usability of the supplies or services for their intended purpose or is a departure from established standards having little bearing on the effective use or operation of the supplies or services.

Block 15. Date the USACE Representative signs.

Block 16. QA representative’s signature.

Block 17. Contractor Representative’s printed name.

Block 18. Date Contractor Representative signs.

Block 19. Contractor representative signature. Signature does not indicate concurrence with stated findings, only that contractor has received the report.

Block 20a. Contractor indicates action(s) taken to determine cause of the deficiency, action taken to correct immediate deficiency, and action taken to prevent a recurrence of the deficiency. Include dates of actions taken and a schedule for completion of planned actions.

Block 20b. Contractor representative’s printed name, title, date signed, and signature.

Block 20c. Indicate government acceptance of contractor’s actions to correct identified deficiencies.

Block 20d. Indicate negative government actions taken as a result of the deficiency.

Block 20e. Signature of contractor, PDT representative and contracting officer or COR indicating close out for all deficiencies indicated.

US ARMY CORPS OF ENGINEERS (USACE)
MUNITIONS RESPONSE
QUALITY ASSURANCE REPORT (QAR) FORM
The proponent agency is CESO. *See instructions on page 2.*

1. REPORT NO. *(1,2,3, etc., for the Task Order (T.O.))*: 5

2. USACE REPRESENTATIVE'S NAME: Eric M. Dotson

3. DATE ACTIVITY COMPLETED: 2020-01-10

4. PROJECT NAME: RI/FS Area A BMGR

5. PROJECT LOCATION: Barry M. Goldwater (BMGR) Area A, AZ

6. WEATHER CONDITIONS: N/A

7. CONTRACTOR: Parsons

8. CONTRACT NUMBER: W912DY-16-D-0024

9. T.O. NUMBER: W9128F-17-F-0255

10. DISTRIBUTED TO (*check boxes and insert individual's name*)

- ☒ a. District Program/Project Manager: David Johansen (USACE PM)
- ☒ b. Design Center: Jim Bond (USACE OESS Section Chief)
- ☐ c. Remedial Action District TM
- ☒ d. Contractor: Richard Endress (Parsons UXOQCS)

11. RESPONSE DUE DATE (*Based on type of nonconformance, IF REQUIRED)*

12. TYPE OF ACTIVITY CONDUCTED (*Include types of inspections/audits conducted, operations observed, etc.)*
Government Quality Assurance Inspection of Work Performed - Surface Clearance of MEC/MPPEH.

13. RESULTS AND OBSERVATIONS
QA Inspection was performed on the following grids I2, J1, J2, J3, J4, K5 & K6 and have passed government QA Inspection for Definable Feature of Work 2A Visual Surveys (Coverage/Detection), IAW UFP-QAPP for Remedial Investigation/Feasibility Study at the Area A Munitions Response Site, Barry M. Goldwater Range/Luke Air Force Base, Arizona., dated December 2018, and are recommended for acceptance.

14. DEFICIENCY TYPE (*select one*) ☒ a. Not Applicable ☐ b. Critical ☐ c. Major ☐ d. Minor

☐ e. Other, *Specify*

15. DATE: 2020-01-13

16. USACE REPRESENTATIVE'S SIGNATURE: DOTSON.ERIC.MICHAEL.1157472921 Digitally signed by DOTSON.ERIC.MICHAEL.1157472921 Date: 2020.01.13 08:42:27 -07'00'

17. CONTRACTOR REPRESENTATIVE'S NAME: Richard Endress (Parsons UXOQCS)

18. DATE: 2020-01-13

19. CONTRACTOR REPRESENTATIVE'S SIGNATURE (*indicating receipt of the QAR*)
Richard Endress Digitally signed by Richard Endress Date: 2020.01.14 05:01:01 -07'00'

20. **The Contractor will provide the following information to the Contract Specialist by the "Response Due" date above. Please contact the Contracting Officer's Representative (COR) or Project Manager if you have any questions.**

a. Contractor Response as to Cause and Actions Taken to Correct Current Condition and to Prevent Recurrence (*cite applicable quality control procedures or changes in plans, procedures, or practices*).

b. Contractor Representative's Authentication (*form must be signed before returning*)

(1) Printed Name	(2) Title	(3) Date Signed	(4) Signature

c. Government Evaluation (*acceptance, partial acceptance, etc.*)

d. Government Actions (*reduced payment, cure notice, show cause, other*)

e. Close Out	Name	Title	Date (*YYYY-MM-DD*)	Signature
(1) Contractor Notified				
(2) USACE PDT Representative				
(3) Contracting Officer or COR				

INSTRUCTIONS FOR ENG FORM 6048

Block 1. Report number.

Block 2. Name of USACE representative conducting the quality assurance (QA) activity.

Block 3. Date QA Activity completed.

Block 4. Project Name, i.e., “Camp Swampy (MRS-02).

Block 5. Project Location, i.e., “Smithville, Alaska”.

Block 6. Weather conditions, if applicable.

Block 7. Contractor and/or subcontractor executing the work.

Block 8. Contract number.

Block 9. Task Order number.

Block 10. List by name all official recipients of the QAR. At a minimum, the District Program/Project Manager must be selected.

Block 11. Enter the date that the contractor is to respond, if applicable.

Block 12. List all QA-related activities, inspections, audits conducted, operations observed, etc. Include specific references to applicable government quality requirements, i.e., Quality Assurance Surveillance Plans, Department of Defense, Army, and/or USACE requirements, policy, guidance, etc., requiring the inspection/audit being conducted. For example: “Spot-checked inventory of demolition explosives as required by the project QASP and approved Explosives Safety Submission (ESS).”

Block 13. Describe results and observations of each QA activity conducted. Attach discipline-specific checklists/documentation used. All deficiencies noted must include reference to the specific regulation or requirement that was violated. For example: “Demolition explosives stored on site were not inventoried weekly in accordance with ESS paragraph 4.2 and Work Plan paragraph 5.4. Last inventory was conducted 3 weeks ago on xx Feb 2013.”

