Site Assessment and Closure Plan

Adams County Shooting Range

November 10, 2016

Prepared By:

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ACRONYMS

ACA: Additional Characterization Area

AQCC: Air Quality Control Commission

ASTM: American Society for Testing and Materials

bcy: Bank Cubic Yards

bgs: below ground surface

BLC: Boulder Land Consultants, Inc.

BMP: Best Management Practices

BOA: Balance of Area

CAP: Corrective Action Plan

CCTV: Closed Circuit Television

CD: Certificate of Designation

CDH: Colorado Department of Health

CDPHE: Colorado Department of Public Health and Environment

CDPS: Colorado Discharge Permit System

CGS: Colorado Groundwater Standards

CMP: Corrugated Metal Pipe

COC: Contaminants of Concern

COGCC: Colorado Oil and Gas Conservation Commission

CQA: Construction Quality Assurance

CSEV: Colorado Soil Evaluation Values

DEHP: Di-ethylhexl-pthalate

DO: Dissolved Oxygen

DQO: Data Quality Objective

DWR: Division of Water Resources

ESA: Environmental Site Assessment

EPA: Environmental Protection Agency

FSL: Field Screening Level

GMP: Gas Monitoring Probe

GPL: Groundwater Protection Level

gpm: Gallons Per Minute

GPS: Global Positioning System

HASP: Health and Safety Plan

HMWMD: Hazardous Materials and Waste Management Division

K: Hydraulic Conductivity

LEL: Lower Explosive Limit

MCL: Maximum Contaminant Level

MSW: Municipal Solid Waste

MT2: Metals Treatment Technologies

O&G: Oil and Gas

OM&M: Operations, Maintenance, and Monitoring

ORP: Oxidation-Reduction Potential

OSHA: Occupational Safety and Health Administration

PAH: Polynuclear Aromatic Hydrocarbons

PCB: Polychlorinated Biphenyls

PID: Photoionization Detector

POC: Point of Compliance

ppm: parts per million

ppmV: parts per million by volume

PVC: Polyvinyl Chloride

QA/QC Quality Assurance and Quality Control

RCRA: Resource Conservation and Recovery Act

REC: Recognized Environmental Condition

RSL: Regional Screening Levels

SAP: Sampling and Analysis Plan

SPLP: Synthetic Precipitation Leachate Procedure

SSO: Site Safety Officer

SVOC: Semivolatile Organic Compounds

SWAT: Special Weapons And Tactics

SWMP: Storm Water Management Plan

TAL: Test America Laboratories

TCHD: Tri-County Health Department

TCLP: Toxicity Characteristic Leaching Procedure

TOC: Top of Casing

TSCA: Toxic Substances Control Act

USCS: Unified Soil Classification System

USGS: United States Geological Survey

VCUP: Voluntary Clean Up Program

VEC: Vapor Encroachment Condition

VOC: Volatile Organic Compound

WBC: Water-Balance Cover

WMI: Waste Management Inc.

WQCC: Water Quality Control Commission

WQCD: Water Quality Control Division

XRF: X-Ray Fluorescence

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1.0 INTRODUCTION

In October 2015, Adams County (the County) retained Quantum Water & Environment and its team of subcontractors (Burns & McDonnell, Metals Treatment Technologies [MT2], DS Environmental Consulting, and JA Environmental) (collectively referred to as Quantum) to conduct a site assessment and closure plan for the 29-acre Sheriff's Shooting Range property located at 14451 Riverdale Road in unincorporated Adams County, Colorado (Site). This Site Assessment and Closure Plan Report (Report) discusses the results of site assessment activities and proposes corrective actions to restore the Site to a condition that is protective of human health and the environment and is consistent with the planned end use. Following site restoration, the County envisions the Site being used as open space or solar farm.

The County acquired the property in 1970 and since that time the Site was operated as a municipal solid waste (MSW) landfill, a firearms training facility, and has been used for oil and gas (O&G) production by the Texas American Oil Company (Texas Tea). A Topographic Map and Site Plan are included as Figures 1 and 2, respectively.

The Quantum Team member roles are as follows:

- Quantum Water & Environment - Program management,
- MT2 - Shooting range consultant,
- Burns & McDonnell - Landfill cover design,
- DS Consulting - Building surveys and demolition specifications,
- JA Environmental - Remediation consultant, and
- Boulder Land Consultants - Land surveys.

In December 2015, Quantum met with representatives of the Colorado Department of Public Health and Environment (CDPHE) Hazardous Materials and Waste Management Division (HMWMD) to determine regulatory authorities and regulations applicable to the cleanup of the Site. It was mutually agreed that environmental impacts associated with the former firearms training facility will be mitigated in accordance with the Integrated Corrective Action Plan (CAP) program of the Resource Conservation and Recovery Act (RCRA) regulations. On April 11, 2016, the County filed a CAP application with CDPHE and a copy of this letter is included in Appendix A. This Report summarizes the results of shallow soil sampling of the shooting range soil areas to determine the level and extent of soil impacts. The CAP sections of this Report discuss the proposed approach to treating shooting range soils on-Site to reduce metals leachability and placement of the soil on-Site as gradefill beneath the proposed landfill soil cover.

As part of landfilling operations in the 1970's, a 30" diameter, corrugated metal pipe (CMP) storm water drainage pipe was installed near the bottom of the landfill waste to drain an approximate 150-acre watershed area immediately west of the site. This pipe is a critical storm water conveyance for the Todd Creek Farms residential development. Investigations by Quantum in 2016 revealed that the buried CMP is at least partially crushed and is obstructed by tires and brush in at least two locations in the pipe. This Report provides a summary of the investigations of the pipe integrity and provides a recommendation to install a new storm water drainage pipe.

The existing MSW landfill was not closed and capped in accordance with CDPHE regulations. The permanent closure and capping of the landfill will be completed in accordance with the Colorado Solid Waste Regulations and guidance provided by the Solid Waste Division of CDPHE. This Report includes a Conceptual Cover Plan that summarizes the proposed approach to regrading the Site to attain required slopes and drainage, placing

a CDPHE-approved Water-Balance Cover (WBC) over the limits of landfill waste, and implementing a long-term maintenance and monitoring plan to evaluate groundwater quality and potential migration of landfill gas.

Additionally, Quantum has requested that CDPHE consider the portions of this project that involve permanent landfill closure for eligibility into the CDPHE Voluntary Cleanup Program (VCUP). The landfill operator received a Certificate of Designation (CD) in 1970, two years prior to the effective date of the Colorado Solid Waste Regulations (April 1972). The County has voluntarily undertaken the cleanup of this Site and the County is evaluating several land use options, CDPHE has indicated that it will make a determination of VCUP eligibility upon review of this Report (Henderson 2016).

In late spring 2016, the Colorado Oil and Gas Conservation Commission (COGCC) foreclosed on Texas Tea's financial assurance and the agency has subsequently prohibited the O&G production company from conducting O&G operations in the State of Colorado. In late 2016, COGCC is planning to retain a contractor to abandon the Texas Tea well and remove equipment and appurtenances associated with the O&G facility.

Anadarko Oil Company (Anadarko) has a deeded 50-foot easement for a gathering O&G pipeline which trends from southeast to northwest across the Site. The existing easement traverses portions of the landfill which is planned to be regraded and capped with a soil cover. Anadarko reports that the gathering line is no longer in use and will be emptied and permanently abandoned in place. The County and Anadarko are currently in discussions to negotiate a revised easement.

There are 13 buildings and miscellaneous items on-Site associated with the former firearms training facility. This Report discusses the results of regulated building materials surveys and the proposed demolitions and off-Site disposal of Site buildings, structures,waste tires, and miscellaneous debris.

This Report is generally organized as follows:

- Summary of Site Assessment Activities,
- CAP for Shooting Ranges, and
- Conceptual Closure Plan for MSW Landfill.

Following CDPHE approval of this Report, Quantum will prepare design and bidding documents for each specific work package. The proposed corrective actions for the shooting range and proposed conceptual closure plan for the landfill are discussed in Section 11 - Site Closure Plan.

2.0 PROJECT BACKGROUND

Geographically, the Site is located in the SW/4 of the SW/4 of Section 14, Township 1 South, Range 67 West. The Adams County Assessors identifies the Site as Parcel ID 0157114000009 (see Topographic Map, Figure 1).

In January 2016, Quantum completed a Phase I Environmental Site Assessment (ESA) on the Site (Quantum 2016A). The Phase I ESA identified the following Recognized Environmental Conditions (REC):

- The Site is listed as a historical solid waste landfill facility. The Adams County Landfill operated between 1970 and 1977. The landfill accepted sanitary waste, sludge, construction debris, and fly ash;
- The Site was occupied from approximately 1959 to 1970 by the Chuck-O-Luck Sporting Club, a private gun club, and from 1993 until approximately 2012 by the Adams County Sheriff's Department Firearms Training Facility. Operations included two shooting ranges, a Special Weapons Attack Team (SWAT) team training facility, two explosives magazines for detonation of confiscated fireworks and unexploded ordnance, a roll-off for bulk storage of confiscated unexploded ordnance, areas of bullet waste on the western portion of the landfill, and a pit to the north of the northern shooting range that was used for detonation of unexploded ordnance; and
- O&G production and transmission activities occurred at the Site from 1982 until approximately 2013 when the operator filed a Notice to Intent to Abandon the well. Existing facilities associated with the Texas Tea well include one out-of-service O&G well, flow line, meter shed, oil tank containment dike, produced water tank containment dike, and two electrical transformers. A buried O&G gathering line crosses the Site from east to west and a buried O&G gathering line extends from the meter shed west to the Site boundary. Both gathering lines are currently owned by the Anadarko.

The following Environmental Concerns were identified in the Phase I ESA:

- A 30-inch buried storm water drainage pipe trends beneath the landfill area from east to west and was reportedly placed within waste. Depending on the integrity of the pipe, the pipe may act as a conduit for landfill leachate to enter the Brantner ditch;
- Asbestos containing materials may be present within the landfill waste. Any earthwork activities should be conducted in accordance with the CDPHE, HMWMD, Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 5.5;
- The waste tires used for the SWAT team training facility should be managed in accordance with state and local regulations;
- The commercial water well located on the Site may be impacted by the landfill and on-Site septic tank and leach field. The well should be tested for water quality and assessed to determine compliance with Colorado Groundwater Standards;
- A Vapor Encroachment Condition (VEC) exists for the Site; and
- Based on the presence of the off-Site chicken waste landfill, which includes biological chicken waste and petroleum hydrocarbon impacted soils, a VEC cannot be ruled out for the north adjacent property.

In January 2016, the County, CDPHE, and Quantum conducted a site walk of the Shooting Range and landfill to familiarize CDPHE officials with the Site characteristics and to discuss the proposed phased approach to the assessment of the Site.

In May 2016, CDPHE approved Quantum's site-specific Sampling and Analysis Plan (SAP) and Health and Safety Plan (HASP) (Quantum 2016B). The purpose of the SAP was to further evaluate the significance of the RECs and Environmental Concerns identified in the Phase I ESA. The SAP describes data collection procedures and data evaluation processes to ensure that appropriate levels of data quality are obtained for field sampling, testing, and analytical activities. The characterization data obtained were used to estimate extents and locations of contaminants, and provide necessary information for the development of a CAP for the shooting ranges and a Closure Plan for the historic landfill.

In May 2016, Quantum began site assessment activities. Field activities were conducted in general accordance with the SAP and SAP Addenda, except where noted. Site assessment activities included the following:

- Off-Site domestic well sampling,
- Utility locates,
- Geophysical survey for landfill delineation,
- Closed circuit television (CCTV) of 30" storm water drainage pipe,
- Soil borings for landfill delineation and sludge characterization,
- Soil characterization sampling,
- Groundwater monitoring well installation and sampling,
- Existing off-Site domestic well and monitoring well monitoring,
- Piezometer installation,
- On-Site commercial well sampling,
- Aquifer testing,
- Landfill gas sampling,
- Shooting range assessment,
- Balance of Area (BOA) site walk,
- Skeet shooting area sampling,
- Explosives magazines/burn drum sampling,
- Sediment sampling,
- Storm water sampling,
- Off-Site spring sampling,
- Off-Site site walk to identify fragmented lead on ground surface, and
- Soil treatability study for lead leachability and treatment.

The tasks listed above are described in further detail in the following sections.

2.1 Previous Investigations

Based on the Phase I ESA, the following known previous investigations were conducted on or near the Site.

KRW Consulting, Inc., on behalf of Tri-County Health Department (TCHD), conducted a methane assessment at the Site during 2003 and 2004 (KRW Consulting, 2003; KRW Consulting, 2004A; KRW Consulting, 2004B; and KRW Consulting, 2004C). The assessment included the installation of ten gas monitoring probes (GMPs, three within the landfill and the remainder along the western and southern perimeters of the landfill) and monitoring of the GMPs using a LandTec Gem 500 field instrument for a duration of three months. Methane concentrations in the three probes installed in the landfill averaged 31.0, 38.2, and 28.1 percent by volume in air during this period. Readings at the perimeter probes did not detect methane during any of the events with the exception of one concentration of 0.1 percent by volume in air at a probe near the western boundary. Static

pressure readings indicated that there was not a strong pressure gradient driving landfill gas migration. The report concluded that methane migration off-Site was probably occurring, but that off-Site gas hazards were unlikely. Boring logs available from the GMP installations show the presence of waste materials within the three probes installed in the landfill area to depths up to 27 feet below ground surface (bgs) and do not indicate the presence of groundwater in any of the ten borings. KRW Consulting gas monitoring probe logs are included in Appendix B.

In January 2016, Quantum visited the Site and identified GMP-1 through GMP-4. The remaining off-Site GMPs no longer appear to be present. Combustible gas concentrations were measured from GMP-1 through GMP-3 located in the landfill area. The percent lower explosive limit (LEL) values were at or greater than 100% at each of the GMPs. Locations of the four GMPs are depicted on Figure 3.

2.2 Problem Definition

The County seeks to have the Site restored so that it can be used as an open space or solar farm. The County will determine the final level of restoration after redevelopment alternatives and associated restoration costs have been considered. In restoring the Site, the County's primary objectives are:

- Protect public health and environment by identifying and mitigating exposures both on and off the Site,
- Limit the County's long-term liability from environmental issues associated with the Site, and
- Obtain written approvals from CDPHE that risks associated with the Site have been been adequately mitigated.

Currently, the Site is vacant and may exhibit potential exposures to human health and the environment from the following:

- Lead and other heavy metal exposures from shooting range operations,
- Chemical and methane exposures from buried and/or surficial municipal waste in the landfill,
- Petroleum hydrocarbon exposures from oil and gas production operations,
- Explosives hazards from the magazines and burn drum, and
- Biological and safety concerns from structures and vegetation.

Quantum proposes these site assessment and closure planning steps to achieve the County's objectives:

- Implement Site Assessment,
- Submit Site Assessment and Closure Plan to CDPHE,
- Obtain CDPHE and County approvals,
- Prepare design and bidding documents for construction work packages,
- Prepare Closure Reports for Shooting Range and Landfill Cover,
- Conduct periodic Site maintenance and monitoring, and
- Obtain written approvals from CDPHE.

In discussions with CDPHE, the landfill closure scopes may be eligible for entry into the Colorado VCUP and associated Brownfield Tax Credits. The cleanup of the shooting ranges is not eligible for the VCUP because of the dates of operation and current RCRA regulations. However, the closure of the landfill, which includes placement of gradefill, regrading, and placement of soil cover, is potentially eligible for the VCUP. CDPHE will make a determination of VCUP eligibility following their review of this Report.

2.3 Regulatory Authorities and Cleanup Standards

The Site Assessment analytical results were compared to the following regulatory guidance and standards:

Asbestos – CDPHE HMWMD, Regulations Pertaining to Solid Waste Sites and Facilities, (6 CCR 1007-2, Part 1, Section 5.5 of the Regulation) (CDPHE HMWMD, 2015), CDPHE Air Quality Control Commission Regulation No. 8 (5 CCR 1001-10, Part B) (CDPHE Air Quality Control Commission [AQCC], 2008);

Soil – Environmental Protection Agency (EPA) Regional Screening Levels (RSL) guidance residential and industrial worker use scenarios (EPA, 2016), CDPHE Groundwater Protection Values Soil Cleanup Table (CDPHE HMWMD, 2014), Toxic Substances Control Act (TSCA, 1976); CDPHE Arsenic Concentrations in Soil, Risk Management Guidance for Evaluating (July 2014) (CDPHE, 2014);

Groundwater – CDPHE Basic Standards for Groundwater (Colorado Groundwater Standards (CGS), Rule 41, June 30, 2016) (CDPHE Water Quality Control Commission [WQCC], 2016), Appendix B of the CDPHE Solid Waste Regulations (January 14, 2015) (CDPHE HMWMD, 2015); and

Landfill Gas – CDPHE Indoor Air Guidance (September 2004) (CDPHE HMWMD, 2004), CDPHE Air Screening Concentrations Table (January 2016) (CDPHE HMWMD, 2016) if suspected source is a hazardous substance, and CDPHE Hazardous Materials and Waste Management Division, Regulations Pertaining to Solid Waste Sites and Facilities (Section 2.2 of the Regulation) (CDPHE HMWMD, 2015).

3.0 SITE HISTORY

The following background information was obtained from the Phase I ESA and follow-up discussions with the Adams County Sheriff and the Chief of the Adams County Hazardous Materials Unit.

Landfill Operations

The Site was reportedly used for gravel mining prior to the permitting of the Adams County Landfill in 1970. The original CD was issued to the County by the Colorado Department of Health (CDH) on July 13, 1970. Property Improvements, Inc. took over operations on February 24, 1971. During operation, the landfill accepted primarily MSW as well as digester sludge from the City of Brighton and reportedly received fly ash waste from the Public Service Company of Colorado Cherokee Power Plant, which was placed primarily in the southwestern portion of the Site in the current location of the explosives magazines. The landfill was reported to be out of compliance during the 1975 CDH annual inspection due to windblown debris, appearance, and inadequate cover material. The landfill was closed on April 1, 1977 because it had reached capacity.

Firearms Training Facility Operations

The Chuck-O-Luck Sporting Club (Chuck-O-Luck), a private shooting club, owned and occupied the Site from approximately 1959 to 1970 before selling the Site to the County. No information was recovered about the shooting activities that were conducted by Chuck-O-Luck. Based on recent Site Assessment data indicating the presence of skeet and elevated soil sampling results beneath the South Shooting Range asphalt pavement, it is believed that Chuck-O-Luck primarily used the South Shooting Range area for their operations.

The Adams County Sheriff's Office obtained approval from the Board of County Commissioners on June 21, 1993 to occupy the Site with a firearms training facility. The firearms training facility served the Adams County Sheriff's Office along with following agencies: Brighton Police Department, Commerce City Police Department, Federal Heights Police Department, Northglenn Police Department, Westminster Police Department, Thornton Police Department, the Adams County District, Attorney's Office, and the Colorado State Patrol. Domestic wastewater and water supply were supported by a septic system and a groundwater well, although bottled drinking water was supplied from an outside source. An armory was constructed for use by the Sheriff's Office and included a methane mitigation system to control potential methane migration into the building. Six major structures were built between 1991 and 2004 to support the facility and are still present. The Conditional Use Permit extension expired on August 8, 2012, but the training activities apparently continued with a temporary extension until the completion of the new Adams County Flatrock Training Center.

Firearm Training Areas

North and South Shooting Ranges: The North Shooting Range consists of the primary northernmost shooting range and the east-adjacent "Situation Range", and includes associated berms, range floors, and safety fan/ fallout areas. The South Shooting Range consists of the primary southernmost shooting range and the west-adjacent skeet-shooting area, and includes associated berms, range floors, and safety fan/fallout areas.

Field observations and documentation suggest that the shooting range berms were constructed by different means and have undergone maintenance throughout the life of the shooting ranges. The primary impact berm and back berm of the South Shooting Range, and possibly the lateral berms, appear to be constructed from excavated terraces in the native weathered bedrock and overlying alluvial materials. The berms enclosing the

North Shooting Range are most likely fill material that has been placed for berm purposes. The westernmost lateral berm of the North Shooting Range appears to be soil intermixed with reworked soil impacted by previous shooting range operations. Both the North Shooting Range and South Shooting Range impact berms have been maintained by MT2 on multiple occasions by sieving out fragmented lead for recycling, treating the soil with ECOBOND®, a patented non-hazardous metals stabilization product, and replacement of the treated soil in the berm areas. MT2 reportedly removed and recycled approximately 48,000 pounds of lead during the 2010 event and treated soils to below 2 milligrams per liter (mg/L) lead Toxicity Characteristic Leaching Procedure (TCLP) concentration before returning the treated soils to the berm areas.

SWAT Team Training Facility: The SWAT Team Training Facility is located in the southwest portion of the Site and consists of a structure resembling building hallways and rooms constructed of waste tires and a large pile of waste tires used by the SWAT team for shooting practice.