Block 14. Select the type of deficiency, if any, observed. Use contract-specific definitions if available, or use the following general definitions:

a. Check the appropriate box.

b. Critical: A deficiency that is likely to result in hazardous or unsafe conditions for individuals using, maintaining, or depending upon the supplies or services; or is likely to prevent performance of a vital agency mission.

c. Major: A deficiency, other than critical, that is likely to result in failure of the supplies or services, or to materially reduce the usability of the supplies or services for their intended purpose.

d. Minor: A deficiency that is not likely to materially reduce the usability of the supplies or services for their intended purpose or is a departure from established standards having little bearing on the effective use or operation of the supplies or services.

Block 15. Date the USACE Representative signs.

Block 16. QA representative’s signature.

Block 17. Contractor Representative’s printed name.

Block 18. Date Contractor Representative signs.

Block 19. Contractor representative signature. Signature does not indicate concurrence with stated findings, only that contractor has received the report.

Block 20a. Contractor indicates action(s) taken to determine cause of the deficiency, action taken to correct immediate deficiency, and action taken to prevent a recurrence of the deficiency. Include dates of actions taken and a schedule for completion of planned actions.

Block 20b. Contractor representative’s printed name, title, date signed, and signature.

Block 20c. Indicate government acceptance of contractor’s actions to correct identified deficiencies.

Block 20d. Indicate negative government actions taken as a result of the deficiency.

Block 20e. Signature of contractor, PDT representative and contracting officer or COR indicating close out for all deficiencies indicated.

US ARMY CORPS OF ENGINEERS (USACE)
MUNITIONS RESPONSE
QUALITY ASSURANCE REPORT (QAR) FORM
The proponent agency is CESO. *See instructions on page 2.*

1. REPORT NO. *(1,2,3, etc., for the Task Order (T.O.))*: 6

2. USACE REPRESENTATIVE'S NAME: Eric M. Dotson

3. DATE ACTIVITY COMPLETED: 2020-01-28

4. PROJECT NAME: RI/FS Area A BMGR

5. PROJECT LOCATION: Barry M. Goldwater (BMGR) Area A, AZ

6. WEATHER CONDITIONS: N/A

7. CONTRACTOR: Parsons

8. CONTRACT NUMBER: W912DY-16-D-0024

9. T.O. NUMBER: W9128F-17-F-0255

10. DISTRIBUTED TO (*check boxes and insert individual's name*)

- ☒ a. District Program/Project Manager: David Johansen (USACE PM)
- ☒ b. Design Center: Jim Bond (USACE OESS Section Chief)
- ☐ c. Remedial Action District TM
- ☒ d. Contractor: Richard Endress (Parsons UXOQCS)

11. RESPONSE DUE DATE (*Based on type of nonconformance, IF REQUIRED*): 2020-02-03

12. TYPE OF ACTIVITY CONDUCTED (*Include types of inspections/audits conducted, operations observed, etc.)*
Observation of Motor Vehicle Operation Safety Violation (Utility Vehicle)

13. RESULTS AND OBSERVATIONS
While observing the contractor prepare for daily operations after the morning safety briefing, an employee was observed operating a motor vehicle (UTV - Utility Vehicle) without wearing a seatbelt, IAW EM 385-1-1 18.B.09. As the on site Government Representative Eric Dotson was engaged in a conversation with the SUXOS Scott Phillips, an employee was driving a UTV out of the portable storage container where they are stored overnight for security reasons. While watching the equipment move to it's staging area and come to a stop, it was observed that the seatbelt was not in use. The SUXOS and UXOSO Matt Busch were immediately notified of the Safety Violation. The Contractor had been issued a verbal warning on a previous occasion when the Assistant Site Manager James Coon committed the same Safety Violation of operating a motor vehicle (UTV) without wearing a seatbelt.

14. DEFICIENCY TYPE (*select one*) ☐ a. Not Applicable ☐ b. Critical ☐ c. Major ☒ d. Minor

☐ e. Other, *Specify*

15. DATE: 2020-01-28

16. USACE REPRESENTATIVE'S SIGNATURE: DOTSON.ERIC.MICHAEL.1157472921 Digitally signed by DOTSON.ERIC.MICHAEL.1157472921 Date: 2020.01.28 08:36:29 -07'00'

17. CONTRACTOR REPRESENTATIVE'S NAME: Richard Endress (Parsons UXOQCS)

18. DATE: 2020-01-28

19. CONTRACTOR REPRESENTATIVE'S SIGNATURE (*indicating receipt of the QAR*)
Richard Endress Digitally signed by Richard Endress Date: 2020.01.29 04:50:23 -07'00'

20. **The Contractor will provide the following information to the Contract Specialist by the "Response Due" date above. Please contact the Contracting Officer's Representative (COR) or Project Manager if you have any questions.**

a. Contractor Response as to Cause and Actions Taken to Correct Current Condition and to Prevent Recurrence (*cite applicable quality control procedures or changes in plans, procedures, or practices*).
Complacency is the most likely cause. All site personnel were reminded after James' incident. It can be assumed that personnel view it as just pulling UTV's out of the conex then immediately stopping and getting out, so they forget about putting safety restraints on. The UXOSO informed the people involved, and also the Team Leaders, to re-brief that anytime someone is in a UTV and they plan to start it up and move it, for any reason, the seatbelt is required to be on. The UXOSO will also put it out again at the morning and afternoon briefs.

b. Contractor Representative's Authentication (*form must be signed before returning*)

(1) Printed Name	(2) Title	(3) Date Signed	(4) Signature
Chris tenBraak	Project Manager	2020-02-03	Chris tenBraak Digitally signed by Chris tenBraak Date: 2020.02.04 08:38:47 -07'00'

c. Government Evaluation (*acceptance, partial acceptance, etc.*)

d. Government Actions (*reduced payment, cure notice, show cause, other*)

e. Close Out	Name	Title	Date (*YYYY-MM-DD*)	Signature
(1) Contractor Notified				
(2) USACE PDT Representative				
(3) Contracting Officer or COR				

INSTRUCTIONS FOR ENG FORM 6048

Block 1. Report number.