Explosives Magazines, Storage Roll-off, and Burn Drum: Two explosives magazines and one Waste Management Inc. (WMI) roll-off used for unexploded ordnance bulk storage are located near the southwestern boundary of the Site, and one above-ground storage tank converted into a burn drum for the detonation of unexploded ordnance is located on the landfill area to the north of the oil and gas well. These features may potentially have remnant explosives contamination present in soil.

The following information is a summary of telephone discussions between Quantum and the Adams County Sheriff (Michael McIntosh) and the Chief of the Adams County Hazardous Materials Unit (Roger Kelley).

Portions of the Site were used by the Hazardous Materials Unit to burn, detonate, or destroy evidence items such as fireworks, ammunition, and an occasional improvised explosive device. These activities were conducted on a portion of the former landfill in the west-central portion of the Site.

An Explosives Magazine Area and WMI roll-off container are located in the west-central portion of the Site. The Magazine Area consists of two magazine sheds (a wood blasting cap magazine shed and a steel explosives magazine shed) inside a rectangular fence with a locking gate. Explosives such as dynamite, shape charges, and detonation cord were stored in the sheds in the Magazine Area. Confiscated fireworks were stored in the roll-off container. Only the steel magazine shed and roll-off container are present on the Site and both are reported to be empty.

Fireworks were disposed in a 300-gallon burn drum located approximately 300 feet northeast of the Magazine Area. The fireworks were burned in the drum and the residue/debris was removed and disposed at a landfill off-Site. The burn drum is visible on-Site (see Site Plan, Figure 2).

Confiscated explosives were burned in a shallow pit on the Site. The pit reportedly measured approximately five to 6 feet wide by 1.5 feet deep. Dunnage (straw) and accelerant (diesel fuel) were added to the explosives to help complete full combustion of materials. The pit was reportedly located in the same general area as the burn drum, but its location has not been verified by Quantum.

Reportedly, hundreds of pounds of ammunition were burned in a self-contained trailer that was brought out to the Site near the same location as the burn drum. The ammunition was destroyed in a contained operation and the trailer has previously been removed from the Site. The fireworks, explosives, and munitions destruction activities were last conducted on the Site three to four years ago.

Waste Ammunition Disposal Areas: During site walks, several piles of bullet fragments intermixed with soil were observed outside of shooting range areas on top of the landfill area. The observed piles were approximately one cubic yard or less in size and contained a significant amount of waste bullet fragments.

Firearms used at the facility included semi-automatic handguns and rifles, automatic rifles, and shotguns. Ammunition sizes ranged from 0.38 to 0.57 caliber, 9 mm and 45 mm bullets. Sniper teams used the AR-15, M-16, and MP5 automatic rifles in the SWAT Team Training Area.

Oil and Gas Production

An O&G well was drilled and operated on the western portion of the Site by Texas Tea. Per discussions with representatives from COGCC and Anadarko, crude oil was separated into gas, oil, and produced water at a former separator located next to the meter shed. Separated oil and water were piped to a former oil tank and a former water tank. The remnants of the oil tank and water tank containment areas with soil dikes are still present. The natural gas was piped to a shed where the sales meter was located. Anadarko owns a gathering line that reportedly runs from the meter shed to the west Site boundary. Anadarko reports that the line has been "blown down" and is no longer in service. COGCC is planning to abandon the well, meter shed, and associated infrastructure up to the Anadarko gathering line.

4.0 CORRECTIVE ACTION PLAN APPLICATION

On April 11, 2016, the County submitted a CAP Permit Application to CDPHE pursuant to Section 100.26 (CAP) of the Colorado Hazardous Waste Regulations. On April 22, 2016, CDPHE issued the County an EPA Hazardous Waste Generator I.D. for a one-time, large quantity generator of hazardous waste. Copies of the CDPHE letters are included in Appendix A. Project contact information required by Section 100.26 is listed below:

Site Owner: Adams County, 4430 South Adams County Parkway Brighton, CO 80601-8208

Site Operator: Adams County Facility Operation & Planning Department 4430 South Adams County Parkway, Suite 1700
Brighton, CO 80601-8208

Site Contacts:

Ms. Jen Rutter, Senior Environmental Analyst
Community & Economic Development Department
Adams County, Colorado
Office Phone: 720-523-6841
Email: jrutter@adcogov.org

Mr. Sean Braden
Facility Planning and Operations
Adams County, Colorado
Office Phone: 720-523-6003
Email: sbraden@adcogov.org

EPA Identification Number: COR000241265

5.0 PHYSICAL SETTING

The Site is located 14451 Riverdale Road in Adams County, Colorado. The Site is bound to the north by industrial property used for an O&G production facility; to the south and west by residential property; to the east by Riverdale Road followed by Brantner Ditch and residential property; and to the southeast by agricultural property. Located approximately 700 feet east of the Site are two City of Thornton water storage ponds that receive water from the South Platte River located east of the Ponds.

According to the Phase I ESA, based on review of the United States Geological Survey (USGS), Brighton, Colorado quadrangle 7.5-minute series topographic map (published 1965, revised 1994). The Site lies within a sloped area approximately 5,050 feet above mean sea level, on average. The southern portion of the Site generally slopes to the east-northeast while the northern portion generally slopes to the south.

5.1 Soils/Geology

According to the United States Department of Agriculture's National Resources Conservation Service, the soils underlying the northern, western, and southwestern portions of the Site include the Gravelly Land-Shale Outcrop Complex soil unit. The Gravelly Land-Shale Outcrop Complex consists of gravelly sand derived from colluvium or slope alluvium and unweathered bedrock with very low to moderately low permeability rates. The soils underlying the southeastern and central portions of the Site include Ulm Loam. Ulm series soil forms in calcareous alluvium derived from sedimentary rock. Ulm Loam is generally found on alluvial fans, fan remnants, ridges, and hills with a slope gradient ranging from 0 to 18 percent and moderate to slow permeability.

The Site is geologically situated within the Denver Basin, in an asymmetric syncline of Tertiary and Cretaceous sedimentary rock layers. Denver Basin stratigraphic units include (in descending order from ground surface) Dawson Formation, Denver Formation, Arapahoe Formation, Laramie Formation, and the Fox Hills Sandstone. The Basin is bound on the west by the Front Range of the Rocky Mountains, on the north by the Hartville Uplift and the Chadron Arch, and on the south by the Apishapa Uplift and Las Animas Arch. The stratigraphic units dip more steeply on the western edge than near the eastern edge of the Basin due to the asymmetric orientation. According to the Surficial Geologic Map of the Denver 1 degree x 2 degree quadrangle, Colorado, the Property is underlain by andesitic clayey colluvium, a yellowish-brown clayey, very fine to very coarse quartz sand. The bedrock underlying the Site consists of Denver and Arapahoe formations, according to the USGS Geologic Map of Colorado.

Three geologic cross-sections were generated to depict the unconsolidated materials through the Site to a total depth of 60 feet bgs. These cross-sections illustrate the unconsolidated materials that were encountered during the drilling of the boreholes (Figures 3, 3A, 3B, and 3C).

Layers of clay, silty sandy clay, sandy silt and well sorted sand were found throughout the Site. A lense of gravel was located at the southern end of the site as illustrated on Figures 3B and 3C. Silty sand fill material was found above the waste and is depicted on Figure 3B. Beneath the waste material a silty sandy clay and a well sorted sand exist at approximately 4 to 5 ft and beneath those materials is a silty sand (Figure 3B).

5.2 Hydrogeology

The Site is situated within the South Platte River Basin. The South Platte River Basin drains an 18,924 square mile area within Colorado, Wyoming, and Nebraska. The South Platte River and its many tributaries originate in the Rocky Mountains of Colorado and descend eastward where the main stem and its tributaries converge near Greeley, Colorado. From Greeley, the main stem heads in a northeasterly direction where it exits the state of Colorado at Julesburg and enters Nebraska. Immediately east of the Property boundary, on the east side of Riverdale Road, is Brantner Ditch, an unlined irrigation ditch. The Brantner Ditch diverts water from the South Platte River upstream of the Property and ends at a location over ten miles north of the Property. The South Platte River, the geographically closest perennial stream to the Property, is approximately 1,900 feet to the east of the Site.

Underlying the unconsolidated sediments of the Site are the Denver Basin aquifers. The aquifer system is comprised of four aquifers including (in descending order) the Dawson, Denver, Arapahoe, and the Laramie-Fox Hills aquifers. At the Site, the uppermost bedrock aquifer is the Lower Arapahoe. The depth of the top of the aquifer is approximately at120 feet bgs based on the on-Site commercial well boring log (permit number 164204) that was completed into the Lower Arapahoe aquifer. The depth to water in the Lower Arapahoe aquifer beneath the Site as measured in the commercial well is 185 feet bgs. The confining unit (shale bedrock) above the Lower Arapahoe aquifer was encountered at the Site in monitoring well AC-MW-1 at 55 feet bgs, AC-MW-2 at 22 feet bgs and in the off-Site domestic well (permit number 78505-F) to the east of the Site at 20 feet bgs.

Depth to shallow groundwater was measured in the monitoring wells and piezometers on three occasions during the site assessment (Table 1). The on-Site gas monitoring probes were also measured once for groundwater level information. One monitoring well (AC-MW2), one piezometer (AC-P1) and two of the gas monitoring probes (GMP-2, GMP-3) did not have any measurable groundwater during the measurement period. The depth to shallow groundwater was measured in the on-Site monitoring wells and piezometers between the elevations of 5040.62 to 4984.96 feet above mean sea level. No groundwater was observed in fill materials that were encountered in some of the subsurface investigations.

Figure 3 illustrates the location of three cross-section lines that were created through the Site. Figures 3A through 3C are the cross-sections; two north-south and one east-west. These cross-sections illustrate the location of the subsurface materials in relation to the depth to groundwater. As depicted on the north-south cross section A-A' (Figure 3A) there is a separation of approximately 10 feet between the waste material and the groundwater. Groundwater was not observed in any boring, monitoring well or piezometer that penetrated the waste material.

The static water level occurs in gravel at the southern portion of the Site and in sandy silt to silt through the rest of the Site based on the lithologic logs of the piezometers and monitoring wells (Appendix C1), and as illustrated on the cross-sections Figures 3A through 3C. The groundwater occurs in both silty sands and clays at depth beneath the Site.

The depth to groundwater data were used to contour the surface of the shallow groundwater underlying the Site (Figure 3). Based on the contours, it is determined that the flow direction is to the east of the Site toward the South Platte River. The slope of the water table as calculated from the contoured surface is 0.052 feet/foot.

Slug tests were conducted on three of the monitoring wells, AC-MW-1, AC-MW-4, and AC-MW-5 to obtain general hydraulic conductivity measurements for the unconsolidated materials underlying the Site. The slug test data

were analyzed using the Bouwer and Rice method (Bouwer and Rice, 1976), and the results of the falling and rising head evaluation are summarized in the table below. The graphs of the slug test analyses can be found in Appendix C2.

Based on the average hydraulic conductivity of 2.2 x 10^{-6} cm/sec, the slope of 0.052 feet/foot and an effective porosity value of 0.25, the average linear velocity of the shallow groundwater is 0.01 ft/day or 4 ft/year. Over the lifetime of the landfill (46 years), it is reasonable to assume that groundwater may have traveled approximately 170 ft to the east.

Table of Hydraulic Conductivity Values from Slug Tests

Well/Piezometer	Falling Head (cm/sec)	Rising Head (cm/sec)	Average (cm/sec)
AC-MW-1	2.50 x 10^{-6}	6.94 x 10^{-6}	4.72 x 10^{-6}
AC-MW-4	1.02 X 10^{-6}	2.08 X 10^{-7}	6.14 X 10^{-7}
AC-MW-5	3.80 X 10^{-6}	-1.31 X 10^{-7}	1.25 X 10^{-6}

Average of all values 2.2 x 10^{-6} cm/sec

6.0 METHODS OF INVESTIGATION

Methods of investigation are discussed in Section 6.0. Photographs depicting pertinent features and selected field activities are included in Appendix D.

6.1 Off-Site Domestic Well

On January 23, 2016, Quantum collected a groundwater sample from an off-Site domestic water well (Permit No. 258253) to evaluate the potential for off-Site groundwater impacts associated with the landfill and shooting ranges on-Site. The water well location is depicted on the Site Plan (Figure 2). According the well construction log (Appendix E), the 300-foot deep well was installed in 2004. The Colorado Division of Water Resources (DWR) indicates that the well is completed in the Arapahoe bedrock aquifer. Prior to sampling, the well was purged from an exterior hydrant. During the purging process, field parameters (pH, conductivity, and temperature [°C]) were monitored and recorded. When three consecutive readings indicated that the field parameters had stabilized, the well was considered adequately purged. After approximately 400 gallons of groundwater had been purged and field parameters had stabilized, groundwater sample (258253-012316) was collected from the hydrant. The sample containers were labeled, packaged and chilled on ice. On January 24, 2016, Quantum hand-delivered the water sample under standard chain-of-custody procedures to Accutest Laboratories in Wheat Ridge, Colorado for analysis of volatile organic compounds (VOCs, EPA Method 8260C); semivolatile organic compounds (SVOCs, EPA Method 8270C); pesticides (EPA Method 8081A); poly-chlorinated biphenyls (PCBs, EPA Method 8082A); herbicides (EPA Method 8151A); Total RCRA 8 Metals (EPA Method 200.8/7470A); chloride, fluoride, nitrate, nitrite, and sulfate (EPA Method 300); total coliform bacteria; cyanide (EPA Method D6888); Gross Alpha and Gross Beta (SM 7110); Total Solids (EPA Method 160.3); and asbestos (Transmission Electron Microscopy). The Accutest laboratory reports are included in Appendix F1. Analytical results are summarized in Table 2 and discussed in Section 7.1. A copy of the well sampling log form is included in Appendix G.

6.2 30-Inch Storm Water Drainage Pipe

Quantum subcontracted Quality Pipe Services (QPS) to conduct a CCTV video to evaluate the integrity of the 30-inch CMP storm water drainage pipe. The CCTV video was conducted on May 5, 2016. QPS noted and recorded observations of pipe damage and deformation with distance from the pipe opening.

Initially, the pipe was video surveyed from the inlet located near the western Site boundary. At a distance of 24 feet from the inlet, the camera encountered a blockage of brush and debris. The debris blockage prevented further advancement of the CCTV and the survey was abandoned at 24 feet. No significant damage to the interior of the pipe was noted up to the blockage. The QPS CCTV inlet survey report is included in Appendix H.

QPS relocated the CCTV to the pipe outlet located near the eastern Site boundary. Holes in the pipe were observed at distances of 6 and 60 feet from the inlet. Horizontal deformation was observed at a distance of 15 feet. Horizontal deformation and a blockage of automotive tires was observed at a distance of 75 feet. The tire blockage prevented further advancement of the CCTV and the survey was abandoned at 75 feet. The QPS CCTV outlet survey report is included in Appendix H.

6.3 Waste Delineation

Additional assessments were completed to better refine the estimate of the limits of landfill waste. The limits of landfill waste were provided to Burns & McDonnell for the development of the landfill Closure Plan (Section 11.3).

6.3.1 Geophysical Survey

Quantum subcontracted Fugro Consultants, Inc. (Fugro) to conduct a geophysical survey over the suspected landfill area of the Site, based on the information obtained from the Phase I ESA and field observations. Fugro completed the geophysical survey on May 5, 2016 using a Geonics Ltd. EM31 electromagnetic terrain conductivity meter to traverse the suspected boundary of the landfill area along a series of linear lines orientated at approximately right angles to the expected edge of the landfill. Data were also collected along the Texas Tea steel O&G flow line to locate the pipe line. The area of the Site covered by the geophysical survey is depicted on Figure 4.

Fugro presented the data as both ground conductivity and inphase maps with an interpreted possible landfill boundary. Fugro concluded that the EM31 survey mapped significant variations in the bulk ground conductivity across the survey area. Denver Formation claystone bedrock is electrically conductive and was suspected of contributing to some of the higher conductivity areas in the survey. A more resistive feature was observed in the northeastern portion of the Site and was interpreted to possibly be an area of fill or soil disturbance. Multiple features were observed outside of the suspected landfill area and were considered to potentially be associated with the shooting range and its infrastructure. The EM31 survey located the Texas Tea O&G flow line but did not locate the nearby Anadarko pipe line, which was believed to have been constructed of a non-metallic material. In general, the geophysical survey's ability to distinguish between buried landfill waste and natural geologic materials was affected due to the high conductivity of the native bedrock materials.

Fugro recommended conducting an intrusive subsurface investigation to identify anomalies and confirm the results of the geophysical investigation. Additional discussion on the results of the geophysical survey is provided in the geophysical survey report (Appendix I).

6.3.2 Soil Borings

Exploratory borings were advanced to further delineate the lateral extent of landfill waste. Quantum subcontracted DrillPro Services, Inc. (DrillPro) to advance the borings with a 6-inch diameter solid stem auger. Boring locations were selected based on the results of the geophysical survey and information gathered during the Phase I ESA. On May 16, 25, and 26, 2016 and on October 20, 2016, a total of 47 borings were advanced at the locations depicted on Figure 4. Waste delineation boring logs are included in Appendix C1.

Prior to advancement of soil borings, the Utility Notification Center of Colorado (UNCC) was contacted to locate and mark subsurface utilities and an Notice of intent (NOI) form to construct monitoring hole(s) was filed with the Colorado DWR. NOIs are included in Appendix J. Boulder Land Consultants conducted private utility locates for the Texas Tea buried gathering lines and Site structures. Additional borings advanced to delineate and characterize a sludge material discovered to the north of the SWAT team training facility are discussed in Section 6.12.3.

Soil borings were advanced for the following purposes:

- Forty-one "deep" soil borings were advanced to evaluate waste limits on the north, east, south and west edges of the suspected landfill area. The borings were advanced in an "outside-in" approach, beginning in areas not expected to contain waste and advancing towards the landfill until waste was identified. These soil borings were advanced to depths ranging from eighteen inches to ten feet bgs. Quantum documented the thickness of the waste material, types of waste material observed (i.e., construction and demolition debris, MSW), thickness of soil cover, and characterized soil textural properties by the Unified Soil Classification System (USCS); and
- Six "shallow" soil borings were advanced to evaluate the existing soil cover thickness. Shallow soil borings were advanced to a depth of 2 feet bgs or until waste was encountered at locations biased towards areas where landfill waste was not visible at the ground surface. Quantum documented the thickness of the existing soil cover and characterized soil textural properties by the USCS.

Waste encountered in borings consisted primarily of MSW intermixed with soil. Wastes observed included plastic bags, Styrofoam, plastic fragments, scrap metal, clothing, glass, shoes, newspaper, and plastic bottles. Petroleum odors were noted within borings AC-SB-14 and AC-SB-20. Waste materials observed were dry to moist. No wet or saturated waste was observed. Concrete was identified in and around soil boring AC-SB-35 at a depth of approximately 6 inches bgs.

Waste materials were overlain by fill soil consisting of intermixed clay, sand, and silt. Fill soil varied in depth within the borings from approximately 6 inches to 6 feet. In general, it appeared that approximately 20 percent of the landfill area had exposed MSW and debris on the ground surface. Quantum observed cover thicknesses ranging from 6 inches to two feet within "shallow" soil borings. Fill depths were irregular across the Site and the existing cover generally did not appear to be salvageable based on the irregularity over short distances.

Waste was not observed within AC-SB-36. However, waste was observed outcropping in the hillside to the north of AC-SB-36 and the approximate landfill extent boundary (Figure 4) was adjusted to include this waste within the landfill boundary.

Advancements of soil borings within the expected landfill area were overseen by a certified asbestos building inspector trained and certified in accordance with CDPHE AQCC Regulation 8 (5 CCR 1001-10, Part B) (CDPHE AQCC, 2008) and having a minimum of 40 hours of on the job "asbestos in soils" experience on a minimum of three different asbestos in soils projects, conducted under either AQCC Regulation No. 8 or Section 5.5 of the Regulations Pertaining to Solid Waste Sites and Facilities (6 CCR 1007-2, Part 1) (CDPHE HMWMD, 2015). No materials suspected of containing asbestos were observed during the assessment.

No waste suspected of being a hazardous waste was encountered during the assessment. Sludge observed in cuttings from soil borings AC-SB-33 and AC-SB-34 was laboratory-analyzed for hazardous waste characteristics and found to be non-hazardous (see Section 6.12.3). Waste materials generated during boring activities within the landfill area were containerized in 55-gallon drums and stored in the Armory building for future disposal.

6.3.2.1 Soil Cover Characterization Samples

Two potential soil cover characterization samples were collected during the landfill delineation borings from boring locations AC-SB-10 and AC-SB-21 to assess potential on-Site borrow source areas for suitability as landfill

cover material. These samples were delivered to Ground Engineering for aggregate gradation (American Society for Testing and Materials (ASTM) C 136) and hydrometer analysis (ASTM D 422). An additional soil sample was collected on June 17, 2016 from the surficial alluvial soil on the hilltop located on the southwest area of the Site and delivered to Ground Engineering for aggregate gradation (ASTM C 136) and Atterburg Limits (ASTM D 4318). Geotechnical sample reports are included in Appendix K.

No soil samples were collected from the existing landfill cover due to the poor and irregular condition of the cover.

6.4 Piezometer and Monitoring Wells

DrillPro advanced soil borings and installed five piezometers outside of the expected downgradient (based on topography) side of the landfill to identify depth to groundwater and groundwater flow directions and five permanent groundwater monitoring wells (three wells on the hydraulically downgradient edge of the Site and two wells on the hydraulically upgradient edge of the Site) to monitor upgradient and downgradient water quality at the Site boundaries.

Prior to advancement of soil borings for piezometer and monitoring well installation, the UNCC was contacted to locate and mark subsurface utilities and an NOI form to construct monitoring hole(s) was filed with the DWR. NOIs are included in Appendix J. Boulder Land Consultants conducted private utility locates for the Texas Tea buried gathering lines and Site structures.

Quantum's field geologist observed and documented the soils encountered in the borings for type, color, grain size, and other soil characteristics using the USCS. Soil cores were observed for indications of impact, namely visible staining or foreign material in the soil. Soil samples were collected for field screening purposes and placed into labeled, plastic, sealable bags for headspace screening using a PID. PID field screening did not detect the presence of VOCs in any of the boreholes. Piezometer and monitoring well locations are shown on Figure 3.

6.4.1 Piezometer Installation

On July 7, 2016, DrillPro advanced five soil borings until drilling refusal at depths ranging from 13 to 20 feet bgs and constructed five piezometers (AC-P1 through AC-P5) within each of the soil borings to assess the presence of shallow or alluvial groundwater and map the groundwater table for design and placement of permanent monitoring wells.

Soil borings were advanced using a a truck-mounted direct-push drill rig (Hurricane Geoprobe®) with acetate liners for soil core collection. Soil borings encountered intermixed sand, silt, and clay. No discolored soil was observed and no abnormal odors were noted in soil samples collected from the five borings. No discolored soil was observed and no abnormal odors were noted in soil samples collected from the five borings. Boring and piezometer construction logs representing the observed stratification boundaries of the soils are presented in Appendix C2.

Piezometers were constructed within each of the boreholes at depths ranging from 13 to 20 feet bgs. Piezometers were constructed with 1-inch diameter, Schedule 40, polyvinyl chloride (PVC) 0.010 slotted screen and riser equipped with threaded bottom caps. Sand pack (10x20 mesh silica sand) was placed from the bottom of the borehole to approximately two feet above the screen, and hydrated bentonite chips filled the annular

space from the top of the sand pack to approximately 6 inches bgs. Piezometers were completed with a concrete skirt and bolt down flush mount cover.

Static water level measurements were collected within the piezometers on July 18 and 21 and on August 24, 2016. Static water level measurements ranged from 11 to 16 feet during this time period. Piezometer AC-P1, which did not contain water during this time period. Water level measurements are included in Table 1.

6.4.2 Monitoring Well Installation

On July 12 through 14, 2016, DrillPro advanced five soil borings to depths ranging from 22 to 60 feet bgs and constructed five groundwater monitoring wells (AC-MW1 through AC-MW5) within each of the soil borings to monitor upgradient and downgradient water quality at the Site boundaries. Monitoring wells AC-MW1 and AC-MW2 were constructed in order to obtain information on upgradient groundwater quality at the Site. Monitoring wells AC-MW3, AC-MW-4, and AC-MW-5 were constructed in order to obtain information on groundwater quality at the downgradient Site boundary.

Soil borings were advanced using a a truck-mounted hollow stem auger with split spoon samplers. Soil borings encountered intermixed sand, silt, and clay. Claystone bedrock was encountered within AC-MW1, AC-MW2, and AC-MW3 at depths ranging from 26 to 55 feet bgs. No discolored soil was observed and no abnormal odors were noted in soil samples collected from the five borings. Boring and well construction logs representing the observed stratification boundaries of the soils are presented in Appendix C2.

Monitoring wells were installed in the general location specified in the SAP, excluding MW-1 which was relocated approximately 400 feet south of the originally- specified location.

Monitoring wells were constructed within each of the boreholes at depths ranging from 20 to 59 feet bgs. Monitoring wells were constructed with 2-inch diameter PVC screen (0.010 slot) and riser and equipped with threaded bottom caps. Sand pack (10x20 mesh silica sand) was placed from the bottom of the borehole to approximately two feet above the screen, and hydrated bentonite chips filled the annular space from the top of the sand pack to approximately 6 inches bgs. Monitoring wells were completed with a 2-foot by 2-foot concrete pad with a stick-up steel protective casing with a locked hinged cover.

Static water level measurements were collected within the monitoring wells on July 18 and 21 and on August 24, 2016. Static water level measurements ranged from 13 to 34 feet during this time period. AC-MW2 did not contain water during these three measurement events and AC-MW3 did not contain water until the August 24 measurement collection. Water level measurements are included in Table 1.

6.4.3 Well Development and Sampling

Piezometers containing groundwater following construction (AC-P2, AC-P3, and AC-P4) were developed on July 18 and 21, 2016. Development of piezometers was performed using a 0.75-inch diameter disposable PVC bailer. An attempt was made to surge and purge a minimum of five casing volumes of groundwater. However, piezometers were generally bailed dry prior to removing five full well volumes..

Groundwater monitoring wells containing groundwater following construction (AC-MW1, AC-MW4, and AC-MW-5) were developed on July 18 and 21, 2016. AC-MW3 was developed on September 23, 2016 with a

surge block following water production in the well. Development of monitoring wells was performed using a weighted bailer to surge and purge at least five casing volumes of groundwater from each well. AC-MW4 was bailed dry before five full well volumes could be removed.

Quantum collected groundwater samples on July 18, 2016 from monitoring well AC-MW5 and off-Site monitoring well MW-H05; on August 12, 2016 from monitoring wells AC-MW1, AC-MW4, and piezometer AC-P4; and following water production from monitoring well AC-MW3 on September 26 and October 7, 2016. Piezometer AC-P4 was sampled by purging the piezometer dry with a disposable bailer and sampling the recharge water on the following day. Monitoring well sampling was conducted by micropurging the wells using a submersible SS Geosub® pump and dedicated polyethylene tubing. The pump intake was set approximately at the middle of the screened interval of the well. The objective of micropurging was to obtain a representative groundwater sample by removing groundwater at a sufficiently low rate to encourage inflow from the formation rather than inflow of stagnant water from well casing. During micropurging, Quantum monitored the groundwater depth in the well and adjusted the pumping rate accordingly to minimize inflow of groundwater from the well casing. The groundwater field parameters temperature, pH, specific conductivity, oxygen reduction potential (ORP), and dissolved oxygen (DO) were recorded approximately every three minutes during micropurging. Groundwater samples were collected after readings indicated that the field parameters had stabilized (within 0.1 for pH, 3% for conductivity, 10 millivolts [mV] for ORP, and 10% for DO).

Following purging, Quantum collected groundwater samples in pre-cleaned laboratory supplied containers and immediately placed the samples in a cooler on ice. Quantum hand-delivered the samples to TestAmerica Laboratories in Arvada, Colorado under chain-of-custody procedures for analysis of the Solid Waste Regulation Appendix IA and IB Detection Monitoring analytes (Appendix L). Piezometer AC-P4 was only sampled and analyzed for VOCs by EPA Method 8260B due to limited water quantities during sampling. Monitoring well AC-MW-3 was sampled for VOCs by EPA Method 8260B using micro-purging techniques on September 26, 2016 but, due to slow recharge, was sampled on October 7, 2016 for the remaining analytes in the Appendix IA and IB Detection Monitoring list without re-purging the well.

Analytical results for the piezometer and monitoring well sampling are discussed in Section 7.3.

6.4.4 Aquifer (Slug) Testing

Quantum performed falling- and rising-head slug tests in upgradient well AC-MW-1 and downgradient wells AC-MW-4 and AC-MW-5 on August 24, 2016 to obtain general hydraulic conductivity (K) measurements and associated linear velocities within the study area. Slug tests were performed in general accordance with the SAP.

Groundwater measurement data was used to determine proper placement of the pressure transducer and a slug with a volume of 0.5 gallons. Data was collected in the field using an In-Situ LevelTROLL® 700 pressure transducer coupled to a laptop computer. The static water level was measured upon opening the well with a water level meter. The pressure transducer was lowered to within approximately two feet of the bottom of the well, and the slug was fully submerged in the well following the start of data logging. Groundwater levels were allowed to return to static following slug placement. Groundwater elevations were recorded prior to and following placement of the slug until it appeared that the groundwater elevation had stabilized. At this point the slug was removed and groundwater elevations were again recorded to log groundwater recovery. Recovery was logged until it appeared that the groundwater elevation had stabilized.

Slug tests were analyzed by the Bouwer-Rice Method (Bouwer and Rice, 1976) using the computer software AquiferWin32 Version 5 by Environmental Simulations, Inc. Data results are presented in graphic forms located in Appendix C3. The average K estimated by this method includes both vertical and horizontal permeability components, but horizontal conductivity is the dominant component measured. Linear velocities were calculated using the average K value multiplied by the surveyed gradient along flow paths between monitoring wells and then divided by an effective porosity estimated from table values for the borehole lithology.

Calculated K, slope, and estimated groundwater flow velocity are discussed in Section 5.2.

6.5 On-Site Commercial Well

One commercial water supply well is located at the Site. Well permit #164204 was installed in the vicinity of the South Shooting Range (Figure 2) in 1993 to support the Sheriffs Firearms Training Facility. The well is reported to have a depth of 400 feet bgs, steel casing from approximately ground surface to 105 feet bgs, PVC casing from 85 feet to 120 feet bgs, perforated PVC casing from 120 ft to 400 feet bgs, a static water level of 180 feet bgs, and a production rate of 10 gallons per minute (gpm). Although the SAP specified re-energizing the pump, purging three casing volumes of water from the well, then collecting a sample from the well spigot, low-flow sampling techniques following the removal of the pump and associated piping were used.

Quantum was on-Site on August 10, 2016 to oversee the removal of the well pump and associated piping, and collect a sample of water from the well. Colorado Pump was contracted for the pump removal. Approximately 360 feet of 2-inch diameter Schedule 40 PVC pipe and a Jacuzzi Sand Handler Pump was removed from the well.

Following removal of the pump and associated piping, Depth to water was measured to be 140 feet bgs. Groundwater was purged from the well until the field parameters pH, conductivity, and temperature stabilized in accordance with the approved SAP (Quantum, 2016B). After approximately 18 minutes of well purging, field parameters were observed to stabilize and Sample AC-164204-081016 was collected. The Sample was placed in a cooler, on ice, and delivered to TAL under chain-of-custody protocol for analysis of the Solid Waste Regulation Appendix IA and IB Detection Monitoring analytes (Appendix L). Analytical results are discussed in Section 7.2 and the laboratory analytical report is included in Appendix F2.

6.6 Shooting Range Sampling

The following sections discuss site assessment and sampling of the North Shooting Range, South Shooting Range, and SWAT Team Training Area. Site assessment and sampling in these areas was performed in general accordance with the SAP, except as noted in the following sections.

Sampling was performed using teams consisting of one Quantum technician and one MT2 technician. The role of the Quantum technician was to observe X-ray fluorescence (XRF) field screening and collect soil samples from each sample location. The MT2 technician role was to perform XRF field screening and maintain the XRF for function in the field.

In addition to the Quantum and MT2 technicians, a full-time Site Safety Officer (SSO) was present during the intrusive sampling phases. The role of the SSO was to monitor ambient air conditions, collect personal exposure data, and monitor safety and welfare of Site personnel. The SSO also verified that safety procedures were

followed in accordance with the site-specific HASP (Quantum, 2016B). The SSO conducted daily safety meetings prior to the start of work each day.

Shooting range soil samples were collected from sampling grids (of similar surface areas) within the shooting range areas. Design sampling coordinates (latitude, longitude) were specified near the center of each sampling grid. In the field, hand-held global positioning system (GPS) devices were used to navigate to each sampling location.

Samples collected from the shooting range areas were collected in laboratory-provided containers and placed in a cooler on ice following sampling. Samples were hand-delivered, under chain-of-custody protocol to TAL for analysis of Total Metals - Shooting Range Contaminants of Concern (COC) (lead, antimony, arsenic, cadmium, copper, tin, and zinc) by EPA Method 6010C.

6.6.1 XRF Field Analysis

The XRF was used as a field-screening instrument to provide real-time, semi-quantitative estimates of soil lead concentrations. Confirmatory laboratory soil samples were selected on the basis of "in-situ" XRF screening results. The XRF provided estimates of "high" and "low" lead content in soil and preliminary estimates of depths and extents of lead-impacted soils.

Although the XRF can provide real-time measurements, the in-situ XRF method is prone to false positive results from interference due to inhomogeneous samples and soil moisture content. For this reason, the evaluation of final horizontal and vertical extents lead soil impacts was based on laboratory analytical results.

An in-situ XRF reading was collected by first clearing/grubbing and smoothing the soil surface to be analyzed. After removing any visible munitions debris (i.e., bullets, shell casings, shrapnel, shot wads) from the measurement surface, the technician collected an XRF measurement by following the manufacturer's operating instructions.

The Residential RSL for lead in soil is 400 milligrams per kilogram (mg/kg). Quantum used an XRF field screening level (FSL) of 300 mg/kg as an assumption that the soil lead concentration was less than the Residential RSL. An initial in-situ XRF measurement was collected at the ground surface at each sampling location. Soil was removed sequentially in lifts (sampling depth interval) until a 300 mg/kg XRF reading, or less, was observed. At this surface, a laboratory soil sample was collected for analysis. Sampling depth intervals varied based on the sampling locations and are discussed further in the following sections.

The Industrial RSL for lead is 800 mg/kg. Quantum compiled, tabulated and plotted observed XRF readings and laboratory analysis results of laboratory confirmation samples to approximate the locations, depths and volumes of soil exceeding the Residential and Industrial RSLs on the North and South Shooting Ranges.

6.6.2 Sieving for Fragmented Lead

Some areas of the shooting ranges contain soils with recyclable quantities of fragmented lead (i.e., bullet slugs, shot, and pellets). Based on previous experience and discussions with MT2, soil containing >15% elemental lead is potentially economically recyclable. That is, assuming there is sufficient soil volume, the cost to mobilize and operate a screening plant can potentially be offset by the recycle value of the elemental lead. Sieving the samples

was also necessary to minimize laboratory false positive results caused by inadvertent analysis of fragmented lead. Soil samples from the impact berm, back berm, lateral berm, and range floor areas were sieved in the field, as necessary to provide estimates of the percentage (by weight) of lead fragments in the soil sample. The following procedures were used to estimate fragmented lead percentages in soil:

1. Collect one approximate 1 gallon surficial soil sample from each grid at the locations shown on Figures 5A and 5B;
2. Weigh the entire sample on a scale, accurate to 1 gram, and record the weight in grams;
3. Sieve the sample through a ¼-inch screen. Weigh the fragmented lead recovered on the screen to nearest 1 gram;
4. Calculate percent of fragmented lead by dividing the lead weight by the total weight and multiplying by 100;
5. Record the sample location, sample depth, and lead percentage in the field log book or on the field form; and
6. Repeat this process with each subsequent lift until the percent fragmented lead is < 5%.

The percent fragmented lead values are compiled in Table 3. Approximately 12 sample grids were sieved during assessment activities by weight. Lead percentages (by weight) ranged from 0 to 51% (Table 3).

6.6.3 North Shooting Range

The North Shooting Range is located on the northeast area of the Site and includes the main range, safety fan, and tactical training area (east of main range). The North Range was divided into five areas for assessment and sampling, including the safety fan area, back berms, lateral berms, impact berms, and range floor (Figure 5A).

Site assessment and sampling in these areas included XRF field screening, sampling of potentially impacted soil, and sieving of fragmented lead as necessary. Assessment and sampling activities varied slightly dependent on the area and expected lead and bullet concentrations. In general, an XRF field reading was collected at each sample area, which would drive additional depths to be sampled if the XRF field reading indicated lead concentrations above the FSL. If an XRF field reading indicated elevated concentrations of lead above the FSL, 3- or 6-inch lifts would be excavated until the XRF indicated that concentrations of lead were below the FSL. Samples were collected from the top lift and bottom lift if XRF field screening indicated the need for additional lifts and submitted for analysis.

Site assessment of the North Shooting Range was conducted between July 19, 2016 and July 26, 2016.

Safety Fan Area:

The North Shooting Range safety fan area was divided into 24 sample grids. Five-point composite samples were collected from each sample grid for XRF field screening and sampling for laboratory analysis. XRF field screening did not indicate lead concentrations in any of these areas to be above the FSL. A laboratory 5-point composite sample was collected from each sample grid and analyzed for Total Metals - Shooting Range COCs. No samples in this area were analyzed for TCLP Shooting Range COCs due to the low levels of total lead observed during XRF field screening and absence of fragmented lead on the ground surface.

Back Berm:

The North Shooting Range back berm area was divided into 10 sample grids. Fragmented lead was observed on the ground surface, but not at concentrations high enough to require sieving in any of the sample grids. In addition, XRF field screening did not indicate any sample grids with lead concentrations exceeding the FSL. One soil sample was collected from each sample grid and submitted for laboratory analysis of Total Metals - Shooting Range COCs. One sample was collected from Sample Grid NRBB-5 from 0 to 3 inches and analyzed for TCLP - Shooting Range COCs.

Lateral Berms:

The North Shooting Range lateral berms were divided into 14 sample grids. Sample grid numbers were designated with an "I" if on the interior side of the berm (relative to the shooting range), and designated with an "O" if on the exterior side of the berm. Fragmented lead was observed on the ground surface in concentrations similar to those of the back berms. XRF field screening indicated one area that required an additional lift be dug from 3 to 6 inches bgs (NRLB-5O), which had an XRF reading of 664 ppm from 0 to 3 inches bgs. One soil sample was collected from each sample grid at a depth of 0 to 3 inches bgs. Additionally, two samples (0-3 and 3-6 inches) were collected from Sample Grid NRLB-5O. Samples were submitted for laboratory analysis of Total Metals - Shooting Range COCs. No TCLP samples were analyzed from the North Shooting Range lateral berms due to the generally low levels of lead observed during XRF field screening.

Range Floors:

Two range floors are present on the North Shooting Range, one covered in asphalt (main shooting range area) on the west, and one uncovered range floor (tactical shooting area) on the east. The west range floor was divided into four sample grids. The west range floor required coring into the asphalt range floor to access the soil below. No fragmented lead was observed in soil beneath the asphalt pavement.

The east range floor was divided into five sample grids. The east range floor contained fragmented lead on the ground surface at concentrations similar to the back berm and the lateral berms.

XRF field analysis did not indicate concentrations of lead in any range floor sample grids above the FSL. Samples were collected from each sample grid and submitted for laboratory analysis of Total Metals - Shooting Range COCs. No TCLP samples were analyzed from the North Shooting Range range floor due to XRF field readings below the FSL.

Impact Berms:

The North Shooting Range has two impact berms, one located at the north end of the main range and one located at the north end of the tactical shooting area. These impact berms are designed as a catch location for bullets and therefore tend to have higher relative concentrations of bullets and fragmented lead than other areas of the range.

The North Shooting Range impact berms were divided into five sample grids. Grids NRIB-1 through NRIB-3 are located on the western main shooting range impact berm. Grids NRIB-4 and NRIB-5 are located are located on the eastern tactical shooting area impact berm.

The main shooting range impact berm had a higher relative concentration of bullets and fragmented lead than the tactical shooting area impact berm. NRIB-1 required lifts to 12 inches bgs with sieving required on the first 6-inch lift. NRIB-2 required lifts to 24 inches with sieving required on the three top 6-inch lifts. NRIB-3 required lifts to 24 inches with sieving required on the top three 6-inch lifts.

Sample grids NRIB-4 and NRIB-5 did not require sieving or additional lifts and XRF field screening indicated levels of total lead below the FSL.

Nine soil samples were collected from the North Shooting Range impact berms for analysis of Total Metals - Shooting Range COCs. Three of the samples were additionally analyzed for TCLP - Shooting Range COCs.

6.6.4 South Shooting Range

The South Shooting Range is located on the southern area of the Site and includes the south range shooting area, safety fan, and skeet shooting area. The range was divided into five areas for assessment and sampling, including the safety fan area, back berms, lateral berms, impact berms, and the shooting range floor (Figure 5B). Field assessment of the range indicated high concentrations of fragmented lead in the impact berms, moderate amounts of fragmented lead in some areas of the lateral berms and range floors, and low concentrations of fragmented lead on the remaining areas. In general, some amount of fragmented lead was observed on the surface of the five areas of the range.

In the South Shooting Range area, Excess Risk soils were identified as soils containing Total Metals - Shooting Range COCs above the Residential RSL. The South Shooting Range is outside of the proposed landfill cover area and will potentially be subject to visitation by the public. Quantum determined that the cost differential between restoring the area to Residential vs. Industrial risk levels was negligible. Therefore, the proposed corrective actions restore the South Shooting Range area to EPA Residential risk levels.