Block 2. Name of USACE representative conducting the quality assurance (QA) activity.

Block 3. Date QA Activity completed.

Block 4. Project Name, i.e., “Camp Swampy (MRS-02).

Block 5. Project Location, i.e., “Smithville, Alaska”.

Block 6. Weather conditions, if applicable.

Block 7. Contractor and/or subcontractor executing the work.

Block 8. Contract number.

Block 9. Task Order number.

Block 10. List by name all official recipients of the QAR. At a minimum, the District Program/Project Manager must be selected.

Block 11. Enter the date that the contractor is to respond, if applicable.

Block 12. List all QA-related activities, inspections, audits conducted, operations observed, etc. Include specific references to applicable government quality requirements, i.e., Quality Assurance Surveillance Plans, Department of Defense, Army, and/or USACE requirements, policy, guidance, etc., requiring the inspection/audit being conducted. For example: “Spot-checked inventory of demolition explosives as required by the project QASP and approved Explosives Safety Submission (ESS).”

Block 13. Describe results and observations of each QA activity conducted. Attach discipline-specific checklists/documentation used. All deficiencies noted must include reference to the specific regulation or requirement that was violated. For example: “Demolition explosives stored on site were not inventoried weekly in accordance with ESS paragraph 4.2 and Work Plan paragraph 5.4. Last inventory was conducted 3 weeks ago on xx Feb 2013.”

Block 14. Select the type of deficiency, if any, observed. Use contract-specific definitions if available, or use the following general definitions:

a. Check the appropriate box.

b. Critical: A deficiency that is likely to result in hazardous or unsafe conditions for individuals using, maintaining, or depending upon the supplies or services; or is likely to prevent performance of a vital agency mission.

c. Major: A deficiency, other than critical, that is likely to result in failure of the supplies or services, or to materially reduce the usability of the supplies or services for their intended purpose.

d. Minor: A deficiency that is not likely to materially reduce the usability of the supplies or services for their intended purpose or is a departure from established standards having little bearing on the effective use or operation of the supplies or services.

Block 15. Date the USACE Representative signs.

Block 16. QA representative’s signature.

Block 17. Contractor Representative’s printed name.

Block 18. Date Contractor Representative signs.

Block 19. Contractor representative signature. Signature does not indicate concurrence with stated findings, only that contractor has received the report.

Block 20a. Contractor indicates action(s) taken to determine cause of the deficiency, action taken to correct immediate deficiency, and action taken to prevent a recurrence of the deficiency. Include dates of actions taken and a schedule for completion of planned actions.

Block 20b. Contractor representative’s printed name, title, date signed, and signature.

Block 20c. Indicate government acceptance of contractor’s actions to correct identified deficiencies.

Block 20d. Indicate negative government actions taken as a result of the deficiency.

Block 20e. Signature of contractor, PDT representative and contracting officer or COR indicating close out for all deficiencies indicated.

US ARMY CORPS OF ENGINEERS (USACE)
MUNITIONS RESPONSE
QUALITY ASSURANCE REPORT (QAR) FORM
The proponent agency is CESO. *See instructions on page 2.*

1. REPORT NO. *(1,2,3, etc., for the Task Order (T.O.))*: 7

2. USACE REPRESENTATIVE'S NAME: Eric M. Dotson

3. DATE ACTIVITY COMPLETED: 2020-01-30

4. PROJECT NAME: RI/FS Area A BMGR

5. PROJECT LOCATION: Barry M. Goldwater (BMGR) Area A, AZ

6. WEATHER CONDITIONS: N/A

7. CONTRACTOR: Parsons

8. CONTRACT NUMBER: W912DY-16-D-0024

9. T.O. NUMBER: W9128F-17-F-0255

10. DISTRIBUTED TO (*check boxes and insert individual's name*)

- ☒ a. District Program/Project Manager: David Johansen (USACE PM)
- ☒ b. Design Center: Jim Bond (USACE OESS Section Chief)
- ☐ c. Remedial Action District TM
- ☒ d. Contractor: Richard Endress (Parsons UXOQCS)

11. RESPONSE DUE DATE (*Based on type of nonconformance, IF REQUIRED)*

12. TYPE OF ACTIVITY CONDUCTED (*Include types of inspections/audits conducted, operations observed, etc.)*
Government Quality Assurance Inspection of Work Performed - Surface Clearance of MEC/MPPEH.

13. RESULTS AND OBSERVATIONS
QA Inspection was performed on the following grids H3, I3 & I4 and have passed government QA Inspection for Definable Feature of Work 2A Visual Surveys (Coverage/Detection), IAW UFP-QAPP for Remedial Investigation/Feasibility Study at the Area A Munitions Response Site, Barry M. Goldwater Range/Luke Air Force Base, Arizona., dated December 2018, and are recommended for acceptance.

14. DEFICIENCY TYPE (*select one*) ☒ a. Not Applicable ☐ b. Critical ☐ c. Major ☐ d. Minor

☐ e. Other, *Specify*

15. DATE: 2020-02-04

16. USACE REPRESENTATIVE'S SIGNATURE
DOTSON.ERIC.MICHAEL.1157472921 Digitally signed by DOTSON.ERIC.MICHAEL.1157472921 Date: 2020.02.04 07:47:16 -07'00'

17. CONTRACTOR REPRESENTATIVE'S NAME: Richard Endress (Parsons UXOQCS)

18. DATE: 2020-02-04

19. CONTRACTOR REPRESENTATIVE'S SIGNATURE (*indicating receipt of the QAR*)
Richard Endress Digitally signed by Richard Endress Date: 2020.02.05 04:15:40 -07'00'

20. **The Contractor will provide the following information to the Contract Specialist by the "Response Due" date above. Please contact the Contracting Officer's Representative (COR) or Project Manager if you have any questions.**

a. Contractor Response as to Cause and Actions Taken to Correct Current Condition and to Prevent Recurrence (*cite applicable quality control procedures or changes in plans, procedures, or practices*).

b. Contractor Representative's Authentication (*form must be signed before returning*)

(1) Printed Name	(2) Title	(3) Date Signed	(4) Signature

c. Government Evaluation (*acceptance, partial acceptance, etc.*)

d. Government Actions (*reduced payment, cure notice, show cause, other*)

e. Close Out	Name	Title	Date (*YYYY-MM-DD*)	Signature
(1) Contractor Notified				
(2) USACE PDT Representative				
(3) Contracting Officer or COR				

INSTRUCTIONS FOR ENG FORM 6048

Block 1. Report number.