Site assessment of the South Shooting Range was conducted between July 19, 2016 and July 26, 2016.

Safety Fan Area:

The South Shooting Range safety fan area was divided into nine sample grids. Quantum assessed and sampled these sample grids in the same manner as the North Shooting Range safety fan, excluding composite grid areas where concentrations of lead exceeded the FSL during XRF field screening. In general, the sample grids within the safety fan contained low concentrations of observable fragmented lead on the ground surface. Two grids (SRSF-3 and SRSF-4) exhibited composite sample XRF field measurements above the FSL. When composite sample XRF field screening exceeded the FSL, each sub-sample was treated as a new sample location. SRSF-3 contained two areas that required sieving and SRSF-4 did not contain areas that required additional sieving.

Back Berm:

The South Shooting Range back berm area was divided into six sample grids. Fragmented lead was observed in high concentrations above the wood landing (eyebrow) over impact berm. Fragmented lead concentrations appeared to decrease towards the safety fan. Sample grid SRBB-6 exhibited an XRF field reading above the FSL and required an additional lift to be completed from 3 to 6 inches bgs. XRF field screening indicated total lead concentrations below the FSL in SRBB-6 from 3 to 6 inches bgs.

Lateral Berms:

The South Shooting Range lateral berms were divided into eight sample grids. Based on XRF field screening, two sample grids SRLB-4I and SRLB-5O required additional lifts to 6 and 15 inches, respectively.

Quantum observed that the exterior side of lateral berms SRLB-4 through SRLB-8 contained relatively higher concentrations of fragmented lead on the ground surface. It is possible that impact berm material may have been transported to the exterior lateral berm surface as part of berm maintenance. Although, this supposition cannot be verified.

Range Floors:

Two range floors are present on the South Shooting Range; one paved with asphalt (shooting range area) on the southeast, and one unpaved grassland range floor (the skeet shooting area) on the northwest.

The southeast and northwest range floors were each divided into five sample grids. Fragmented lead was observed on the ground surface on the northwest range floor and little fragmented lead was observed on the paved southeast range floor. The northwest range floor contained three sample grids (SRRF-2 through SRFF-4) requiring additional lifts (3 to 6 inches bgs) due to elevated levels of lead based on XRF field screening.

The southeast range floor was paved with asphalt except sample grid SRRF-6 which was not paved and covered with grassland. Four sample grids (SRRF-6 though SRRF-9) required additional lifts to nine inches bgs due to elevated levels of lead during XRF field screening above residential RSLs.

An additional composite sample of the West range floor (SRRF-PAH) was collected for TCLP - Shooting Range COCs analysis.

Impact Berms:

The South Shooting Range impact berm was divided into 12 sample grids. Grids SRIB-1 through SRIB-6 were located behind the skeet range with low levels of fragmented lead observed on the ground surface. Grids SRIB-7 through SRIB-12 were located behind the shooting range area and contained high levels of fragmented lead on the ground surface. Table 4 summarizes the lead sieve results for sample grids in the impact berms. XRF field screening indicated levels of lead above the FSL in SRIB-3 and SRIB-6 through SRIB-12. The table below indicates the final sample depths for sample grids in the impact berms.

Sample Grid	Final Sample Depth (inches bgs)
SRIB-3 and -6	6
SRIB-7	18
SRIB-8 and -9	36
SRIB-10	24
SRIB-11	30
SRIB-12	36

6.6.5 SWAT Team Training Area

The SWAT Team Training Area is located west of the South Shooting Range. Due to the amount of vegetative cover in this area, Quantum could not provide an estimate of observable fragmented lead on the ground surface. The SWAT Team Training Area was divided into two sample grids (STRF-1 and STRF-2). XRF field screening in these grids did not indicate concentrations of lead exceeding the FSL. Site assessment of the SWAT Team Training area was conducted on July 21, 2016.

6.6.6 Polycyclic Aromatic Hydrocarbon (PAH) Sampling

The northwest grassland range floor of the South Shooting Range was reportedly used for skeet shooting based on the Phase I ESA. A 5-point composite sample was collected from the ground surface of sampling grids SRRF-2 through -5 and submitted to TAL for analysis of PAHs (EPA Method 8270C). PAH sampling was conducted on October 3, 2016.

6.7 Balance of Area (BOA) Site Walk

The BOA is defined as the remaining areas of the Site not used as a firearms training facility. This area is depicted in Figures 6 and 7 of the SAP, and is generally described as the landfill area, areas south and west of the South Shooting Range, areas northeast of the North Shooting Range and the area paralleling Riverdale Road. On June 28, 2016, three Quantum personnel walked at arm's length along parallel east-west transects across the landfill area. The purpose of the BOA walk was to observe and identify any areas of fragmented lead or munitions debris associated with the firearms training facility. As reported in the Phase I ESA, the County reported that shooting range berm soils may have been transported and disposed in other parts of the Site. The remaining areas of the BOA were walked on separate occasions and no evidence of munitions debris was observed in these other areas.

As a result of the BOA walk and subsequent site-walks, Quantum identified three bullet piles and three other areas requiring additional site characterization (Additional Characterization Areas [ACAs]). Trace levels of fragmented lead were also identified on the sampling grids of the South Shooting Range safety fan. The assessment of ACA soils are further discussed in Section 7.7.1. The bullet piles and ACA locations are depicted on Figures 6A and 6B.

6.8 Sediment Sampling

Sediment sampling was conducted at seven locations on August 11, 2016 in general accordance with the SAP (see Figure 7). The samples were collected at a depth from 0 to 6 inches bgs.

Two samples were collected from the storm water detention (riprap) basin located immediately southeast of the South Shooting Range. The purpose of the riprap basin is to detain storm water runoff conveyed from an inlet located within the South Shooting Range area. Sample AC-SED-06-0.005 was collected from the west side of the basin and AC-SED-07-0.005 was collected from the east side of the basin. These samples were analyzed by TAL for Total Metals - Shooting Range COCs.

Two samples were collected downgradient from primary storm water discharge locations and within the drainage swale between the Site fence and Riverdale Road, one sample (AC-SED-04-0.005) was collected north of the northern entrance gate and one sample (AC-SED-05-0.005) was collected south of the southern entrance gate . These samples were analyzed by TAL for Total Metals - Shooting Range COCs.

One sample (AC-SED-01-0.005) was collected immediately upstream of the inlet of the 30" storm water drainage pipe and one sample (AC-SED-02-0.005) was collected immediately downstream of the pipe outlet. These samples were analyzed by TAL for VOCs, SVOCs, RCRA 8 Metals, herbicides, pesticides, and PCBs.

One sample (AC-SED-03-0.005) was collected from the swale area northeast of the North Shooting Range, near the eastern fence line between the Site fence and Riverdale Road at the lowest point of the swale. This sample was analyzed by TAL for VOCs, SVOCs, RCRA 8 Metals, herbicides, pesticides, and PCBs.

6.9 Storm Water Sampling

Quantum staff visited the Site on numerous occasions between June and October 2016 in an attempt to sample storm water flowing through the 30-inch storm water drainage pipe. During each Site visit, insufficient flow was present within the pipe to collect a sample. Quantum will continue to monitor precipitation events and if sufficient flow is present, inlet and outlet storm water samples will be collected and submitted to TAL for analysis.

6.10 Explosives Sampling

Soil sampling for explosives analysis was conducted on August 11 and 24, 2016 in general accordance with the SAP. Samples were collected in front of the south explosives magazine (AC-EXP-EMS), the northern explosives magazine (AC-EXP-EMN), the roll-off container east of the explosives magazine (AC-EXP-RO) and in front of the loading side (south side) of the burn drum (AC-EXP-BD). Sample locations are depicted on Figure 7. Samples were collected from ground surface to approximately 6 inches bgs using a disposable pair of nitrile gloves at each sample location. Following sample collection, samples were placed in a cooler, on ice, and delivered under chain of custody protocol to TAL for analysis of explosives (EPA-RCA Method 8330B). No analytes were reported above laboratory detection limits.

6.11 Landfill Gas Sampling

Landfill gas sampling was conducted on August 24, 2016 in general accordance with the SAP. Gas monitoring probes AC-GMP-2, AC-GMP-4 and piezometer AC-P2 were sampled for methane by EPA Method TO-3, hydrogen sulfide by ASTM D 5504-12, and VOCs by EPA Method TO-15. Total depth and groundwater depth (if present) was measured prior to placement of a PVC slip cap with a double-sided barbed brass fitting and vinyl tubing. Vinyl tubing was placed to the approximate center of the screened interval above any groundwater present in the well. The probes and piezometer were purged for ten minutes prior to sampling using a MultiRae 5-gas meter with gas concentrations recorded regularly during purging. Results of field screening is summarized below:

- AC-GMP-2 contained concentrations of methane greater than 100% LEL, VOCs, and H_2S were not detected during field screening;
- AC-GMP-4 contained VOCs at a concentration of 0.2 ppm. Methane and H_2S were not detected during field screening; and

- AC-P2 contained VOCs at concentrations ranging from 0.1 ppm to 0.4 ppm. Methane and H_2S were not detected during field screening.

After purging, the vinyl tubing was clamped to prevent influence from the atmosphere on landfill gas concentrations in the gas monitoring probes and piezometer. A batch certified Bottle-Vac™ was then connected to the vinyl tubing to collect the landfill gas sample. A landfill gas sample was collected at each location and a duplicate sample was collected at AC-GMP-2 (DUPE-V). The samples were packaged and shipped under chain-of-custody protocol to ALS Laboratories in Simi Valley, California. In addition, a trip blank (Trip Blank) was submitted for analysis of VOCs, which was present during sampling, packaging and shipping activities, to verify that no ambient sources of VOCs impacted the samples.

6.12 SAP Addenda Investigation and Sampling

Upon completion of the BOA Site walk, several areas were noted as requiring additional characterization. These ACAs are discussed in Addendum 1 to the SAP, Revision 1 (Quantum, 2016C). Fragmented lead was observed on the ground surface in three ACAs not included in the shooting range assessment; ACA-1 and ACA-2 on the landfill area, and ACA-3 south of the South Shooting Range. These ACAs are depicted on Figures 6A and 6B. Fragmented lead was also observed near the southern boundary of the Site near the south-adjacent residential property at 14331 Riverdale Road. Addendum 1 included methodology for conducting a site walk on the 14331 Riverdale Road property to identify if elemental lead from the Adams County Shooting Range was present on the property. Sampling and characterization in these areas were performed in general accordance with Addendum 1 to the SAP (Quantum, 2016C).

On September 21, 2016, Addendum 2 to the SAP was submitted to CDPHE (Quantum 2016D). This Addendum discussed methodology for sampling of a spring identified during the site walk on the 14331 Riverdale Road property. Addendum 2 also included methodology for advancing additional soil borings in the southern landfill area on the Site to further delineate and analytically characterize a sludge waste identified in the original waste delineation borings (Section 6.3.2). Field sampling was implemented in general accordance with the Second Addendum to the SAP.

The following sections discuss the assessment results for Addenda 1 and 2 to the SAP.

6.12.1 SAP Addendum 1 - Additional Characterization Area Assessment

A Site walk of ACA-1, -2, and -3 was conducted to estimate approximate average quantities of lead on the ground surface and collect samples for analysis. ACA locations are depicted on Figures 6A and 6B. In each ACA, the selected sample location was biased towards the highest concentration of fragmented lead observed on the ground surface. Consequently, these sample locations are believed to be "worst case" and not representative of the average fragmented lead content in the ACA. Sampling of ACA-1 and ACA-2 was conducted on August 17, 2016. An area believed to be included in the ACA-3 area was sampled on August 16, 2016. However, based on final mapping of this sample location, the sample was determined to be located in SRLB-4 and the data collected were used as additional assessment data for SRLB-4. On October 3, 2016, Quantum visited ACA-3 and collected sample ACA-3.2(0-3). This sample was determined to be located within ACA-3.

ACA-1 contained some fragmented lead on the ground surface over the entire sample grid with a concentration at the sample location of approximately 70 pieces of fragmented lead per square yard. Sieving was performed

in this location in three inch lifts to nine inches bgs with less than 5% by weight from six to nine inches bgs. XRF field screening indicated lead concentrations above the FSL from zero to six inches bgs. Soil samples were collected from the zero to three inch lift (ACA-1(0-3)) and the six to nine inch lift (ACA-1(6-9)) and submitted to TAL for analysis of Total Metals - Shooting Range COCs. Additionally, sample ACA-1(0-3) was analyzed for TCLP - Shooting Range COCs.

ACA-2 contained some fragmented lead on the ground surface over the entire sample grid with a concentration at the sample location of approximately 10 pieces of fragmented lead per square yard. Sieving was performed in this location in three inch lifts to six inches bgs with less than 5% by weight from zero to three inches bgs. XRF field screening indicated lead concentrations below the FSL in both samples at this location. A soil sample was collected from the zero to three inch lift (ACA-2(0-3)) and submitted to TAL for analysis of Total Metals - Shooting Range COCs and TCLP Shooting Range COCs.

ACA-3 contained some sporadic fragmented lead concentrations on the ground surface over the entire sample grid with most areas containing an observed concentration of approximately five to ten pieces of fragmented lead per square yard. Several areas contained larger concentrations of 20 to 25 pieces of fragmented lead per square yard. The sample collected from this grid (ACA-3.2(0-3)) was submitted to TAL for analysis of Total Metals - Shooting Range COCs.

6.12.2 SAP Addendum 2 - 14331 Riverdale Property Assessment

On August 26, 2016, a Quantum technician and an MT2 technician conducted a site walk on the south-adjacent 14331 Riverdale Road residential property. The purpose of the walks was to conduct a visual observation for fragmented lead on the ground surface, XRF field screening, and if necessary soil sampling. The rectangular site walk area measured approximately 530 feet in length along the southern boundary of the Site by 100 feet in width. The location and dimensions of this area were selected based on the proximity to the South Shooting Range safety fan and the likelihood of stray bullets and ricochets leaving the Site. During the site walk, it was noted that approximately 50% of the ground surface was covered by grasses and brushy vegetation which made identification of fragmented lead difficult. During the site walk, 16 pieces of fragmented lead were observed and removed from the property. XRF field readings collected below the lead fragments did not exceed 130 ppm or the FSL. Based on the low XRF field readings, no soil samples were collected. An additional area walk is proposed to be performed in the winter months when less ground cover is present.

During the August 26, 2016 site walk, a spring was observed on the 14331 Riverdale Road property near the southwest corner of the Site. Based on an west to east groundwater flow direction at the Site, it does not appear that groundwater from the Site is a contributing source of the spring. However, based on proximity to the Site, the spring was selected for sampling. On September 26, 2016, Quantum visited the 14331 Riverdale Road property to collect water quality measurements using a YSI 556 and collect a water sample (AC-SPRING) from the spring. The sample was collected in laboratory-provided containers and placed in a cooler on ice immediately after sampling. The sample was submitted under chain-of-custody protocol to TAL for analysis of the Solid Waste Regulation Appendix IA and IB Detection Monitoring analytes.

6.12.3 Sludge Delineation and Characterization

During the advancement of borings to delineate the limits of landfill waste in July 2016, Quantum encountered a sludge waste material in the upper 10 feet of two borings (SB-33 and SB-34) near the southern end of the landfill area (see Figure 4). Additional information about this waste material was needed to determine the lateral and vertical extent of this waste, if the material has sufficient bearing capacity to withstand loads of construction equipment and/or landfill cover; and if the waste exhibits chemical concentrations that may be detrimental to Site workers or impact groundwater.

On September 26, 2016, seven direct push soil borings (AC-SB-45 through AC-SB-51) were advanced in the vicinity of SB-33 and SB-34 to depths ranging between 8 feet and 18 feet bgs. Delineation of the sludge material was limited to the south by the topography within the SWAT Team Training Facility area. Soil borings were advanced by DrillPro using a truck-mounted Geoprobe® direct push drill rig with 2-inch diameter acetate liners for sample collection. Boring logs for the sludge assessment are included in Appendix C1.

Sludge was encountered at depths ranging from 2 feet to 5 feet bgs. The thickness of sludge ranged from 4 inches to 8.5 feet. Sludge appeared as wet, light gray, very soft silt with high cohesion and slight plasticity. The sludge was often mottled (light gray, green, yellow, white) in areas and occasionally contained small, brittle, black, coal-like fragments. Soil underlying the sludge was dry to moist and exhibited significant iron oxide staining and evaporite deposits. Dark green sand was observed directly underlying the sludge in AC-SB-48. PID readings collected from the head space of bagged soil samples of sludge ranged from 0 to 0.1 ppm VOCs.

6.12.3.1 Sludge Sampling

Quantum collected one composite and two discrete sludge samples. The composite sample (AC-SB-45-51) was collected by combining and homogenizing sludge from each of the borings containing sludge. Due to inadequate volume of sludge from within boring samples, the discrete samples, AC-SB-46 (4-8) and AC-SB-47 (4-8), were collected from the 4-foot to 8-foot bgs depth interval from borings AC-SB-46 and AC-SB-47 and analyzed for different parameters to fulfill the sampling suite.

Laboratory samples were collected in 4-ounce sample jars, placed immediately on ice in a cooler, and hand-delivered to TAL under chain-of-custody procedures. Investigation-derived waste was containerized in a labeled drum and stored on-Site.

In addition, one soil sample was collected to evaluate geotechnical parameters to determine if the material has sufficient bearing capacity to withstand loads of construction equipment and/or landfill cover. No rutting or heaving was observed while the drill rig was driving or working over the sludge area. The geotechnical sample was submitted to Kumar & Associates, Inc. for analysis of moisture content, sieve analysis, and Atterberg Limits. The sludge geotechnical report is included in Appendix M.

6.13 Land Surveys

Quantum used different methods to locate features on the Site depending on the level of accuracy required. Where the highest levels of horizontal and vertical accuracies were required, Quantum subcontracted Boulder

Land Consultants (BLC), a Colorado licensed Professional Land Surveyor based in Boulder, Colorado. BLC to provide the following survey deliverables:

- Boundary Survey,
- Improvement Survey,
- Topographic Map (2-foot contour),
- Title Commitment,
- Utility Delineations, and
- Monitoring well and piezometers.

Copies of the Land Survey Plat and Improvement Survey Plat are included in Appendix N. Topographic contours depicted on Figures 3 and 8 were generated from U.S. Army Corp of Engineers post September 2013 Flood LiDAR data.

Lower quality survey data were needed for the following Site features:

- Soil and sediment sampling locations,
- Bullet piles,
- Waste delineation borings, and
- Fragmented lead (bullets and ricochets).

These features were located by geo-referencing the feature from an aerial photograph, using a hand-held GPS device, or using the Theodolite application on an iPhone. For these features, the horizontal accuracies are assumed to be within 10 to 15 feet of actual locations.

6.14 Investigation-Derived Waste

Quantum placed investigation derived waste into labeled polyethylene or steel Department of Transportation-approved 55-gallon drums. These drums are stored on Site and will be managed and disposed as described in the table below.

Investigation-Derived Waste Inventory

Description	# of Drums	Haz. or Non-Haz.	Location	Proposed Disposal
Landfill Waste from delineation borings	2	Non-hazardous based on laboratory analysis	Armory	on Site beneath WBC
Cuttings from piezometer and monitoring well installations	14	Non-hazardous based on field screening	Armory	on Site beneath WBC
Well development fluids from piezometers and monitoring wells	3	Non-hazardous based on laboratory analysis	One drum by wells AC-MW1, AC-MW3, and AC-MW5	Manifest and dispose in licensed local Subtitle D landfill

6.15 Treatability Plan Sampling

The purpose of the Treatability Testing Plan (Quantum, 2016E) was to evaluate the effectiveness of ECOBOND® at reducing leachability of lead from the Adams County Shooting Range soils. MT2 reports that ECOBOND® has consistently reduced lead leachability in soils by 80 to 90%. The Synthetic Precipitation Leachate Procedure (SPLP) (EPA Method 1312) was used to establish lead leachability for three sample grids known to contain high soil lead concentrations. In discussions with CDPHE, soil that contains lead concentrations below the Industrial RSL (800 mg/kg) and is nonhazardous (i.e., lead TCLP result <5.0 mg/L) will be acceptable for placement as gradefill on-Site beneath the new landfill soil cover. Soil that does not meet the Industrial RSL, is non-hazardous (based on TCLP), and does not meet the CDPHE Groundwater Protection Level (GPL) for lead (1.1 mg/L) as determined by SPLP, will be treated (stabilized for metals) on-Site and reanalyzed for SPLP. Soil that is unable to be treated to achieve the TCLP or GPL requirements will be transported off-Site and disposed in a licensed Subtitle C landfill permitted to accept this type of waste.

On October 12, 2016 Quantum was on-Site at the Adams County Shooting Range to collect soil samples treatability testing. Based on total lead results of samples collected during the previous sampling of the shooting range areas, three locations were chosen to provide a broad range of concentrations believed to be representative of conditions on the shooting ranges. Soil was collected adjacent to the sampling location of sample SRIB-11 (0 to 6 inches bgs with a total lead concentration of 170,000 mg/kg), SRIB-9 (0 to 6 inches bgs with a total lead concentration of 34,000 mg/kg) and SRRF-4 (0 to 3 inches bgs with a total lead concentration of 4519.6 mg/kg).

Soil collected for the treatability study was collected at the same depth of the original samples for each location, sieved to remove any fragmented lead and placed in a 5-gallon bucket. Each soil sample was thoroughly mixed to provide an homogenized sample. Each sampling location had three subsamples, one subsample untreated, one subsample treated with 1% ECOBOND® by weight, and one subsample treated with 2% ECOBOND® by weight.

The nine subsamples were delivered to TAL under chain-of-custody protocol for analysis of the following

- The untreated samples were analyzed for total lead (EPA 6010C), dissolved Lead by TCLP (EPA Method 1311), and dissolved lead by SPLP (EPA Method 1312); and
- The two treated samples were analyzed for dissolved lead by TCLP (EPA Method 1311), and dissolved Lead by SPLP (EPA Method 1312).

The results of the treatability sampling are pending and will be provided later in an Addendum to this Report.

6.16 Asbestos, Lead-based Paint, and Regulated Building Material Survey

Asbestos, lead-based paint, and regulated building material surveys were performed by DS Environmental Consultants from September 21, 2016 to October 19, 2016. The scope of the survey included four on-Site buildings, seven miscellaneous sheds, two explosives magazines, and the wood/metal backstop located on the north end of the North Shooting Range. The reports summarizing the findings of these surveys are provided in Appendix O.

6.16.1 Asbestos Survey

A total of 87 asbestos samples were collected in 41 homogeneous areas during the asbestos survey which was performed by an EPA and CDPHE Certified Asbestos Building Inspector in accordance with the guidelines published as EPA Final Rule: Title II of the TSCA, 15 USC, Sections 2641 through 2654 (TSCA, 1976) and in compliance with 40 CFR, Part 763 (EPA, 2011) and CDPHE Regulation Number 8, Part B - Asbestos (Reg. 8) (CDPHE AQCC, 2008).

All asbestos bulk-samples were analyzed by a National Voluntary Laboratory Accreditation Program accredited laboratory via Polarized Light Microscopy for asbestos content.

The percentage of asbestos within each individual bulk-sample can vary depending on sample location, homogeneity of the material, and the type of application. Any sample reporting a "TRACE" amount of asbestos must be considered positive for asbestos greater than 1% unless it is re-analyzed utilizing the point-count method and verified to be less than 1%.

Materials containing less than 1% asbestos are not regulated by CDPHE Regulation 8, Part B – Asbestos (CDPHE AQCC, 2008). However, all demolition/abatement activities should be performed following the applicable Occupational Safety and Health Administration (OSHA) regulations. This would include, but not limited to, the appropriate asbestos training for the type of material being removed/disturbed as well as having a properly trained supervisor on-Site, using wet removal methods, wearing adequate personal protective equipment (HEPA-filtered particulate respirators), medical surveillance of workers, personal-exposure air monitoring, area air monitoring in occupied buildings, etc. There may also be landfill disposal requirements for these materials, depending on the facility.

Results of the asbestos survey are discussed in Section 7.9.

6.16.2 Lead-based Paint Survey

Paint located in building interiors and on building exteriors were analyzed for the presence of lead-based paint during the lead-based paint survey. A Colorado Certified Lead-Based Inspector performed limited lead-paint testing surveys of the various painted materials of on-Site buildings and miscellaneous structures. An XRF was used for the testing.

Results of the lead-based paint survey are discussed in Section 7.9.

6.16.3 Regulated Building Material Survey

A regulated building material survey of on-Site structures was performed by surveying each structure for the following items:

- Mercury-Containing Components,
- PCB and Di-ethylhexl-pthalate (DEHP) Containing Items,
- Electronic Waste,
- Radioactive Exit Signs and Smoke Detectors, and

- Freon in Appliances.

The purpose of the regulated building materials survey was to assess environmental concerns including universal waste products per the federal universal waste regulations set forth in 40 CFR part 273. The intent was to identify and catalog potentially hazardous RBMs that may be impacted by planned demolition activities at the Site.

Results of the regulated building material survey are discussed in Section 7.9.

6.17 Health and Safety

Health and Safety oversight was performed in accordance with the Site-specific Health and Safety Plan (Quantum 2016B). Personal ambient air monitoring was conducted on field personnel during the shooting range sampling tasks. Integrated personal air monitoring was conducted initially during soil sampling to gather exposure data, and determine the adequacy of employee protection from airborne lead exposure. Air sampling equipment was worn for three consecutive shifts, and a total of six samples were collected, along with one field blank, for analysis. Air sampling results for each individual indicated an airborne lead exposure below the OSHA permissible exposure limit of 0.05 milligrams per cubic meter. Personal air sampling and analysis occurred according to the National Institute for Occupational Safety and Health Method AA (7082). Samples were submitted to an American Industrial Hygiene Association accredited laboratory for analysis.

A large patch of poison ivy was observed on the north Site boundary immediately west of monitoring well AC-MW2. A photograph of the plants is included in Appendix D. Site-specific health and safety plans will address this biological hazard.

7.0 RESULTS SUMMARY

7.1 Off-Site Domestic Well

Concentrations of barium, iron, lead, chloride, fluoride, and sulfate were detected in sample 258253-012316 collected from the off-Site domestic well above the respective laboratory detection limits. Sulfate was detected at a concentration of 338 mg/L, above the CGS for sulfate (250 mg/L). Analytical results are summarized in Table 5 and the laboratory analytical report is provided in Appendix F1.

7.2 On-Site Commercial Well

Concentrations of chloride, sulfate, alkalinity, bicarbonate alkalinity as $CaCO_3$, carbonate alkalinity as $CaCO_3$, calcium, magnesium, potassium, sodium, barium, chromium, cobalt, copper, lead, nickel, vanadium, and zinc were reported, above their respective laboratory detection limits in sample AC-164204-081016 collected from the on-Site commercial well. Analyzed constituents were reported at concentrations below their respective CGS. Due to elevated reporting limits as the result of laboratory error, many VOC reporting limits were too high to determine whether VOCs are present in the well at concentrations above their respective groundwater standards. Therefore, the VOC data was rejected as further discussed in Section 10.0 Quality Assurance / Quality Control. Analytical results are summarized in Table 2 and the laboratory analytical report is provided in Appendix F2.

7.3 Groundwater Sampling

The following summarizes general chemistry, metals, and VOC detections in groundwater samples collected from AC-MW1, AC-MW3, AC-MW4, AC-MW5, AC-P4, and off-Site monitoring well MW-H05. Analytical results were compared their respective CGS. The following summarizes constituents that exceeded their respective CGS. Analytical results are summarized in Table 2. The the laboratory analytical reports are provided in Appendix F3 and the VOC sampling analytical report of AC-MW3 is provided in Appendix F7.

General Chemistry

- Chloride was detected in AC-MW1, AC-MW3, AC-MW4, and MW-H05 above the CGS of 250 mg/L at concentrations of 3,300 mg/L, 290 mg/L, 640 mg/L, and 730 mg/L, respectively.
- Nitrate as N was detected in AC-MW3 above the CGS of 10 mg/L at a concentration of 13 mg/L.
- Sulfate was detected in AC-MW1, AC-MW3, AC-MW4, AC-MW5, and MW-H05 above the CGS of 250 mg/L at concentrations of 1,700 mg/L, 2,600 mg/L, 2,300 mg/L, 3,700 mg/L, and 4,300 mg/L, respectively.

General chemistry parameters were not measured in AC-P4 due to limited quantities of groundwater present in this location.

Metals

- Selenium was reported in the groundwater sample collected from AC-MW1 and AC-MW3 at concentrations of 92 µg/L and 220 µg/L, both above the CGS of 50 µg/L.
- Metals were not analyzed in AC-P4 due to limited quantities of groundwater present in this location.

Volatile Organic Compounds

- Cis-1,2-dichloroethene was detected in off-Site well MW-H05 at a concentration of 20 µg/L, above the CGS which has a range of 14 µg/L to 70 µg/L.
- Vinyl chloride was detected in AC-MW4 and MW-H05 at an estimated concentration of 0.53 µg/L, and a concentration of 1.3 µg/L, respectively. These concentrations exceed the CGS which has a range of 0.023 µg/L to 2 µg/L.

When the CGS is listed as a range, the lower standard is a strictly health-based standard and the higher standard is the maximum contaminant level (MCL), established under the federal Safe Drinking Water Act. The CDPHE Water Quality Control Division intends that control requirements for these analytes be implemented to attain a level of ambient water quality at least equal to the lower standard except as follows:

- Wherever the Commission has adopted alternative, site-specific standards for the chemical, the site-specific standards shall apply instead of these statewide standards; and
- The implementing agency has determined that setting the protection level to the second number in the range is consistent with the current and reasonably anticipated future uses of the groundwater, factoring in site-specific information, such as: existing prohibitions on groundwater use; whether the location is within the boundaries of an existing or reasonably anticipated public water supply; the proximity of the site to existing and reasonably anticipated water wells; whether or not the aquifer can produce water at a rate capable of supporting the anticipated use; or it can be demonstrated that access to groundwater is prohibited, unavailable, or present at insufficient quantities for reliable use.

There are currently no Site-specific analyte concentration standards in place at the Site, and Bullet Two of the list above is not currently applicable at the Site. Therefore, the most conservative number in the range must be considered as the groundwater standard at the Site, until further evaluation by CDPHE.

7.4 Shooting Range Results

The following sections discuss results of soil samples collected in the shooting range areas.

7.4.1 North Shooting Range

Analytical results of the North Shooting Range soil samples are summarized in Table 4.

Impact Berms:

Concentrations of Total Metals - Shooting Range COCs in samples collected from grids NRIB-4 and NRIB-5 were below action levels, with total lead in these grids at 42 mg/kg and 57 mg/kg, respectively. Total lead concentrations in NRIB-1 through NRIB-3 exceeded action levels due to their location on the shooting range area. Analytical results from NRIB-1 through NRIB-3 are summarized below.

- NRIB-1 (0 to 6 inches) contained a total lead concentration of 32,000 mg/kg, above the Industrial RSL, TCLP - Lead analysis yielded a lead result 710 mg/L, above the EPA TCLP limit of 5 mg/L. Total antimony was reported at a concentration of 190 mg/kg, above the Residential RSL of 31 mg/kg and total arsenic was reported at a concentration of 45 mg/kg, above the CDPHE arsenic action level of 11 mg/kg (CDPHE, 2014);
- NRIB-1 (6 to 12 inches) contained a total lead concentration of 52,000 mg/kg, above the Industrial RSL. Total antimony was reported at a concentration of 1,900 mg/kg, above the Industrial RSL of 470 mg/kg;
- NRIB-2 (0 to 6 inches) contained a total lead concentration of 34,000 mg/kg, above the Industrial RSL, and a TCLP - Lead concentration of lead of 410 mg/L above the EPA TCLP limit. Total antimony was reported at a concentration of 270 mg/kg, above the Residential RSL and a total arsenic was reported at a concentration of 96 mg/kg, above the CDPHE arsenic action level. The subsequent lift from 18 to 24 inches contained total metal concentrations below the Residential RSLs; and
- NRIB-3 (0 to 6 inches) contained a total lead concentration of 30,000 mg/kg, above the Industrial RSL, TCLP analysis yielded a lead result of 450 mg/L, above the TCLP limit. Total antimony was reported at a concentration of 240 mg/kg, above the Residential RSL and total arsenic was reported at a concentration of 350 mg/kg, above the CDPHE arsenic action level. The subsequent lift (18 to 24 inches) contained total metals concentrations below the Residential RSLs.

Back Berm:

Analytical results of soil samples collected indicated that Total Metals - Shooting Range COCs in these areas is below the Residential RSL. Total lead concentrations in the North Shooting Range back berm ranged from 18 mg/kg to 240 mg/kg.

One TCLP sample was collected from grid NRBB-5 from 0 to 3 inches bgs which yielded concentration of lead at 36 mg/L, above the EPA TCLP limit. The total lead concentration in sample NRBB-5 from 0 to 3 inches contained a concentration 36 mg/kg.

Lateral Berms:

Total Metals - Shooting Range COCs concentrations in the North Shooting Range lateral berms was generally low, with total lead concentrations ranging from 7.6 mg/kg to 290 mg/kg excluding the sample from NRLB-4O from 0 to 3 inches.

- NRLB-4O(0) from 0 inches to 3 inches bgs contained total lead at a concentration of 480 mg/kg, above the Residential RSL.

Range Floors:

Samples collected from the two North Shooting Range range floors indicated low concentrations of Total Metals - Shooting Range COCs. Total lead concentrations in these sample grids ranged from 6.4 mg/kg to 81 mg/kg.

Safety Fan Area:

Results of laboratory analysis reported concentrations of Total Metals - Shooting Range COCs in the North Shooting Range safety fan below the Residential RSL. Total lead concentrations in the North Shooting Range safety fan ranged from 6.9 mg/kg to 42 mg/kg.

7.4.2 South Shooting Range

Analytical results of the South Shooting Range soil samples are summarized in Table 4 and the laboratory analytical reports are provided in Appendix F4.

Impact Berms:

In general, Total Metals - Shooting Range COCs were elevated in the South Shooting Range impact berm with high total lead concentrations and elevated TCLP-Lead concentrations. Analytical results from South Shooting Range impact berm sampling is summarized below:

- SRIB-6 (0-6 inches) contained total lead at 1,400 mg/kg, above the Industrial RSL;
- SRIB-6 (3-6 inches) contained total lead at 34,000 mg/kg, above the Industrial RSL. Total antimony was reported at a concentration of 1,100 mg/kg, above the Industrial RSL;
- SRIB-7 (0-6 inches) contained total lead at 25,000 mg/kg, above the Industrial RSL, TCLP-Lead was detected at a concentration of 1,100 mg/L above the EPA TCLP limit. Total antimony was reported at a concentration of 140 mg/kg, above the Residential RSL;
- SRIB-7 (12-18 inches) contained total lead at 650 mg/kg, above the Residential RSL;
- SRIB-8 (0-6 inches) contained total lead at 130,000 mg/kg, above the Industrial RSL, TCLP lead was detected at a concentration of 1,300 mg/L above the EPA TCLP limit. Total antimony was reported at a concentration of 1,400 mg/kg, above the Industrial RSL and total arsenic was reported at a concentration of 410 mg/kg, above the CDPHE arsenic action level;
- SRIB-9 (0-6 inches) contained total lead at 34,000 mg/kg, above the Industrial RSL, TCLP-Lead was detected at a concentration of 1,200 mg/L above the EPA TCLP limit. Total antimony was reported at a concentration of 100 mg/kg, above the Residential RSL;
- SRIB-10 (0-6 inches) contained total lead at 86,000 mg/kg, above the Industrial RSL, TCLP-Lead was detected at a concentration of 1,500 mg/L above the EPA TCLP limit. Total antimony was reported at a concentration of 450 mg/kg, above the Residential RSL;
- SRIB-10 (18-24 inches) contained total lead at 980 mg/kg, above the Industrial RSL;
- SRIB-11 (0-6 inches) contained total lead at 170,000 mg/kg, above the Industrial RSL. Total antimony was reported at a concentration of 1,300 mg/kg, above the Industrial RSL and total arsenic was reported at a concentration of 130 mg/kg, above the CDPHE arsenic action level; and
- SRIB-12 (0-6 inches) contained total lead at 18,000 mg/kg, above the Industrial RSL, TCLP-Lead was detected at a concentration of 790 mg/L above the EPA TCLP limit. Total antimony was reported at a concentration of 90 mg/kg, above the Residential RSL.

Range Floors:

The South Shooting Range range floors generally contained elevated concentrations of total lead concentrations with several samples containing elevated concentrations of arsenic and one sample containing an elevated

concentration of antimony. Results of South Shooting Range range floor analytical results are summarized below:

- SRRF-2 (0-3 inches) contained total lead at 1,200 mg/kg, above the Industrial RSL. The TCLP sample in this location contained a concentration of lead at 18 mg/L, above the EPA TCLP limit;
- SRRF-3 (0-3 inches) contained total lead at 2,400 mg/kg, above the Industrial RSL;
- SRRF-3 (3-6 inches) contained total lead at 770 mg/kg, above the Residential RSL;
- SRRF-4 (0-3 inches) contained total lead at 3,900 mg/kg, above the Industrial RSL;
- SRRF-6 (0-3 inches) contained total lead at 2,200 mg/kg, above the Industrial RSL and a TCLP result for lead (13 mg/L) above the EPA TCLP limit, lead was also present in the lab blank;
- SRRF-7 (0-3 inches) contained total lead at 55,000 mg/kg, above the Industrial RSL and TCLP result for lead above the EPA TCLP limit at a concentration of 300 mg/L, lead was also present in the lab blank. Total antimony was reported at a concentration of 1,800 mg/kg, above the Industrial RSL and total arsenic was reported at a concentration of 670 mg/kg, above the CDPHE arsenic action level;
- SRRF-7 (6-9 inches) contained total lead at 5,800 mg/kg, above the Industrial RSL;
- SRRF-8 (0-3 inches) contained total lead at 1,800 mg/kg, above the Industrial RSL;
- SRRF-8 (6-9 inches) contained total lead at 580 mg/kg, above the Residential RSL. Total arsenic was reported at a concentration of 45 mg/kg, above the CDPHE arsenic in soil concentration;
- SRRF-9 (0-3 inches) contained total lead at 690 mg/kg, above the Residential RSL; and
- SRRF-9 (6-9), SRRF-10 (0-3), and SRRF-10 (3-6) contained total arsenic concentrations at 14 mg/kg, 15 mg/kg, and 13 mg/kg, respectively. These concentrations exceed the CDPHE arsenic action level.

An additional composite sample of the West range floor (SRRF-PAH) contained TCLP concentrations above the EPA TCLP limit.

Back Berm:

Total metals concentration in the South Shooting Range back berm were generally low excluding total lead concentrations in three of the six grid areas. A summary of these results are summarized below:

- SRBB-2 contained total lead at a concentration of 470 mg/kg, above the Residential RSL;
- SRBB-5 contained total lead at a concentration of 980 mg/kg, above the Industrial RSL; and
- SRBB-6 from 0-3 inches bgs contained total lead at a concentration of 2,400 mg/kg, above the Industrial RSL. The TCLP sample collected from SRBB-6 (0) contained lead at a concentration of 6.5 mg/L, above the EPA TCLP limit.

Lateral Berms:

The lateral berms contained generally low concentration of Total Metals - Shooting Range COCs, excluding the areas shown below:

- SRLB-2I (0-3 inches) contained total lead at 940 mg/kg, above the Industrial RSL;
- SRLB-5O (0-3 inches) contained total lead at 4,000 mg/kg, above the Industrial RSL and TCLP concentration of lead at 64 mg/L above the EPA TCLP limit. Total antimony was reported at a concentration of 40 mg/kg, above the Residential RSL;
- SRLB-6O (0-3 inches) contained total lead at 5,400 mg/kg, above the Industrial RSL. Total antimony was reported at a concentration of 58 mg/kg, above the Residential RSL;

- SRLB-7O (0-3 inches) contained total lead at 4,600 mg/kg, above the Industrial RSL. Total antimony was reported at a concentration of 73 mg/kg, above the Residential RSL; and
- A sample collected from SRLB-4 that was on the southern border of this area (ACA-3 (0-3)) contained a total lead concentration of 100 mg/kg and a TCLP lead concentration of 7 mg/L, above the EPA TCLP limit.

Total Metals - Shooting Range COCs concentrations in the remaining 14 samples were low with total lead concentrations ranging from 13 to 330 mg/kg.

Safety Fan Area:

With the exception of sample grid SRSF-4, the South Shooting Range safety fan generally contained low concentrations of Total Metals - Shooting Range COCs. The northernmost sub-sample from SRSF-4 (SRSF-4NW[0] from 0 to 3 inches bgs) contained a total lead concentration of 150,000 mg/kg, above the Industrial RSL, total antimony at a concentration of 2,600 mg/kg above the Industrial RSL , and a total arsenic concentration of 68 mg/kg above the CDPHE action level. Total lead in the remaining sub-samples ranged from 17 mg/kg to 340 mg/kg.

The TCLP - Lead concentration in the 5-point composite sample from SRSF-4 from 0 to 3 inches bgs was 40 mg/L, above the EPA TCLP limit.

7.4.3 SWAT Team Training Area

Analytical results of the Swat Team Training Area soil samples are summarized in Table 4 and the laboratory analytical report is provided in Appendix F4. The samples collected from the two sample STRF-1(0) collected from 0 to 3 inches, and STRF-2(0) collected from 0 to 3 inches contained Total Metals - Shooting Range COCs concentrations below Residential RSLs.

7.4.4 PAH Sampling Results

Analytical results of the 5-point composite sample SRRF-PAH, submitted for analysis of PAHs by EPA Method 8270C yielded an estimated concentration of pyrene above the laboratory detection limit, but below the Industrial RSL (23,000 mg/kg). The remaining analytes were reported below the laboratory detection limit. The laboratory analytical report is provided in Appendix F4.