Block 2. Name of USACE representative conducting the quality assurance (QA) activity.

Block 3. Date QA Activity completed.

Block 4. Project Name, i.e., “Camp Swampy (MRS-02).

Block 5. Project Location, i.e., “Smithville, Alaska”.

Block 6. Weather conditions, if applicable.

Block 7. Contractor and/or subcontractor executing the work.

Block 8. Contract number.

Block 9. Task Order number.

Block 10. List by name all official recipients of the QAR. At a minimum, the District Program/Project Manager must be selected.

Block 11. Enter the date that the contractor is to respond, if applicable.

Block 12. List all QA-related activities, inspections, audits conducted, operations observed, etc. Include specific references to applicable government quality requirements, i.e., Quality Assurance Surveillance Plans, Department of Defense, Army, and/or USACE requirements, policy, guidance, etc., requiring the inspection/audit being conducted. For example: “Spot-checked inventory of demolition explosives as required by the project QASP and approved Explosives Safety Submission (ESS).”

Block 13. Describe results and observations of each QA activity conducted. Attach discipline-specific checklists/documentation used. All deficiencies noted must include reference to the specific regulation or requirement that was violated. For example: “Demolition explosives stored on site were not inventoried weekly in accordance with ESS paragraph 4.2 and Work Plan paragraph 5.4. Last inventory was conducted 3 weeks ago on xx Feb 2013.”

Block 14. Select the type of deficiency, if any, observed. Use contract-specific definitions if available, or use the following general definitions:

a. Check the appropriate box.

b. Critical: A deficiency that is likely to result in hazardous or unsafe conditions for individuals using, maintaining, or depending upon the supplies or services; or is likely to prevent performance of a vital agency mission.

c. Major: A deficiency, other than critical, that is likely to result in failure of the supplies or services, or to materially reduce the usability of the supplies or services for their intended purpose.

d. Minor: A deficiency that is not likely to materially reduce the usability of the supplies or services for their intended purpose or is a departure from established standards having little bearing on the effective use or operation of the supplies or services.

Block 15. Date the USACE Representative signs.

Block 16. QA representative’s signature.

Block 17. Contractor Representative’s printed name.

Block 18. Date Contractor Representative signs.

Block 19. Contractor representative signature. Signature does not indicate concurrence with stated findings, only that contractor has received the report.

Block 20a. Contractor indicates action(s) taken to determine cause of the deficiency, action taken to correct immediate deficiency, and action taken to prevent a recurrence of the deficiency. Include dates of actions taken and a schedule for completion of planned actions.

Block 20b. Contractor representative’s printed name, title, date signed, and signature.

Block 20c. Indicate government acceptance of contractor’s actions to correct identified deficiencies.

Block 20d. Indicate negative government actions taken as a result of the deficiency.

Block 20e. Signature of contractor, PDT representative and contracting officer or COR indicating close out for all deficiencies indicated.

US ARMY CORPS OF ENGINEERS (USACE)
MUNITIONS RESPONSE
QUALITY ASSURANCE REPORT (QAR) FORM
The proponent agency is CESO. *See instructions on page 2.*

1. REPORT NO. *(1,2,3, etc., for the Task Order (T.O.))*
8

2. USACE REPRESENTATIVE'S NAME
Eric M. Dotson

3. DATE ACTIVITY COMPLETED
2020-03-17

4. PROJECT NAME
RI/FS Area A BMGR

5. PROJECT LOCATION
Barry M. Goldwater (BMGR) Area A, AZ

6. WEATHER CONDITIONS
N/A

7. CONTRACTOR
Parsons

8. CONTRACT NUMBER W912DY-16-D-0024

9. T.O. NUMBER W9128F-17-F-0255

10. DISTRIBUTED TO (*check boxes and insert individual's name*)

☒ a. District Program/Project Manager David Johansen (USACE PM)

☒ b. Design Center Jim Bond (USACE OESS Section Chief)

☐ c. Remedial Action District TM

☒ d. Contractor Richard Endress (Parsons UXOQCS)

11. RESPONSE DUE DATE (*Based on type of nonconformance, IF REQUIRED)*

12. TYPE OF ACTIVITY CONDUCTED (*Include types of inspections/audits conducted, operations observed, etc.)*
Government Quality Assurance Inspection of Work Performed - Surface Clearance of MEC/MPPEH.

13. RESULTS AND OBSERVATIONS
QA Inspection was performed on the following grids F4, G4, G5, G7, H4, H7 & J6 and have passed government QA Inspection for Definable Feature of Work 2A Visual Surveys (Coverage/Detection), IAW UFP-QAPP for Remedial Investigation/Feasibility Study at the Area A Munitions Response Site, Barry M. Goldwater Range/Luke Air Force Base, Arizona., dated December 2018, and are recommended for acceptance.

14. DEFICIENCY TYPE (*select one*) ☒ a. Not Applicable ☐ b. Critical ☐ c. Major ☐ d. Minor

☐ e. Other, *Specify*

15. DATE
2020-03-18

16. USACE REPRESENTATIVE'S SIGNATURE
DOTSON.ERIC.MICHAEL.1157472921 Digitally signed by DOTSON.ERIC.MICHAEL.1157472921 Date: 2020.03.18 03:55:45 -07'00'

17. CONTRACTOR REPRESENTATIVE'S NAME Richard Endress (Parsons UXOQCS)

18. DATE
2020-03-18

19. CONTRACTOR REPRESENTATIVE'S SIGNATURE (*indicating receipt of the QAR*)
Richard Endress Digitally signed by Richard Endress Date: 2020.03.18 13:30:21 -07'00'

20. **The Contractor will provide the following information to the Contract Specialist by the "Response Due" date above. Please contact the Contracting Officer's Representative (COR) or Project Manager if you have any questions.**

a. Contractor Response as to Cause and Actions Taken to Correct Current Condition and to Prevent Recurrence (*cite applicable quality control procedures or changes in plans, procedures, or practices*).

b. Contractor Representative's Authentication (*form must be signed before returning*)

(1) Printed Name	(2) Title	(3) Date Signed	(4) Signature

c. Government Evaluation (*acceptance, partial acceptance, etc.*)

d. Government Actions (*reduced payment, cure notice, show cause, other*)

e. Close Out	Name	Title	Date (*YYYY-MM-DD*)	Signature
(1) Contractor Notified				
(2) USACE PDT Representative				
(3) Contracting Officer or COR				

INSTRUCTIONS FOR ENG FORM 6048

Block 1. Report number.

Block 2. Name of USACE representative conducting the quality assurance (QA) activity.

Block 3. Date QA Activity completed.

Block 4. Project Name, i.e., “Camp Swampy (MRS-02).

Block 5. Project Location, i.e., “Smithville, Alaska”.

Block 6. Weather conditions, if applicable.

Block 7. Contractor and/or subcontractor executing the work.

Block 8. Contract number.

Block 9. Task Order number.

Block 10. List by name all official recipients of the QAR. At a minimum, the District Program/Project Manager must be selected.

Block 11. Enter the date that the contractor is to respond, if applicable.

Block 12. List all QA-related activities, inspections, audits conducted, operations observed, etc. Include specific references to applicable government quality requirements, i.e., Quality Assurance Surveillance Plans, Department of Defense, Army, and/or USACE requirements, policy, guidance, etc., requiring the inspection/audit being conducted. For example: “Spot-checked inventory of demolition explosives as required by the project QASP and approved Explosives Safety Submission (ESS).”

Block 13. Describe results and observations of each QA activity conducted. Attach discipline-specific checklists/documentation used. All deficiencies noted must include reference to the specific regulation or requirement that was violated. For example: “Demolition explosives stored on site were not inventoried weekly in accordance with ESS paragraph 4.2 and Work Plan paragraph 5.4. Last inventory was conducted 3 weeks ago on xx Feb 2013.”

Block 14. Select the type of deficiency, if any, observed. Use contract-specific definitions if available, or use the following general definitions:

a. Check the appropriate box.

b. Critical: A deficiency that is likely to result in hazardous or unsafe conditions for individuals using, maintaining, or depending upon the supplies or services; or is likely to prevent performance of a vital agency mission.

c. Major: A deficiency, other than critical, that is likely to result in failure of the supplies or services, or to materially reduce the usability of the supplies or services for their intended purpose.

d. Minor: A deficiency that is not likely to materially reduce the usability of the supplies or services for their intended purpose or is a departure from established standards having little bearing on the effective use or operation of the supplies or services.

Block 15. Date the USACE Representative signs.

Block 16. QA representative’s signature.

Block 17. Contractor Representative’s printed name.

Block 18. Date Contractor Representative signs.

Block 19. Contractor representative signature. Signature does not indicate concurrence with stated findings, only that contractor has received the report.

Block 20a. Contractor indicates action(s) taken to determine cause of the deficiency, action taken to correct immediate deficiency, and action taken to prevent a recurrence of the deficiency. Include dates of actions taken and a schedule for completion of planned actions.

Block 20b. Contractor representative’s printed name, title, date signed, and signature.

Block 20c. Indicate government acceptance of contractor’s actions to correct identified deficiencies.

Block 20d. Indicate negative government actions taken as a result of the deficiency.

Block 20e. Signature of contractor, PDT representative and contracting officer or COR indicating close out for all deficiencies indicated.

US ARMY CORPS OF ENGINEERS (USACE)
MUNITIONS RESPONSE
QUALITY ASSURANCE REPORT (QAR) FORM
The proponent agency is CESO. *See instructions on page 2.*

1. REPORT NO. *(1,2,3, etc., for the Task Order (T.O.))*: 9

2. USACE REPRESENTATIVE'S NAME: Jeffery R. Young

3. DATE ACTIVITY COMPLETED: 2020-05-12

4. PROJECT NAME: RI/FS Area A BMGR

5. PROJECT LOCATION: Barry M. Goldwater (BMGR) Area A, AZ

6. WEATHER CONDITIONS: N/A

7. CONTRACTOR: Parsons

8. CONTRACT NUMBER: Contract No. W912DY-16-D-0024

9. T.O. NUMBER: W912DY-17-W9128F-17-F-0255

10. DISTRIBUTED TO (*check boxes and insert individual's name*)

- ☒ a. District Program/Project Manager David Johansen (USACE PM)
- ☒ b. Design Center Jim Bond (USACE OESS Section Chief)
- ☐ c. Remedial Action District TM
- ☒ d. Contractor Christian Ten Braak (Parsons PM)

11. RESPONSE DUE DATE (*Based on type of nonconformance, IF REQUIRED)*

12. TYPE OF ACTIVITY CONDUCTED (*Include types of inspections/audits conducted, operations observed, etc.)*
Government Quality Assurance Inspection of Work Performed - Surface Clearance of MEC/MPPEH/MD.

13. RESULTS AND OBSERVATIONS
QA Inspection was performed on the listed grids. The following (03) grids were inspected K7 (525.979242 acres), J7 (1,639.14 acres), I7 (1,669.81885 acres), (3,834.938092 acres total) and have passed government QA Inspection for Definable Feature of Work 2A Visual Surveys (Coverage/Detection), IAW REMEDIAL INVESTIGATION/FEASIBILITY STUDY UFP-QAPP for AREA A MUNITIONS RESPONSE SITE BARRY M. GOLDWATER RANGE/ LUKE AIR FORCE BASE, and are recommended for acceptance.