7.5 Sediment Sampling Results

Analytical results are summarized in Table 6 and the laboratory analytical reports are provided in Appendix F5. Analytical results were compared to Residential and Industrial RSLs, and the CDPHE Colorado Soil Evaluation Values (CSEV) for groundwater protection. No analytes were detected above published CSEV for groundwater protection. Analytical results of analytes detected above the Residential RSL and Industrial RSL are summarized below.

- Arsenic was reported in samples AC-SED-01-0.005, AC-SED-02-0.005, AC-SED-03-0.005, AC-SED-04-0.005, AC-SED-05-0.005, AC-SED-06-0.005, and AC-SED-07-0.005 at concentrations of 6.3

mg/kg, 6.1 mg/kg, 8.9 mg/kg, 4.4 mg/kg, 6.3 mg/kg, 2.4 mg/kg, and 8.4 mg/kg, respectively, each exceeding the Residential RSL, and the Industrial RSL. However, all reported concentrations of arsenic were below the CDPHE arsenic action level of 11 mg/kg; and

- Lead was reported in samples AC-SED-06-0.005, and AC-SED-07-0.005 at concentrations of 670 mg/kg, and 6200 mg/kg, respectively. AC-SED-06-0.005 exceeds the Residential RSL and sample AC-SED-07-0.005 exceeds both the Residential and the Industrial RSL.

7.6 Explosives Sampling Results

Soil sampling for explosives analysis was conducted on August 11 and 24, 2016 in general accordance with the SAP. Samples collected from the south explosives magazine, the northern explosives magazine, the roll-off container, and the burn drum did not contain explosives constituents above laboratory reporting limits. The laboratory analysis report is included in Appendix F5.

7.7 Landfill Gas Sampling Results

A summary of soil vapor analytical results is presented in Table 7 and the laboratory analytical report is provided in Appendix F6. A summary of analytes detected in soil vapor samples is presented below:

Methane

Methane was reported in soil vapor samples at concentrations of 140,000 ppm by volume (ppmV), 190 ppmV, and 61 ppmV in AC-GMP-2, AC-GMP-4, and AC-P2, respectively. Concentrations of methane reported in the landfill boundary monitoring points AC-GMP-4 and AC-P2 contained methane concentrations of 0.019% by volume and 0.0061% by volume, respectively, below the CDPHE Solid Waste Regulation concentration limit of 5% methane by volume at a landfill boundary.

VOCs

Vinyl chloride, 1,1-dichloroethane, chloroform, benzene, trichloroethene, toluene, tetrachloroethene, ethylbenzene, m,p-xylene, and o-xylene were reported in soil vapor samples above the laboratory detection limit in soil samples collected from AC-GMP-2, AC-GMP-4, and AC-P2. In general, concentrations were higher in sample AC-GMP-2, located within the limits of the landfill, than landfill boundary samples AC-GMP-4 and AC-P2, as expected.

When comparing VOC concentrations, reported in landfill boundary monitoring point samples AC-GMP-4 and AC-P2, to EPA Residential RSLs, the CDPHE Hazardous Materials and Waste Management Division, Indoor Air Guidance (September 2004) basement/slab on grade attenuation factor of ten is applied. The attenuation factor assumes, for a soil vapor intrusion risk to be present, that a contaminant concentration of ten times the regulatory limit must be present below a building basement/slab on grade foundation. A summary of the reported VOC concentrations that are ten times the Residential RSLs is provided below.

- Chloroform was reported in AC-P2 at a concentration of 2.90 µg/m^3, greater than ten times the Residential RSL of 0.12 µg/m^3.
- Benzene was reported in AC-GMP-4 at a concentration of 4.7 µg/m^3, greater than ten times the Residential RSL of 0.36 µg/m^3.

- Trichloroethene was reported in AC-P2 at a concentration of 8.7 µg/m3, greater than ten times the Residential RSL of 0.48 µg/m3.
- Tetrachloroethene was reported in AC-P2 at a concentration of 110 µg/m^3, greater than ten times the Residential RSL of 11 µg/m^3.
- Ethylbenzene was reported in AC-GMP-4 and AC-P2 at concentrations of 19 µg/m^3 and 20µg/m^3, respectively. Both concentrations are greater than ten times the Residential RSL of 1.1 µg/m^3.

The attenuation factor mentioned above does not account for attenuation of these constituents from the landfill to off-Site structures.

7.8 SAP Addenda Sampling Results

7.8.1 Additional Characterization Area Sampling

Analytical results of the ACA soil samples are summarized in Table 4 and the laboratory analytical reports are provided in Appendix F4. Analytical results which exceeded regulatory (Residential and Industrial RSLs, and TCLP limit) are summarized below:

- ACA-1 (0-3) collected from 0 to 3 inches bgs contained a total lead concentration of 3,100 mg/kg, above the Industrial RSL;
- ACA-2 (0-3) collected from 0 to 3 inches bgs contained a TCLP-Lead concentration of 60 mg/L, above the TCLP limit. The total lead concentration in this sample was reported at a concentration of 200 mg/kg, below the Residential RSL; and
- ACA-3.2 (0-3)) collected from 0 to 3 inches bgs contained Total Metals - Shooting Range COCs concentrations below the Residential RSLs and was not analyzed for TCLP-Shooting Range COCs.

7.8.2 14331 Riverdale Road Spring Sampling

Analytical results for the spring sample AC-SPRING collected from a hillside spring at the 14331 Riverdale Road Property were compared to the Water Quality Control Commission Regulation No. 41: Basic Standards for Groundwater (CDPHE WQCC, 2016). Analytical results for AC-SPRING are summarized below as well as in Table 2, the laboratory analytical report is provided in Appendix F7:

General Chemistry:

Chloride, sulfate, alkalinity, and bicarbonate alkalinity as $CaCO_3$ were detected above laboratory detection limits. Two analytes were reported above their respective CGS. Chloride was detected at a concentration of 780 mg/L, above the CGS of 250 mg/L, and sulfate was reported at a concentration 8,900 mg/L, above the CGS of 250 mg/L.

Metals:

Calcium, magnesium, potassium, sodium, antimony, arsenic, barium, cobalt, copper, lead, nickel, selenium, silver, vanadium, and zinc were reported above the laboratory detection limit. No analytes were reported above their respective CGS.

Volatile Organic Compounds:

Acetone was reported at a concentration above the laboratory reporting limit but below the CGS.

7.8.3 Sludge Results

A summary of sludge sample analytical results from landfill waste delineation on September 26, 2016 is presented below:

- Arsenic was reported at a concentration of 4.8 micrograms per kilogram (µg/kg) in composite sample AC-SB-45-51 and at a concentration of 5.3 µg/kg in the discrete sample AC-SB-46 (4-8) below the Industrial RSL and the CDPHE Groundwater Protection Value;
- VOCs, PAHs, and total metals were reported at concentrations below their respective Industrial RSLs and CDPHE Groundwater Protection Values;
- Free liquid was identified in composite sample AC-SB-45-51, but not in the discrete sample AC-SB-47 (4-8);
- Total cyanide was reported in AC-SB-47 (4-8) at an estimated value of 0.49 mg/kg, below the reporting limit, and was also present in the laboratory method blank. Total cyanide and sulfide were not reported in the other samples;
- The corrosivity values of both samples were within the EPA's non-corrosive range (pH>2 and pH<12.5); and
- The flashpoint for both samples was reported as greater than 220 degrees Fahrenheit, which is considered not ignitable, according to RCRA EPA criteria (greater than 140 degrees Fahrenheit).

Sludge environmental sample data is summarized in Table 8. The analytical report is included in Appendix F8.

The geotechnical analysis of the sludge sample collected was analyzed using and percent solids ASTM D2216-90. The testing resulted in a designation of the material being a non-plastic silt with sand (ML) and having an in-situ moisture of 47.8%. The plastic limit is non-plastic and the liquid limit is a non-value. The geotechnical report is included in Appendix M.

7.9 Asbestos, Lead-based Paint, and Regulated Building Material Survey

Asbestos survey, lead-based paints survey, and regulated building material survey reports, provided by DS Environmental Consultants, are included in Appendix O.

Asbestos

Of the materials sampled during asbestos inspection by DS Consulting of on-Site buildings, one material was found to contain asbestos:

- Green 9-inch by 9-inch floor tile (2% Chrysotile asbestos) with black mastic (non-detect for asbestos) located in the main room of Building C (located adjacent to the South Shooting Range) beneath ceramic floor tile.

Lead-Based Paint

All paint was found to be negative for lead-based paint.

Regulated Building Materials

Building A:

- Eight (8) 8' Fluorescent Light Ballasts,
- Five (5) 4' Fluorescent Light Ballasts,
- Ten (10) 4' Fluorescent Light Bulbs,
- Two (2) Illuminated Emergency Exit Signs,
- One (1) Exterior Air Conditioning Unit, and
- One (1) Wall-mounted Thermostat.

Building B:

- Fourteen (14) 4' Fluorescent Light Ballasts,
- Twenty Eight (28) 4' Fluorescent Light Bulbs,
- One (1) Exterior Air Conditioning Unit, and
- One (1) Wall-mounted Thermostat.

Building C:

- Two (2) 8' Fluorescent Light Ballasts,
- Four (4) 8' Fluorescent Light Bulbs,
- One (1) Wall Mounted Air Conditioner, and
- One (1) Wall-mounted Thermostat.

Building H:

- Eight (8) 4' Fluorescent Light Ballasts, and
- Sixteen (16) 4' Fluorescent Light Bulbs.

Note: Mercury may be present in fluorescent lightbulbs, thermostats as well as safety and emergency lighting in the four buildings referenced above. PCBs and possibly DEHP-containing light ballasts may be located in the four buildings referenced above. Freon may be present in the external air conditioning units of the two buildings and in one wall-mounted air conditioning unit of the one building referenced above.

8.0 EXTENT OF CONTAMINATION

8.1 Soil

Site assessment data obtained from sampling and analysis of the Shooting Range areas were compiled and compared to the regulatory action levels and cleanup standards (Section 2.3). The term "Excess Risk" soil is defined as soil that has been determined to have unacceptable levels of risk either for leaving uncovered on Site or for placing as gradefill beneath the WBC. This is determined by either exceeding the lead CDPHE GPL (1.1 mg/L) as determined by SPLP or exceeding TCLP. Soil that has been treated and no longer exhibits "Excess Risk" can be placed beneath the WBC. This assessment data was used for estimating areas, thicknesses, and volumes of soil exceeding regulatory action levels (referred to in this document as Excess Risk soil). Exceedance soil volume estimates were made using the following decision criteria or assumptions:

- Although other metals such as antimony and arsenic were reported above Industrial RSLs, lead is the main constituent of concern in the Shooting Range soils. Managing and treating the soils for lead will also treat the soils for antimony and arsenic,
- North Shooting Range Excess Risk soil - Exceeds the Industrial RSL for total lead (800 mg/kg), or exceeds TCLP-Lead (5 mg/L),
- South Shooting Range Excess Risk soil - Exceeds the Residential RSL for total lead (400 mg/kg), or exceeds TCLP-Lead (5 mg/L),
- Each laboratory reported constituent value is assumed to represent the average value over the sample grid area times the sample lift thickness (3" or 6"),
- The minimum excavation (cut) depth is 6 inches due to practical limitations in excavation equipment and the irregular topography of the berms at the Site, and
- If the base of soil impact in a particular sample grid was not confirmed by laboratory analysis, then the base of soil impact for the deepest neighboring grid was used as the cut depth for that sample grid.

8.1.1 North Shooting Range

Approximately 110 bank cubic yards (bcy) of Excess Risk soil exists in three sample grids (NRIB-1, -2, and -3) of the impact berm. This soil exceeds both Industrial RSL and TCLP for lead. The estimated depth of Excess Risk soil ranges from 1.0 to 1.5 feet. Figures 9A-1 through 9A-5 depict sample grid locations and depths of Excess Risk soil at depths of 0", 3", 6", 12" and 18" bgs, respectively. As indicated on Figure 9B, none of the 24 soil samples collected from the North Shooting Range Safety Fan exceeded the Residential RSL for Shooting Range COCs and the North Shooting Range Safety Fan soil does not appear to contain Excess Risk soil. The table below summarizes sample grids, depths and volumes of Excess Risk soil.

North Shooting Range Excess Risk Soil

Sample Grid	Depth (feet)	Exceeds EPA Total Lead Industrial RSL (800 mg/kg)	Exceeds TCLP Lead (5 mg/L)	Volume (bcy)
NRIB-1	1.0	Yes	Yes	28
NRIB-2	1.5	Yes	Yes	42
NRIB-3	1.5	Yes	Yes	40
TOTAL EXCESS RISK SOIL = 110 bcy[a]				

mg/kg = milligrams per kilogram, mg/L = milligrams per liter, RSL = Regional Screening Level
TCLP = Toxicity Characteristic Leaching Procedure, bcy = bank cubic yards, a = rounded

8.1.2 South Shooting Range and Storm Water Basin

Approximately 1,614 bcy of Excess Risk soil exists in 24 sample grids within the South Shooting Range, safety fan and storm water (riprap) basin. This soil exceeds Residential RSL and some soil exceeds TCLP for lead. The estimated depth of Excess Risk soil ranges from 1.0 to 2.0 feet. The deepest observed occurrence of Excess Risk soil (2.0 feet) is within the impact berm. Beneath the range floor proximal to the impact berm Excess Risk soil exists between a depth of approximately 0.5 to 1.0 feet. Soil beneath the range floor may have been impacted by lead from the Chuck-O-Luck Sporting Club, which pre-dated the Adams County Shooting Range, or by storm water runoff leaching lead from fragmented lead on the shooting range pavement surface. Sample Grid SRSF-4 of the safety fan contains Excess Risk soil that exceeds Industrial RSL and TCLP for lead. Due to concentrations of fragmented lead on the surface in this grid, it is suspected that some impact berm material may have been transported to this part of the range as part of berm maintenance. The remaining 22 sample grids in the berms and range floor of the South Shooting Range may contain trace levels of munitions debris (i.e. bullets, shell casings, ricochets, wadding) on or near the ground surface.

Figures 10A-1 through 10A-9 depict sample grid locations and depths of Excess Risk soil at depths of 0", 3", 6", 9", 12", 15", 18", 24" and 30" bgs, respectively. As indicated on Figure 10B, one of the nine sample grids in the South Shooting Range Safety Fan exceeded the Industrial RSL and TCLP for lead. The rest of the Safety Fan sample grids do not contain Excess Risk soil. However, based on site walks over this area, traces of fragmented lead are observed on the ground surface in most of these grids. The table below summarizes sample grids, depths and volumes of Excess Risk soil.

South Shooting Range Excess Risk Soil

Sample Grid	Depth (feet)	Exceeds EPA Total Lead Residential RSL (400 mg/kg)	Exceeds TCLP Lead (5 mg/L)	Volume (bcy)
SRBB-2	0.5	Yes	NA	45
SRBB-5	0.5	Yes	NA	43
SRBB-6	0.5	Yes	No	42

Sample Grid	Depth (feet)	Exceeds EPA Total Lead Residential RSL (400 mg/kg)	Exceeds TCLP Lead (5 mg/L)	Volume (bcy)
SRIB-6	0.5	Yes	NA	12
SRIB-7	1.0	Yes	Yes	28
SRIB-8	2.0	Yes	Yes	56
SRIB-9	2.0	Yes	Yes	53
SRIB-10	2.0	Yes	Yes	54
SRIB-11	2.0	Yes	NA	54
SRIB-12	2.0	Yes	NA	51
SRLB-2I	0.5	Yes	NA	24
SRLB-4O	0.5	No	Yes	28
SRLB-5O	1.5	Yes	Yes	61
SRLB-6O	0.5	Yes	NA	18
SRLB-7O	0.5	Yes	NA	19
SRRF-2	0.5	Yes	Yes	78
SRRF-3	0.5	Yes	NA	8
SRRF-4	0.5	Yes	NA	84
SRRF-6	0.5	Yes	Yes	102
SRRF-7	1.0	Yes	Yes	209
SRRF-8	0.5	Yes	NA	96
SRRF-9	0.5	Yes	No	98
SRSF-4	0.5	Yes	Yes	199
SEDIMENT BASIN	0.5	Yes	NA	83
TOTAL EXCESS RISK SOIL = 1,614 bcy[a]				

mg/kg = milligrams per kilogram, mg/L = milligrams per liter, RSL = Regional Screening Level
TCLP = Toxicity Characteristic Leaching Procedure, bcy = bank cubic yards, NA = Not analyzed, a = rounded

8.1.3 Bullet Piles and Additional Characterization Areas

Approximately 130 bcy of assumed Excess Risk soil exists in three bullet piles. Bullet Piles #1 and #2 exist on the landfill surface and Bullet Pile #3 exists adjacent to the lateral berm of the South Range Skeet Shooting Area. The bullet piles consist of a mixture of soil and munitions debris. Because of the high concentration of fragmented lead on the pile surface, soil samples were not collected or analyzed. Soil volumes were estimated based on visual observation. Based on discussions with the County, it is suspected that these bullet piles represent impact berm soils that were removed from the North and/or South Shooting Range impact berms as part of routine range maintenance. Locations of the bullet piles are depicted on Figures 6A and 6B.

Approximately 325 bcy of Excess Risk soil exists in two ACAs (ACA-1 and ACA-2) located on the landfill surface. ACA-1 and ACA-2 are large, relatively flat areas where munitions debris were observed on the land surface. This soil exceeds Industrial RSL or TCLP for lead. The volume estimate is based on an assumed depth of soil impact of 0.5 feet bgs. Based on discussions with the County, it is suspected that these ACAs represent soil that was removed from the North and/or South Shooting Range impact berms and graded out over the landfill surface as part of routine shooting range maintenance. Figures 6A and 6B depict ACA sample locations and depths of Excess Risk soil at depths of 0" and 3" bgs, respectively.

A total of 455 bcy of Excess Risk soil is estimated to exist in the three bullet piles and two ACAs.

Bullet Piles and Additional Characterization Areas - Excess Risk Soil

Sample Grid	Depth (feet)	Exceeds EPA Total Lead Industrial RSL (800 mg/kg)	Exceeds TCLP Lead (5 mg/L)	Volume (bcy)
Bullet Pile #1	0.5	NA	NA	123
Bullet Pile #2	0.5	NA	NA	2
Bullet Pile #3	0.5	NA	NA	5
ACA-1	0.5	Yes	No	160
ACA-2	0.5	No	Yes	165
TOTAL EXCESS RISK SOIL = 455 bcy[a]				

mg/kg = milligrams per kilogram, mg/L = milligrams per liter, RSL = Regional Screening Level
TCLP = Toxicity Characteristic Leaching Procedure, bcy = bank cubic yards, NA = Not analyzed, a = rounded

8.1.4 South Shooting Range Safety Fan and Additional Characterization Area-3

Eight sample grids of the South Shooting Range Safety Fan and Additional Characterization Area 3 do not contain Excess Risk soil but may contain munitions debris on the ground surface.

8.1.5 Total Estimated Volume of Excess Risk Soil

The total estimated volume of Excess Risk soil for the shooting ranges, bullet piles and ACAs is 2,179 bcy. Calculations for each shooting range area are included in Appendix P. The mitigation of these Excess Risk Soils is discussed in Section 11.2 - Shooting Range Corrective Action Plan. Excess Risk Soil volumes are summarized in the table below.

Total Estimated Volume of Excess Risk Soil

Shooting Range Area	Contamination Type	Volume (bcy)
North Shooting Range	Soil Lead Concentrations Exceed Industrial RSL and/or TCLP	110
South Shooting Range	Soil Lead Concentrations Exceed Residential RSL and/or TCLP	1614
Bullet Piles #1, #2, #3, ACA-1 and ACA-2	Soil Lead Concentrations Assumed to Exceed Industrial RSL and/or TCLP	455
TOTAL EXCESS RISK SOIL VOLUME = 2,180 bcy[a]		

RSL = Regional Screening Level, TCLP = Toxicity Characteristic Leaching Procedure, bcy = bank cubic yards, a = rounded

8.2 Groundwater

Sections 7.1 through 7.3 and 7.7.2 summarize the results of sampling and analysis results for on Site and off Site groundwater and the off-Site spring. Chloride, sulfate, nitrate, selenium, cis-1,2-dichloroethene, and vinyl chloride were reported in groundwater samples on Site above CGS. A 1979 report for the proposed landfill expansion assessed baseline groundwater quality for the proposed landfill expansion on the property immediately west of, and hydraulically upgradient of, the Site (Fox Consulting, 1979). This expansion was not approved, and the adjacent land is now used for residential purposes (Todd Creek Farms development). Groundwater data from this study are also assumed to pre-date O&G production activity which later occurred in the vicinity. Quantum considers data from this groundwater study useful since they provide information about background water chemistry for some inorganic constituents.

Chloride, a Secondary Drinking Water parameter (CGS = 250 mg/L), was reported in upgradient monitoring well AC-MW1 at a concentration of 3,300 mg/L and in downgradient monitoring points (AC-MW3, AC-MW4, MW-HO5, and AC-SPRING) at concentrations ranging from 190 to 780 mg/L. Chloride concentrations from the 1979 groundwater study ranged from 48 to 1,820 mg/L. Observed chloride concentrations in downgradient monitoring points are lower than the concentration in upgradient monitoring well AC-MW1. This indicates that chloride is currently not a Site-related constituent. The elevated chloride concentrations observed in AC-MW1 may be associated with naturally occurring sources in the soil and/or bedrock because AC-MW1 is the only well advanced into bedrock, or chloride may be associated with historic O&G production activities upgradient of the Site (Quantum, 2016A).

Sulfate, a Secondary Drinking Water parameter (CGS = 250 mg/L), was reported in monitoring points AC-MW1, AC-MW3, AC-MW4, AC-MW5, MW-HO5, and AC-SPRING at concentrations ranging from 1,700 to 8,900 mg/L. According to the 1979 groundwater study, background sulfate concentrations ranged from 973 to 4,470 mg/L. Based on the similarity in concentration ranges, sulfate is suspected to be associated with naturally occurring sources in the soil and/or bedrock and is not a Site-related constituent.

Nitrate, a Primary Drinking Water parameter (CGS health-based standard = 10 mg/L), was reported in downgradient monitoring well AC-MW3 at a concentration of 13 mg/L. While nitrate occurs naturally in groundwater, concentrations greater than 3 mg/L generally indicate contamination (Madison and Brunett, 1985). Potential sources for nitrate include surface water run-off from agricultural areas with fertilizers, surface

water runoff from pasture areas containing manure, septic tank effluent, and landfill leachate. Monitoring well AC-MW3 is located in a drainage swale approximately 80 feet northeast and hydraulically downgradient of the assumed edge of the landfill (see Figure 8). Based on the location of the well, potential sources of nitrate could be from surface water runoff and/or from the landfill. Nitrate is a potential Site-related constituent.

Selenium, a Primary Drinking Water parameter (CGS health-based standard = 50 mg/L), was reported in monitoring wells AC-MW1 (92 mg/L) and AC-MW3 (220 mg/L) at concentrations exceeding the CGS. One potential sources for selenium is naturally-occurring selenium dissolved from selenium-rich bedrock in the Denver Basin aquifers. Another potential source for selenium is fly ash from coal-fired furnaces. According to the Phase I ESA (Quantum, 2016A), fly ash was disposed in the on Site landfill. Monitoring well AC-MW3 is located approximately 80 feet downgradient of the assumed edge of the landfill (see Figure 8). Based on the downgradient location of AC-MW3 and its relatively higher concentration of selenium in groundwater, selenium is a potential Site-related constituent.

Lead, a Primary Drinking Water parameter (CGS health-based standard = 50 mg/L), was reported in monitoring points ranging from an estimated concentration of 0.4 mg/L (AC-SPRING) to 15 mg/L (MW-H05) below the CGS. Because lead is not normally naturally occurring in Denver Basin aquifers, the lead observed in MW-H05 may be associated with the Site shooting range operations. Lead is a potential Site-related constituent.

Cis-1,2-dichloroethene, a Primary Drinking Water parameter (CGS health-based standard = 14 µg/L, CGS MCL = 70 µg/L), was reported in off-Site monitoring point MW-H05 at a concentration of 20 µg/L. Based on the discussion in Section 7.3, this concentration is above the CGS health-based standard currently implemented at the Site of 14 µg/L. Cis-1,2-dichloroethene is commonly associated with the degradation of chlorinated solvents that may be present in the landfill. Cis-1,2-dichloroethene is a potential Site-related constituent.

Vinyl chloride, a Primary Drinking Water parameter (CGS health-based standard = 0.023 µg/L, CGS MCL = 2.0 µg/L), was reported in monitoring points AC-MW4 and MW-H05 at an estimated concentration of 0.53 µg/L, and a concentration of 1.3 µg/L, respectively. Based on the discussion in Section 7.3, this concentration is above the CGS health-based standard of 0.023 µg/L. Vinyl chloride is commonly associated with the degradation of chlorinated solvents. In addition, vinyl chloride is commonly used in industrial settings and the source may be vinyl chloride present in the landfill, independent of other chlorinated solvents present in the landfill. Vinyl chloride is a potential Site-related constituent

8.3 Landfill Gas

As reported in Section 7.6, relatively high concentrations of methane and VOCs were present in the soil vapor sample collected from AC-GMP2 located within the landfill area. Lower, but detectable concentrations of methane and similar VOCs were observed in GMP-4 and AC-P2 outside of the landfill area. These data indicate the landfill gas may have migrated beyond the limits of landfill waste at least to the GMP-4 and AC-P2 monitoring points. It is not known if landfill gas has migrated beyond the Site boundary.

9.0 EXPOSURE PATHWAYS AND POTENTIAL RECEPTORS

Quantum performed an exposure pathway analysis for the Site. This section summarizes the exposure pathway analysis for the site for soil, groundwater, sediment, and the landfill. Mitigation of completed and potentially completed exposure pathways is discussed in Section 11 - Site Closure Plan.

9.1 Soil/Sediment

Dermal Contact - Lead was reported at concentrations exceeding the Residential and Industrial RSLs in surface and sub-surface soil on the landfill and the North and South Shooting Ranges. This exposure pathway is considered complete.

Ingestion - Lead was reported at concentrations exceeding the Residential and Industrial RSLs in surface and sub-surface soil on the landfill and the North and South Shooting Ranges. This exposure pathway is considered complete.

Vapor Inhalation - Existing Site structures are not occupied and are planned for demolition. This exposure pathway is not considered complete.

Leaching to Groundwater - Groundwater beneath the Site ranges from 10 to 30 feet bgs. Soil sampling results indicate volumes of soil in the shooting ranges exceeding TCLP. Synthetic Precipitation Leaching Procedure (SPLP) testing is underway on selected soil samples to determine the leachability of lead and it's potential impact to shallow groundwater. This exposure pathway is considered complete.

Migration to Surface Water - Lead was reported in the Storm Water Basin sediment samples at concentrations exceeding the EPA Residential and Industrial RSLs. Run off from this Basin enters the Brantner Ditch located approximately 100 feet east of the Site. This exposure pathway is considered complete.

9.2 On-Site Groundwater

Dermal Contact - Nitrate and selenium were reported in Site monitoring well AC-MW3 at concentrations exceeding their respective CGS. Groundwater will not be put to beneficial use on the Site. As specified in the site-specific HASP, sampling personnel will wear appropriate gloves when collecting groundwater samples. This exposure pathway is not considered complete.

Ingestion - Nitrate and selenium were reported in Site monitoring well AC-MW3 at concentrations exceeding their respective CGS. Groundwater will not be put to beneficial use on the Site. This exposure pathway is considered complete. As discussed in Section 6.5, the commercial well (Permit #164204) located in the vicinity of the South Shooting Range was reportedly used by the Adams County Sheriff's Department for non-potable purposes. This well is no longer in use, is scheduled for abandonment in 2016, and is not considered a potential downgradient receptor.

9.3 Off-Site Groundwater

According to the Colorado DWR, seven water well records were identified within a 1/4 mile radius hydraulically downgradient (east) of the Site. One water well record was identified on the south adjacent residential property (Permit #78505). A summary of these well records is provided in the Water Well Search Report (Appendix Q) and in the table below.

Two of the records (Permits #258253 and #78505) are believed to be constructed as wells and used for domestic purposes. As discussed in Section 6.1, domestic well (Permit #258253) is located approximately 180 feet southeast of the Site and was sampled by Quantum on January 23, 2016. The groundwater sample was analyzed for constituents potentially associated with the operation of a solid waste landfill and shooting range activities and included VOCs (EPA Method 8260); SVOCs (EPA Method 8270); pesticides and PCBs (EPA Method 8081/8082); herbicides (EPA Method 8151); total metals (antimony, arsenic, barium, beryllium, cadmium, chromium, iron, lead, mercury, molybdenum, nickel, selenium, silver, thallium, and uranium; EPA Methods 200.8 and 7470A); chloride, fluoride and sulfate (EPA Method 300.0); total coliform bacteria (Method 9221B); asbestos, gross alpha/ beta, and free cyanide. Sulfate was reported at a concentration of 338 mg/L exceeding the Secondary Drinking Water Standard of 250 mg/L. None of the remaining analyzed constituents exceeded their respective Colorado Groundwater Standards. A summary of the detected groundwater constituents is included in Table 5. Based on this information, it is Quantum's opinion that Site operations have not adversely affected groundwater quality in this well. Domestic well (Permit #78505) is located approximately located 0.04 miles southwest of the Site and is believed to be located on the 14331 Riverdale Road property. This well is located hydraulically cross-gradient from the Site and is not believed to be a potential downgradient receptor.

Three of the well records are monitoring wells (MW-H05, MW-H06 and MW-H08) believed to be used by the City of Thornton for monitoring water levels for water rights augmentation purposes. No information is available for well records LH-112 and Permit #206490.

Permitted Wells within 1/4 Mile Downgradient of or Adjacent to Site

Summary of Downgradient Water Wells within 1/4 Mile of Site

Map I.D.	Permit No.	Well Name	Well Use	Direction from Site	Distance from Site (Miles)	Well Depth (ft)	Static Water Level (ft)	Yield (gpm)
1 and 5	43576 259505	MW-H05	Monitoring	Southeast Field verified	0.001	24	20	Unk.
2	NR	LH-112	NR	Northwest	0.001	NR	NR	NR
6	258253	NR	Domestic	Southeast	0.04	300	81	10
6	206490	NR	Domestic	Northeast	0.03	NR	NR	NR
7	78505	NR	Domestic	Southwest	0.04	300	65	10
11	43577	MW-H06	Monitoring	Northeast	0.11	NR	NR	NR
17	259509	MW-H08	Monitoring	Northeast	0.14	16	NR	NR

NR = Not Reported

9.4 Landfill Gas

Benzene and other VOCs were reported in AC-GMP4 and AC-P2 above their respective EPA Residential and Worker Screening Levels. AC-GMP4 and AC-P2 are located near the south and east Site boundaries, respectively. Residential structures are located immediately south, west, and east of the Site. The indoor inhalation pathway for off Site residential structures is potentially complete.

10.0 QUALITY ASSURANCE / QUALITY CONTROL

The specific objectives for the assessment and investigation of the Adams County Shooting Range site, as outlined in the SAP (Quantum, 2016B) are to:

- Identify the hazardous substances that were introduced to the environment during historic operations at the Site;
- Assess the nature and extent of hazardous substances in affected media (primarily soil, sediment, and groundwater), and the concentrations and spatial distribution of hazardous substances; and
- Identify potential pathways for migration, together with the potential environmental effects and risks to human health and/or the environment.

Ultimately, the information collected, compiled, and evaluated during the assessment will be used to identify, screen, and select an appropriate response action(s). Accordingly, the primary purpose of data verification is to ensure that the information necessary to adequately assess site conditions, and to select a response action, has been collected during the Site assessment at the appropriate locations, in sufficient quantities, and that the quality of Site-related data is sufficient to support response-action decisions.

Earlier Sections of this report present the validated results of chemical analyses performed in the field and laboratory, including those collected and analyzed for Quality Assurance and Quality Control (QA/QC) purposes; and contain the results of other tests and measurements in graphs, charts and tabular form. Those Sections of the report also incorporate discussion of data collected during the Site assessment. Subsequent discussion in this Section evaluates whether the information that was collected meet the Data Quality Objectives (DQOs) established in the SAP (Quantum, 2016B), to the degree necessary to support response-action decisions.

10.1 Groundwater Levels

Groundwater elevations were measured in all existing and newly-installed monitoring wells on the Site during two separate measurement events (July 18, 2016 and July 21, 2016; Table 1 and Figure 3), in accordance with the requirements of the SAP. Prior to measuring water levels, the measuring point of each well was surveyed to a common datum (NAVD88) by a licensed surveyor (BLC), so that groundwater elevations could be calculated.

The results of measurement of water levels in monitoring wells were validated by checking operating procedures in the field, examining field notes, comparing field notes with tabulated results, and checking the calculations used to produce tabulated results. Groundwater levels were measured in accordance with standard procedures.

Precision

Water levels were measured in the field, using an electric well sounding probe (GeoTech™). The precision of water level measurements was assessed by collecting each measurement twice and comparing the results. The two measurements at an individual well were allowed to differ by no more than 0.01 ft. Accordingly, the precision DQO for collecting water-level measurements in monitoring wells has been met.

Accuracy

The water-level probe was calibrated by the manufacturer and checked by the equipment vendor (GeoTech™). Measurement procedures were followed, and subsequent calculations were correctly performed. Accordingly, the accuracy DQO for collecting water level measurements in monitoring wells has been met.

Completeness

Water levels were measured in the on-Site and off-Site monitoring wells in July 2016, in accordance with the requirements of the SAP. Water levels are to be measured periodically as future site work proceeds; however, water-level measurements in monitoring wells for the Site assessment are 100 percent complete.

Comparability

Methods of measuring water levels, as specified in the SAP and associated SOPs were followed during the field investigation. The results of water level measurements in monitoring wells have been reported in standard units. Field procedures and calculations were reviewed as part of the data validation and are acceptable. The comparability DQO for collection of water-level measurements in monitoring wells has been satisfied.

Representativeness

The locations of groundwater monitoring wells are shown on Figure 3. The eleven wells, at which measurements of water levels were collected during July 2016 (or at which observations were made regarding the absence of groundwater in a particular well), meet the requirements specified in the SAP. Water level measurements collected on July 18, 2016 were all completed on the same day; and water level measurements collected on July 21, 2016, also were completed on the same day (Table 1). The water level measurements are representative of groundwater conditions at the time of measurement; and the representative DQO for collection of water level measurements in monitoring wells has been satisfied.

Summary

No procedural nonconformances were identified during review of field documentation. On the basis of checking operating procedures in the field, examination of field notes, comparison of field notes with tabulated results, and checking calculations, the results of water level measurements in monitoring wells collected to date satisfy the DQOs of precision, accuracy, completeness, comparability, and representativeness, as specified in the SAP.

10.2 Soil Samples

Samples designated as "soil" were collected from over 100 locations during Site assessment (Figures 5A through 6B). Soil samples from 138 locations on the Site also were analyzed in the field for total metals content, using XRF) technology. The XRF analyzed samples were intended for use primarily for screening purposes, to identify those locations on the site where response actions to address elevated concentrations of metals (primarily lead) in soil might eventually be required. A limited number of soil samples also were collected at locations where XRF screening was conducted; these samples were submitted for laboratory analyses for metals to assess the capabilities of the technology to distinguish among soil samples containing relatively elevated concentrations of metals from those containing lower concentrations. Field screening using XRF technology was specified in the SAP, and was intended as a practical measure for application in identifying an appropriate response action. The

results of XRF screening of soil samples for metals are discussed in "Comparability" subsection. The summary of analytical results for soil samples is presented in Table 4. The results of soil sampling and analyses, as they relate to the individual DQOs, are discussed as follow.

Precision

A primary and a duplicate soil sample were collected from ten locations during the Site assessment (Table 9A; and Figure 5A through 6B) – approximately twice the number of locations specified in the SAP. Duplicate samples (and associated primary samples) were designated in field notes, and are listed in Table 9A. A comparison of the results of analyses of primary and duplicate samples (Table 9A) indicates that the results of all analyses were within the RPD limits specified in the SAP, with the following exceptions:

- Concentrations of lead detected in primary sample NRLB-5I(0) and in its associated duplicate sample (DUPE-1) collected on July 19, 2016, were outside the relative percent detection (RPD) range of 60 percent, specified in the SAP.
- Concentrations of antimony and lead detected in primary sample SRRF-7(6-9) and in its associated duplicate sample (DUPE-5) collected on July 19, 2016, were outside the RPD range of 60 percent, specified in the SAP.
- Concentrations of antimony and tin detected in primary sample SRRF-2(0) and in its associated duplicate sample (DUPE-2) collected on July 20, 2016, were outside the RPD range of 60 percent, specified in the SAP.
- Concentrations of antimony, arsenic, and lead detected in primary sample SRLB-6O(0) and in its associated duplicate sample (DUPE-3) collected on July 20, 2016, were outside the RPD range of 60 percent, specified in the SAP.
- Concentrations of copper and tin detected in primary sample NRRF-6(0) and in its associated duplicate sample (DUPE-4) collected on July 20, 2016, were outside the RPD range of 60 percent, specified in the SAP.
- Concentrations of copper and tin detected in primary sample NRIB-3(0) and in its associated duplicate sample (DUPE-7) collected on July 25, 2016, were outside the RPD range of 60 percent, specified in the SAP.
- Concentrations of copper and tin detected in primary sample ACA-1(0-3) and in its associated duplicate sample (DUPE-ACA) collected on August 17, 2016, were outside the RPD range of 60 percent, specified in the SAP.

Actions: The concentrations of each of the analytes in each of these primary sample/duplicate sample comparisons have been qualified as “estimated” (“J” flag) in each primary sample associated by date with each primary/duplicate sample pair. These qualifications are reflected in Table 4. The qualification of a limited number of constituents in soil samples is regarded as minor. Consequently, the precision DQO for chemical analyses of soil samples has been met.

Accuracy

No primary soil samples were submitted for analyses for VOCs. Therefore, in accordance with the requirements of the SAP, no trip blank samples accompanied any shipment of soil samples from the site.

Method blanks were analyzed with all soil samples; the results of laboratory analyses of method blanks indicate that common laboratory contaminants (e.g., methylene chloride; bis(2)-ethylhexyl-phthalate) may have

influenced the analytical results for some samples; these were noted in the laboratory reports and accompanying narratives, and are reflected in Table 4 by data qualifiers (e.g., the "B" flag indicating that a particular analyte also was detected in a blank sample).

Matrix spike/matrix spike duplicate (MS/MSD) results indicate that matrix interferences may have influenced the analytical results obtained for particular analytes in some soil samples; these were noted in the laboratory reports and accompanying narratives, which also discuss laboratory efforts to resolve MS/MSD issues, and are reflected in Table 4 by data qualifiers (e.g., the "J" flag indicating "estimated concentration"). Surrogate spike recoveries for organic analyses, and for most analyses for metals, were within the specified control limits; excursions were noted in laboratory reports and accompanying narratives, and are reflected in Table 4 by data qualifiers (e.g., the "J" flag indicating "estimated concentration"). Holding times and sample preservation requirements were followed. Accordingly, the accuracy DQO for sediment samples has been met for all analytes, with the minor excursions as noted by appropriate data qualifiers in Table 4.

Completeness
The number of soil samples collected from the Site, as required by the SAP, was exceeded. All required analyses were performed on the soil samples as specified in the SAP. All results have been validated as usable, although analytical results qualified by the laboratory as "estimated" ("J" flag) have not been used in the completeness evaluation, because these analytes generally were detected at concentrations less than the specified reporting limits. Only those analytical data qualified as "detected in blank sample" ("B" flag; Table 4) were regarded as unusable; therefore, the completeness value for chemical analyses of soil samples is over 70 percent, and the completeness DQO for soil samples has been satisfied.

Comparability
The analytical methods specified in the SAP were followed by the laboratory (for those samples that were submitted for laboratory analyses). Analytical results have been reported in standard units. Detection limits were reviewed as part of the data validation and are acceptable.

As previously noted, a majority of soil samples from locations on the site were analyzed in the field for total metals content, using XRF technology. Examination of samples using XRF technique does not distinguish among the metallic constituents that may be present in a particular sample – all metallic constituents respond to the XRF diagnostic approach, although to varying degrees. Consequently, the results of application of the XRF screening technique at the Site is regarded primarily as an indicator of the presence of lead in soil samples (because lead is the most ubiquitous metallic constituent, and typically occurs at the highest concentrations of any metal in soil samples). After the XRF field screening of soil samples for lead and other metallic constituents had been completed, Quantum compared a subset of the XRF results with the results of laboratory analyses of soil samples which were co-located with XRF-field-screened samples, and which had been collected and analyzed for selected metallic constituents (Table 4). The results of a non-parametric statistical comparison of XRF field-analyzed samples with laboratory-analyzed samples from the same locations indicate that application of XRF field-screening techniques represents a valid and semi-quantitative mechanism for distinguishing areas at the site containing high levels of metallic lead from those areas that contain lower levels of metallic lead. The comparability DQO for soil samples therefore has been satisfied.

Representativeness

The soil sampling locations are depicted on Figures 5A through 6B The locations of soil samples, collected during the period July through October 2016, meet the requirements specified in the SAP. The samples are judged to

be representative of the conditions in soil at the time of collection. Therefore, the representative DQO for soil samples has been satisfied.

Summary

Few laboratory nonconformances were identified during review of the documentation provided by the analytical laboratory; these were adequately addressed in the laboratory reports and accompanying narratives; and have been qualified, as appropriate, in Table 4. On the basis of the data verification summary for soil samples, the analytical results for soil samples satisfy the DQOs of precision, accuracy, completeness, comparability, and representativeness, as specified in the SAP.