14. DEFICIENCY TYPE (*select one*) ☒ a. Not Applicable ☐ b. Critical ☐ c. Major ☐ d. Minor

☐ e. Other, *Specify*

15. DATE: 2020-05-12

16. USACE REPRESENTATIVE'S SIGNATURE: YOUNG.JEFFERY.RAY.1179052004 Digitally signed by YOUNG.JEFFERY.RAY.1179052004 Date: 2020.05.12 15:31:00 -05'00'

17. CONTRACTOR REPRESENTATIVE'S NAME: Christian Ten Braak (Parsons PM)

18. DATE: 2020-05-12

19. CONTRACTOR REPRESENTATIVE'S SIGNATURE (*indicating receipt of the QAR*)
Chris tenBraak Digitally signed by Chris tenBraak Date: 2020.05.12 16:45:36 -06'00'

20. **The Contractor will provide the following information to the Contract Specialist by the "Response Due" date above. Please contact the Contracting Officer's Representative (COR) or Project Manager if you have any questions.**

a. Contractor Response as to Cause and Actions Taken to Correct Current Condition and to Prevent Recurrence (*cite applicable quality control procedures or changes in plans, procedures, or practices*).

b. Contractor Representative's Authentication (*form must be signed before returning*)

(1) Printed Name	(2) Title	(3) Date Signed	(4) Signature

c. Government Evaluation (*acceptance, partial acceptance, etc.*)

d. Government Actions (*reduced payment, cure notice, show cause, other*)

e. Close Out	Name	Title	Date (*YYYY-MM-DD*)	Signature
(1) Contractor Notified				
(2) USACE PDT Representative				
(3) Contracting Officer or COR				

INSTRUCTIONS FOR ENG FORM 6048

Block 1. Report number.

Block 2. Name of USACE representative conducting the quality assurance (QA) activity.

Block 3. Date QA Activity completed.

Block 4. Project Name, i.e., “Camp Swampy (MRS-02).

Block 5. Project Location, i.e., “Smithville, Alaska”.

Block 6. Weather conditions, if applicable.

Block 7. Contractor and/or subcontractor executing the work.

Block 8. Contract number.

Block 9. Task Order number.

Block 10. List by name all official recipients of the QAR. At a minimum, the District Program/Project Manager must be selected.

Block 11. Enter the date that the contractor is to respond, if applicable.

Block 12. List all QA-related activities, inspections, audits conducted, operations observed, etc. Include specific references to applicable government quality requirements, i.e., Quality Assurance Surveillance Plans, Department of Defense, Army, and/or USACE requirements, policy, guidance, etc., requiring the inspection/audit being conducted. For example: “Spot-checked inventory of demolition explosives as required by the project QASP and approved Explosives Safety Submission (ESS).”

Block 13. Describe results and observations of each QA activity conducted. Attach discipline-specific checklists/documentation used. All deficiencies noted must include reference to the specific regulation or requirement that was violated. For example: “Demolition explosives stored on site were not inventoried weekly in accordance with ESS paragraph 4.2 and Work Plan paragraph 5.4. Last inventory was conducted 3 weeks ago on xx Feb 2013.”

Block 14. Select the type of deficiency, if any, observed. Use contract-specific definitions if available, or use the following general definitions:

a. Check the appropriate box.

b. Critical: A deficiency that is likely to result in hazardous or unsafe conditions for individuals using, maintaining, or depending upon the supplies or services; or is likely to prevent performance of a vital agency mission.

c. Major: A deficiency, other than critical, that is likely to result in failure of the supplies or services, or to materially reduce the usability of the supplies or services for their intended purpose.

d. Minor: A deficiency that is not likely to materially reduce the usability of the supplies or services for their intended purpose or is a departure from established standards having little bearing on the effective use or operation of the supplies or services.

Block 15. Date the USACE Representative signs.

Block 16. QA representative’s signature.

Block 17. Contractor Representative’s printed name.

Block 18. Date Contractor Representative signs.

Block 19. Contractor representative signature. Signature does not indicate concurrence with stated findings, only that contractor has received the report.

Block 20a. Contractor indicates action(s) taken to determine cause of the deficiency, action taken to correct immediate deficiency, and action taken to prevent a recurrence of the deficiency. Include dates of actions taken and a schedule for completion of planned actions.

Block 20b. Contractor representative’s printed name, title, date signed, and signature.

Block 20c. Indicate government acceptance of contractor’s actions to correct identified deficiencies.

Block 20d. Indicate negative government actions taken as a result of the deficiency.

Block 20e. Signature of contractor, PDT representative and contracting officer or COR indicating close out for all deficiencies indicated.

US ARMY CORPS OF ENGINEERS (USACE)
MUNITIONS RESPONSE
QUALITY ASSURANCE REPORT (QAR) FORM
The proponent agency is CESO. *See instructions on page 2.*

1. REPORT NO. *(1,2,3, etc., for the Task Order (T.O.))*
10

2. USACE REPRESENTATIVE'S NAME
Phillip R. Couch

3. DATE ACTIVITY COMPLETED
2021-04-17

4. PROJECT NAME
RI/FS Area A BMGR

5. PROJECT LOCATION
Barry M. Goldwater (BMGR), Area A, AZ

6. WEATHER CONDITIONS
NA

7. CONTRACTOR
Parsons

8. CONTRACT NUMBER W912DY-16-D-0024

9. T.O. NUMBER W912DT-17-W9128F-17-F-0255

10. DISTRIBUTED TO (*check boxes and insert individual's name*)

☒ a. District Program/Project Manager David Johanson (USACE PM)

☒ b. Design Center Jim Bond (USACE OESS Section Chief)

☐ c. Remedial Action District TM

☒ d. Contractor Christian Ten Braak (Parsons PM)

11. RESPONSE DUE DATE (*Based on type of nonconformance, IF REQUIRED)*

12. TYPE OF ACTIVITY CONDUCTED (*Include types of inspections/audits conducted, operations observed, etc.)*
Government Quality Assurance Inspection of Work Performed-Surface Clearance of MEC/MPPEH/MD.

13. RESULTS AND OBSERVATIONS
A Quality Assurance (QA) inspection was performed on the following (04) listed grids: Grid H6 (840.31197 acres), Grid I5 (1985.44696 acres), Grid I6 (2146.26011) & Grid J5 (1496.77819). All have passed government QA inspection for Definable Feature of Work 2A Visual Surveys (Coverage Detection), IAW Remedial Investigation/Feasibility Study UFP-QAPP for Area A Munitions Response Site Barry M. Goldwater Range/Luke Air Force Base and are recommended for acceptance.

14. DEFICIENCY TYPE (*select one*) ☒ a. Not Applicable ☐ b. Critical ☐ c. Major ☐ d. Minor

☐ e. Other, *Specify* QA Inspection

15. DATE
2021-05-21

16. USACE REPRESENTATIVE'S SIGNATURE
COUCH.PHILLIP.R.1103457536 Digitally signed by COUCH.PHILLIP.R.1103457536 Date: 2021.05.21 13:49:23 -05'00'

17. CONTRACTOR REPRESENTATIVE'S NAME Chris tenBraak, Parsons

18. DATE
2021-05-21

19. CONTRACTOR REPRESENTATIVE'S SIGNATURE (*indicating receipt of the QAR*)
Chris tenBraak Digitally signed by Chris tenBraak Date: 2021.05.21 16:48:37 -06'00'

20. **The Contractor will provide the following information to the Contract Specialist by the "Response Due" date above. Please contact the Contracting Officer's Representative (COR) or Project Manager if you have any questions.**

a. Contractor Response as to Cause and Actions Taken to Correct Current Condition and to Prevent Recurrence (*cite applicable quality control procedures or changes in plans, procedures, or practices*).

b. Contractor Representative's Authentication (*form must be signed before returning*)

(1) Printed Name	(2) Title	(3) Date Signed	(4) Signature

c. Government Evaluation (*acceptance, partial acceptance, etc.*)

d. Government Actions (*reduced payment, cure notice, show cause, other*)

e. Close Out	Name	Title	Date (*YYYY-MM-DD*)	Signature
(1) Contractor Notified				
(2) USACE PDT Representative				
(3) Contracting Officer or COR				

INSTRUCTIONS FOR ENG FORM 6048

Block 1. Report number.

Block 2. Name of USACE representative conducting the quality assurance (QA) activity.

Block 3. Date QA Activity completed.

Block 4. Project Name, i.e., “Camp Swampy (MRS-02).

Block 5. Project Location, i.e., “Smithville, Alaska”.

Block 6. Weather conditions, if applicable.

Block 7. Contractor and/or subcontractor executing the work.

Block 8. Contract number.

Block 9. Task Order number.

Block 10. List by name all official recipients of the QAR. At a minimum, the District Program/Project Manager must be selected.

Block 11. Enter the date that the contractor is to respond, if applicable.

Block 12. List all QA-related activities, inspections, audits conducted, operations observed, etc. Include specific references to applicable government quality requirements, i.e., Quality Assurance Surveillance Plans, Department of Defense, Army, and/or USACE requirements, policy, guidance, etc., requiring the inspection/audit being conducted. For example: “Spot-checked inventory of demolition explosives as required by the project QASP and approved Explosives Safety Submission (ESS).”

Block 13. Describe results and observations of each QA activity conducted. Attach discipline-specific checklists/documentation used. All deficiencies noted must include reference to the specific regulation or requirement that was violated. For example: “Demolition explosives stored on site were not inventoried weekly in accordance with ESS paragraph 4.2 and Work Plan paragraph 5.4. Last inventory was conducted 3 weeks ago on xx Feb 2013.”

Block 14. Select the type of deficiency, if any, observed. Use contract-specific definitions if available, or use the following general definitions:

a. Check the appropriate box.

b. Critical: A deficiency that is likely to result in hazardous or unsafe conditions for individuals using, maintaining, or depending upon the supplies or services; or is likely to prevent performance of a vital agency mission.

c. Major: A deficiency, other than critical, that is likely to result in failure of the supplies or services, or to materially reduce the usability of the supplies or services for their intended purpose.

d. Minor: A deficiency that is not likely to materially reduce the usability of the supplies or services for their intended purpose or is a departure from established standards having little bearing on the effective use or operation of the supplies or services.

Block 15. Date the USACE Representative signs.

Block 16. QA representative’s signature.

Block 17. Contractor Representative’s printed name.

Block 18. Date Contractor Representative signs.

Block 19. Contractor representative signature. Signature does not indicate concurrence with stated findings, only that contractor has received the report.

Block 20a. Contractor indicates action(s) taken to determine cause of the deficiency, action taken to correct immediate deficiency, and action taken to prevent a recurrence of the deficiency. Include dates of actions taken and a schedule for completion of planned actions.

Block 20b. Contractor representative’s printed name, title, date signed, and signature.

Block 20c. Indicate government acceptance of contractor’s actions to correct identified deficiencies.

Block 20d. Indicate negative government actions taken as a result of the deficiency.

Block 20e. Signature of contractor, PDT representative and contracting officer or COR indicating close out for all deficiencies indicated.

US ARMY CORPS OF ENGINEERS (USACE)
MUNITIONS RESPONSE
QUALITY ASSURANCE REPORT (QAR) FORM
The proponent agency is CESO. *See instructions on page 2.*

1. REPORT NO. *(1,2,3, etc., for the Task Order (T.O.))*: 11

2. USACE REPRESENTATIVE'S NAME: Phillip R. Couch

3. DATE ACTIVITY COMPLETED: 2021-05-13

4. PROJECT NAME: RI/FS Area A BMGR

5. PROJECT LOCATION: Barry M. Goldwater (BMGR), Area A, AZ

6. WEATHER CONDITIONS: NA

7. CONTRACTOR: Parsons

8. CONTRACT NUMBER: W912DY-16-D-0024

9. T.O. NUMBER: W912DT-17-W9128F-17-F-0255

10. DISTRIBUTED TO (*check boxes and insert individual's name*)

- ☒ a. District Program/Project Manager: David Johanson (USACE PM)
- ☒ b. Design Center: Jim Bond (USACE OESS Section Chief)
- ☐ c. Remedial Action District TM
- ☒ d. Contractor: Christian Ten Braak (Parsons PM)

11. RESPONSE DUE DATE (*Based on type of nonconformance, IF REQUIRED)*

12. TYPE OF ACTIVITY CONDUCTED (*Include types of inspections/audits conducted, operations observed, etc.)*
Government Quality Assurance Inspection of Work Performed-Surface Clearance of MEC/MPPEH/MD.

13. RESULTS AND OBSERVATIONS
A Quality Assurance (QA) inspection was performed on the following (04) listed grids: Grid D6 (14.287448 acres), Grid D7 (214.900127 acres), Grid E6 (1040.62519 acres), Grid E7 (201.904168 acres), Grid F5 (572.201511), Grid F6 (1614.03621), Grid F7 (207.615365 acres), and Grid G6 (1052.82499). All have passed government QA inspection for Definable Feature of Work 2A Visual Surveys (Coverage Detection), IAW Remedial Investigation/Feasibility Study UFP-QAPP for Area A Munitions Response Site Barry M. Goldwater Range/Luke Air Force Base and are recommended for acceptance.

14. DEFICIENCY TYPE (*select one*) ☒ a. Not Applicable ☐ b. Critical ☐ c. Major ☐ d. Minor

☐ e. Other, *Specify* QA Inspection

15. DATE: 2021-05-21

16. USACE REPRESENTATIVE'S SIGNATURE: COUCH.PHILLIP.R.1103457536 Digitally signed by COUCH.PHILLIP.R.1103457536 Date: 2021.05.21 13:46:57 -05'00'

17. CONTRACTOR REPRESENTATIVE'S NAME: Chris tenBraak, Parsons

18. DATE: 2021-05-21

19. CONTRACTOR REPRESENTATIVE'S SIGNATURE (*indicating receipt of the QAR*)
Chris tenBraak Digitally signed by Chris tenBraak Date: 2021.05.21 16:49:51 -06'00'

20. **The Contractor will provide the following information to the Contract Specialist by the "Response Due" date above. Please contact the Contracting Officer's Representative (COR) or Project Manager if you have any questions.**

a. Contractor Response as to Cause and Actions Taken to Correct Current Condition and to Prevent Recurrence (*cite applicable quality control procedures or changes in plans, procedures, or practices*).

b. Contractor Representative's Authentication (*form must be signed before returning*)

(1) Printed Name	(2) Title	(3) Date Signed	(4) Signature

c. Government Evaluation (*acceptance, partial acceptance, etc.*)

d. Government Actions (*reduced payment, cure notice, show cause, other*)

e. Close Out	Name	Title	Date (*YYYY-MM-DD*)	Signature
(1) Contractor Notified				
(2) USACE PDT Representative				
(3) Contracting Officer or COR				

INSTRUCTIONS FOR ENG FORM 6048

Block 1. Report number.

Block 2. Name of USACE representative conducting the quality assurance (QA) activity.

Block 3. Date QA Activity completed.

Block 4. Project Name, i.e., “Camp Swampy (MRS-02).

Block 5. Project Location, i.e., “Smithville, Alaska”.

Block 6. Weather conditions, if applicable.

Block 7. Contractor and/or subcontractor executing the work.

Block 8. Contract number.

Block 9. Task Order number.

Block 10. List by name all official recipients of the QAR. At a minimum, the District Program/Project Manager must be selected.

Block 11. Enter the date that the contractor is to respond, if applicable.

Block 12. List all QA-related activities, inspections, audits conducted, operations observed, etc. Include specific references to applicable government quality requirements, i.e., Quality Assurance Surveillance Plans, Department of Defense, Army, and/or USACE requirements, policy, guidance, etc., requiring the inspection/audit being conducted. For example: “Spot-checked inventory of demolition explosives as required by the project QASP and approved Explosives Safety Submission (ESS).”

Block 13. Describe results and observations of each QA activity conducted. Attach discipline-specific checklists/documentation used. All deficiencies noted must include reference to the specific regulation or requirement that was violated. For example: “Demolition explosives stored on site were not inventoried weekly in accordance with ESS paragraph 4.2 and Work Plan paragraph 5.4. Last inventory was conducted 3 weeks ago on xx Feb 2013.”

Block 14. Select the type of deficiency, if any, observed. Use contract-specific definitions if available, or use the following general definitions:

a. Check the appropriate box.

b. Critical: A deficiency that is likely to result in hazardous or unsafe conditions for individuals using, maintaining, or depending upon the supplies or services; or is likely to prevent performance of a vital agency mission.

c. Major: A deficiency, other than critical, that is likely to result in failure of the supplies or services, or to materially reduce the usability of the supplies or services for their intended purpose.

d. Minor: A deficiency that is not likely to materially reduce the usability of the supplies or services for their intended purpose or is a departure from established standards having little bearing on the effective use or operation of the supplies or services.

Block 15. Date the USACE Representative signs.

Block 16. QA representative’s signature.

Block 17. Contractor Representative’s printed name.

Block 18. Date Contractor Representative signs.

Block 19. Contractor representative signature. Signature does not indicate concurrence with stated findings, only that contractor has received the report.

Block 20a. Contractor indicates action(s) taken to determine cause of the deficiency, action taken to correct immediate deficiency, and action taken to prevent a recurrence of the deficiency. Include dates of actions taken and a schedule for completion of planned actions.

Block 20b. Contractor representative’s printed name, title, date signed, and signature.

Block 20c. Indicate government acceptance of contractor’s actions to correct identified deficiencies.

Block 20d. Indicate negative government actions taken as a result of the deficiency.

Block 20e. Signature of contractor, PDT representative and contracting officer or COR indicating close out for all deficiencies indicated.