10.3 Sediment Samples

Samples designated as "sediment" were collected from 11 locations during the Site assessment (Figure 7). The summary of analytical results for sediment samples is presented in Table 6. The results of sediment sampling and analyses, as they relate to the individual DQOs, are discussed as follows.

Precision

A primary and a duplicate sediment sample were collected from one location (sampling location AC-SED-02-0.005; Figure 7), as specified in the SAP. The duplicate sample was identified on the Chain of Custody as DUPE-SED. A comparison of the results of analyses (Table 9D) indicates that the results of all analyses were within the RPD limits specified in the SAP. Consequently, the precision DQO for chemical analyses of sediment samples has been met.

Accuracy

Only three primary sediment samples collected during the Site assessment were submitted for analyses for VOCs. Although a trip blank for VOC analyses was required (in the SAP) to accompany all samples submitted for VOC analyses, examination of field and Chain of Custody documentation provides no indication that a trip blank sample was submitted with shipments of sediment samples. Consequently, all detections of VOCs in primary sediment samples collected have been qualified as "estimated concentration" ("J" flag), regardless of whether additional qualification has been assigned by the analytical laboratory; data qualification is reflected in Table 6.

Method blanks were analyzed with all sediment samples. The results of laboratory analyses of method blanks indicate that common laboratory contaminants (e.g., methylene chloride) may have influenced the analytical results; these were noted in the laboratory reports and accompanying narratives, and are reflected in Table 6 by data qualifiers (e.g., the "B" flag indicating that a particular analyte also was detected in a blank sample).

MS/MSD results indicate that matrix interferences may have influenced the analytical results obtained for particular analytes in some sediment samples; these were noted in the laboratory reports and accompanying narratives, which also discuss laboratory efforts to resolve MS/MSD issues, and are reflected in Table 6 by data qualifiers (e.g., the "J" flag indicating "estimated concentration"). Surrogate spike recoveries for organic analyses, and for most analyses for metals, were within the specified control limits; excursions were noted in laboratory reports and accompanying narratives, and are reflected in Table 6 by data qualifiers (e.g., the "J" flag indicating "estimated concentration"). . Holding times and sample preservation requirements were followed. Accordingly,

the accuracy DQO for sediment samples has been met for all analytes, with the minor excursions as noted by appropriate data qualifiers in Table 6.

Completeness

The required number of sediment samples was collected from the Site. All required analyses were performed on the sediment samples as specified in the SAP. All results have been validated as usable, although analytical results qualified by the laboratory as "estimated" ("J" flag) have not been used in the completeness evaluation, because these analytes were detected at concentrations less than the specified reporting limits. Only those analytical data qualified as "detected in blank sample" ("B" flag; Table 6) were regarded as unusable; therefore, the completeness value for chemical analyses of sediment samples is approximately 100 percent, and the completeness DQO for sediment samples has been satisfied.

Comparability

The analytical methods specified in the SAP were followed by the laboratory. Analytical results have been reported in standard units. Detection limits were reviewed as part of the data validation and are acceptable. The comparability DQO for sediment samples therefore has been satisfied.

Representativeness

The sediment sampling locations are shown on Figure 7. The locations of sediment samples, collected in August 2016, meet the requirements specified in the SAP. The samples are representative of the conditions in sediment at the time of collection. Therefore, the representative DQO for sediment samples has been satisfied.

Summary

Few laboratory nonconformances were identified during review of the documentation provided by the analytical laboratory; these were addressed adequately in the laboratory reports and accompanying narratives; and have been qualified, as appropriate, in Table 6. On the basis of the data verification summary for sediment samples, the analytical results for sediment samples satisfy the DQOs of precision, accuracy, completeness, comparability, and representativeness, as specified in the SAP.

10.4 Groundwater Samples

Groundwater samples were collected from six on-Site and off-Site monitoring wells, and from a single, on-Site out-of-serve commercial well during the Site assessment (Figure 8). These groundwater samples were analyzed for VOCs, metals, cations, selected anions, and nitrate; the summary of analytical results for groundwater samples is presented in Table 2. The results of groundwater sampling and analyses, as they relate to the individual DQOs, are discussed as follow.

Precision

A primary and a duplicate groundwater sample were collected from well AC-MW-5 (Table 9B; and Figure 8) as specified in the SAP. The duplicate sample (and associated primary sample) were designated in field notes. A comparison of the results of analyses of the primary and duplicate samples indicates that the results of all analyses were within the RPD limits specified in the SAP, with the following exception:

- The concentrations of chromium, cobalt, lead, nickel, vanadium, and zinc, detected in primary sample AC-MW-5 and in its associated duplicate sample (DUPE1) collected on July 18, 2016, were outside the RPD range of 35 percent, specified in the SAP.

Action: The concentrations of each of the analytes outside of the RPD range in the primary sample/duplicate sample comparison have been qualified as "estimated" ("J" flag) in each primary groundwater sample (which all are associated with this primary/duplicate sample pair). These qualifications are reflected in Table 2. The qualification of a limited number of constituents in groundwater samples is regarded as minor. Consequently, the precision DQO for chemical analyses of groundwater samples has been met.

Accuracy

All primary groundwater samples, collected during the Site assessment, were submitted for analyses for VOCs. Although a trip blank for VOC analyses was required (in the SAP) to accompany all samples submitted for VOC analyses, examination of field and Chain of Custody documentation provides no indication that a trip blank sample was submitted with shipments of groundwater samples that occurred on July 18, 2016, and on October 7, 2016. Consequently, all detections of VOCs in primary groundwater samples collected during the Adams County Shooting Range site investigation on July 18, 2016 and October 7, 2016 have been qualified as "estimated concentration" ("J" flag), regardless of whether additional qualification has been assigned by the analytical laboratory; data qualification is reflected in Table 2.

Method blanks were analyzed with all water samples; the results of laboratory analyses of method blanks indicate that common laboratory contaminants (e.g., acetone; methylene chloride) may have influenced the analytical results for some samples; these were noted in the laboratory reports and accompanying narratives, and are reflected in Table 2 by data qualifiers (e.g., the "B" flag indicating that a particular analyte also was detected in a blank sample).

MS/MSD results indicate that matrix interferences may have influenced the analytical results obtained for particular analytes in some water samples; and also that laboratory contaminants may have been introduced inadvertently into samples used for MS/MSD analyses. These were noted in the laboratory reports and accompanying narratives, which also discuss laboratory efforts to resolve MS/MSD issues, and are reflected in Table 2 by data qualifiers (e.g., the "J" flag indicating "estimated concentration"). Surrogate spike recoveries for organic analyses, and for most analyses for metals, were within the specified control limits; excursions were noted in laboratory reports and accompanying narratives, and are reflected in Table 2 by data qualifiers (e.g., the "J" flag indicating "estimated concentration"). Holding times and sample preservation requirements were followed, with the following exception:

- According to laboratory records, recommended holding times for samples AC-MW5, DUP1, RINSE1, MW-H05, AC-164204-081016, AC-MW1, AC-MW4, and AC-MW3-161007, which were submitted for analysis for alkalinity in accordance with Standard Method 2320B, were exceeded.

Action: The concentration of alkalinity detected in each of these samples is qualified as "estimated" ("J" flag). An additional data qualifier ("B" flag) also is assigned to those samples associated with a blank sample in which alkalinity was detected. These qualifications are reflected in Table 2.

With the exceptions noted above, the accuracy DQO for groundwater samples has been met for all analytes, with the minor excursions as noted by appropriate data qualifiers in Table 2.

Completeness

The number of groundwater samples collected from the Site, required by the SAP, was met (all existing groundwater wells and newly-installed wells from which groundwater could be collected were sampled). All required analyses were performed on the soil samples as specified in the SAP. With the exception of results of analyses for VOCs in the groundwater sample collected from well AC-164204-081016 ("Comparability", below), most results have been validated as usable, although analytical results qualified by the laboratory as "estimated" ("J" flag) have not been used in the completeness evaluation, because these analytes generally were detected at concentrations less than the specified reporting limits. Only those analytical data qualified as "detected in blank sample" ("B" flag; Table 4) were regarded as unusable; therefore, the completeness DQO for groundwater samples has been satisfied.

Comparability

The analytical methods specified for water samples in the SAP were followed by the laboratory. Analytical results have been reported in standard units. Detection limits were reviewed as part of the data validation and are acceptable, with the following exception:

- According to the Case Narrative for sample AC-164204-081016 (collected on August 10, 2016), this groundwater sample was diluted prior to analysis for VOCs based on pre-screening results. This sample was diluted by a factor of 40 (40x dilution). No VOCs were reported to be detected in primary sample AC-164204-081016.

Action: Dilution of primary sample AC-164204-081016 resulted in elevation of laboratory reporting limits for a majority of the VOC analytes in this sample to levels greater than regulatory action levels for those respective analytes in water. Accordingly, the results of analyses for all VOCs in this sample (analyses conducted using USEPA SW-8461 Method 8260B) are regarded as not comparable with the results of analyses of other groundwater samples; are non-representative of actual conditions in the field, are therefore regarded as unusable, and are qualified as "rejected" ("R" flag; Table 2).

Therefore, the comparability DQO for groundwater samples has been satisfied, with the exception of the results of analyses for VOCs in the sample from well AC-164204-081016.

Representativeness

The wells from which groundwater samples were collected are depicted on Figure 8. The locations of groundwater samples, collected during the period July through October 2016, meet the requirements specified in the SAP. In general, the samples are judged to be representative of the conditions in groundwater at the time

of collection. Therefore, the representative DQO for groundwater samples has been satisfied, with the exception of the results of analyses for VOCs in the sample (AC-164204-081016) from the on-Site commercial well .

Summary

Some laboratory nonconformances were identified during review of the documentation provided by the analytical laboratory; these were addressed in the laboratory reports and accompanying narratives; and have been qualified, as appropriate, in Table 2. On the basis of the data verification summary for soil samples, the analytical results for groundwater samples satisfy the DQOs of precision, accuracy, completeness, comparability, and representativeness, as specified in the SAP (QWE, 2016), with the exception of analyses of the groundwater sample (AC-164204-081016) collected from on-Site commercial well for VOCs. The results of analyses for VOCs in the sample from this well are regarded as unusable, and have been rejected ("R" flag in Table 2). Quantum plans to re-sample the commercial well in the near future to address this deficiency.

10.5 QA/QC Summary

On the basis of the data verification review for measurement of groundwater levels, and for collection and analyses of soil samples, sediment samples, and groundwater samples, the results of the Site assessment, completed during the period July through October 2016, satisfy the DQOs of precision, accuracy, completeness, comparability, and representativeness, as specified in the project SAP. These data are regarded as quantitative and usable, with the exceptions noted in the preceding discussion.

11.0 SITE CLOSURE PLAN

The following sections discuss the Site Closure Plan. The Site Closure Plan consists of abandonment of the Texas Tea Well Facilities and the on-Site commercial well, the Shooting Range Corrective Action Plan, and the Landfill Closure Plan.

11.1 Well Abandonment

11.1.1 Texas Tea Well Facilities Abandonment

An out-of-service Texas Tea O&G well (05-001-08204) is present on the west-central area of the Site. The COGCC will be the regulatory authority for the abandonment of the O&G well. In late 2016, COGCC will retain a contractor to plug and abandon the well and remove associated infrastructure. The contractor will also conduct limited soil removal around pipelines if petroleum hydrocarbon impacts are observed. A September 6, 2016 COGCC email to the County summarizing the scope of the abandonment is included in Appendix A. The County will coordinate with COGCC regarding the timing and scheduling of the well abandonment and site closure. The following summarizes the work to be performed by COGCC for the abandonment on the Texas Tea oil and gas well:

- Well will be plugged and cut at least four feet bgs,
- Wellhead equipment will be removed,
- Above ground flowline form the wellhead to the separator will be removed,

- Separator piping will be removed,
- Below ground flowlines to the oil tank battery and produced water tank will be removed,
- Oil tank piping will be removed,
- Produced water tank piping will be removed,
- Rig anchors north of the well will be removed,
- Meter shed will be demolished and removed, and
- COGCC has contacted United Power regarding removal of the transformers which were scheduled for removal no later than October 14, 2016.

In addition to the removal of the Texas Tea O&G well components, COGCC will remove stained soil and will perform an environmental assessment. In the event that the assessment indicates a larger area of impact than stained soil, a more detailed site assessment, including potential delineation will occur. COGCC will not perform reclamation work since the area is to be beneath a landfill soil cover.

The gathering line downstream (west) of the meter shed is owned by Anadarko. At a Site meeting on October 5, 2016, Anadarko reported that the gathering line is empty and will be abandoned by cutting and plugging the ends. The County and Quantum are coordinating with Anadarko to have this work completed prior to landfill cover construction. The Texas Tea O&G well and associated components are shown on Figure 7.

11.1.2 Commercial Well Abandonment

A commercial well permit number 164204, located on the Site (Figure 2), and completed into the Lower Arapahoe aquifer, will be abandoned in accordance with the State of Colorado Division of Water Resources Rules and Regulations for Water Well Construction, Pump Installation, Cistern Installation, and Monitoring and Observation Well/Hole Construction (Colorado Department of Natural Resources, 2016) by a licensed contractor.

The well was completed in 1993 as a commercial supply for on-site use, limited to drinking water and sanitary facilities. The well was completed to a total depth of 400 ft and screened from 120 to 400 ft bls.

The well casing will be cut off five feet bgs in accordance with the regulations. The well will be backfilled with clean, inert, material. The uppermost five feet of the remaining casing will be filled with grout and a watertight seal will be permanently affixed to the remaining casing.

11.2 Shooting Range Corrective Action Plan

The following sections present the corrective actions to be taken at the Site with respect to the Shooting Ranges. The work to be performed is presented as two general items, including the abatement and demolition of on-Site structures and the remediation of soils. It should be noted that since the Northern Shooting Range is located in an area that will be beneath a soil cover as part of the landfill closure, certain scope items (such as re-grading and vegetation) will not apply to the Northern Shooting Range because these items will be included in landfill closure activities. In addition, soils from the Northern and Southern Shooting Ranges that have been impacted by lead and other metals will be treated (if necessary) to reduce metals leachability and approved for use as grade fill beneath the landfill soil cover.

11.2.1 Demolition and Disposal of Buildings

Four buildings, seven sheds, and two explosives magazines are located on-Site. In addition, a large steel backstop with a wood face exists north of the North Shooting Range. Based on an asbestos, lead-based paint, and regulated building material survey performed by DS Environmental Consultants, one asbestos containing material was found in Building C (green 9-inch by 9-inch floor tile, 2% Chrysotile asbestos).

TCLP - Lead analysis of the wood facing of the large wall behind the North Shooting Range reported concentrations of lead below the EPA TC Rule for lead.

Prior to demolition, the contractor will obtain demolition permits for each building from the Adams County Building Department and CDPHE. Following demolition, material produced during demolition activities will be disposed of at an appropriate off-Site disposal facility.

Building C, which contains non-friable resilient floor tiles must be demolished without causing the asbestos containing floor tile to be rendered friable including sanding, cutting, crushing, grinding, pneumatic jacking, etc. Recycling of any building materials such as concrete or metal that are bonded or contaminated with asbestos is also prohibited. OSHA regulations regarding occupational exposure during demolition of Building C are still mandatory. OSHA 29 CFR 1926.1101 requires that workers performing construction-related activities be protected from asbestos fibers in excess of the permissible exposure limit of 0.1 f/cc of air. Contractors must comply with applicable provisions of OSHA 29 CFR 1926.1101 during demolition and renovation activities. These OSHA provisions include, but are not limited to, personal protective equipment (PPE) and respirators, personnel training, personal exposure air monitoring, employee medical surveillance, wet removal methods, signage for regulated areas, etc.

In addition to demolition of on-Site structures, the demolition scope also includes the removal and disposal of miscellaneous debris piles located at multiple locations on the site, and miscellaneous components associated with on-Site structures such as electrical power poles, a septic tank, and air conditioning units. The debris to be removed includes the waste tire pile, railroad ties, and telephone poles. Materials collected during the removal effort will be disposed of at an appropriate off-Site disposal facility or recycled as necessary.

11.2.2 Soil Remediation

Remediation of soils in shooting range areas will be required due to the presence of Shooting Range COCs above RSLs and EPA TC Rule concentrations. In addition many areas were observed, during shooting range assessment activities, to contain large quantities of munitions debris on the ground surface and will require clean up despite samples collected in these areas reporting low levels of Shooting Range COCs in soil.

Soil samples were collected in the shooting range areas to assist in locating materials and estimating volumes of materials that will either require relocation and/or treatment. Samples were collected in accordance with the SAP and SAP Addendum in locations specified prior to site assessment activities as well as areas identified for further investigation during site assessment activities. Samples collected were analyzed for Total Metals - Shooting Range COCs and select samples were analyzed for TCLP-Shooting Range COCs.

The contractor performing soil remediation on-Site will use trained staff that meet the requirements of OSHA 29 CFR 1926.65 (HAZWOPER Standard), OSHA 29 CFR 1926.62, and OSHA 29 CFR 1910.120 and other applicable

OSHA regulations. OSHA 29 CFR 1926.62 requires that workers performing work must be protected from lead exposure in excess of the permissible exposure limit of 50 µg/m^3.

The following table - Shooting Range Soil Remediation Summary - summarizes remediation locations, environmental concern for each location, volume of soil (bcy) to be excavated, and methodology dependent on the environmental concern for each location described. These areas depicted on Figures 11, 12A, 12B, and 13. Soil volumes (in bold text) indicate Excess Risk soils.

Shooting Range Soil Remediation Summary

Location (Sample Grids)	Environmental Concern	Soil Volume (bcy)	Remediation Methodology
North Shooting Range - Impact Berms (*NRIB-1, NRIB-2, NRIB-3*)	Excess Risk soils, recyclable quantities of lead.	**110**	Excavation of soils, sieving as necessary, treatment as necessary
South Shooting Range - Back Berm (*SRBB-2, SRBB-5, SRBB-6*)	Excess Risk soils, recyclable quantities of lead.	**130**	Excavation of soils, treatment as necessary
South Shooting Range - Back Berm (*SRBB-1, SRBB-3, SRBB-4*)	Grid areas lie in area of Excess Risk soils, contains munitions debris on ground surface.	132	Excavation of soils, treatment as necessary
South Shooting Range - Impact Berm (*SRIB-6, SRIB-7, SRIB-8, SRIB-9, SRIB-10, SRIB-11, SRIB-12*)	Excess Risk soils, recyclable quantities of lead.	**306**	Excavation of soils, sieving as necessary, treatment as necessary
South Shooting Range - Impact Berm (*SRIB-1 through SRIB-5*)	Grid areas lie in area of Excess Risk soils, contains munitions debris on ground surface.	68	Excavation of soils, treatment as necessary
South Shooting Range - Lateral Berm (*SRLB-2I, SRLB-4O SRLB-5O, SRLB-6O, SRLB-7O*)	Excess Risk soils, recyclable quantities of lead in grid area SRLB-5O.	**149**	Excavation of soils, sieving as necessary, treatment as necessary
South Shooting Range - Lateral Berm (*SRLB-1O, SRLB-1I, SRLB-2O, SRLB-3O, SRLB-3I, SRLB-4I, SRLB-4O, SRLB-5I, SRLB-6I, SRLB-7I, SRLB-8O, SRLB-8I*)	Grid areas lie in area of Excess Risk soils, contains munitions debris on ground surface.	232	Excavation of soils, treatment as necessary
South Shooting Range - Range Floor (*SRRF-2, SRRF-3, SRRF-4, SRRF-6, SRRF-7, SRRF-8, SRRF-9*)	Excess Risk soils	**747**	Excavation of soils, treatment as necessary
South Shooting Range - Range Floor (*SRRF-1, SRRF-5, SRRF-10*)	Grid areas lie in area of Excess Risk soils, contains munitions debris on ground surface.	219	Excavation of soils, treatment as necessary
South Range Safety Fan (*SRSF-4*)	Excess Risk soils	**199**	Excavation of soils and treatment as necessary
South Range Safety Fan (*SRSF-1 through SRSF-3, SRSF-5 through SRSF-9*)	Munitions debris present on ground surface	NA	Lead collection (See Section 11.2.2.2)

Shooting Range Soil Remediation Summary			
Location (Sample Grids)	**Environmental Concern**	**Soil Volume (bcy)**	**Remediation Methodology**
Bullet Pile #1	Assumed Excess Risk soils present	**123**	Excavation of soils, sieving as necessary, treatment as necessary
Bullet Pile #2	Assumed Excess Risk soils present	**2**	Excavation of soils, sieving as necessary, treatment as necessary
Bullet Pile #3	Assumed Excess Risk soils present	**5**	Excavation of soils, sieving as necessary, treatment as necessary
ACA-1	Excess Risk soils	**160**	Excavation of soils, treatment as necessary
ACA-2	Excess Risk soils	**165**	Excavation of soils, treatment as necessary
ACA-3	Munitions debris on ground surface	NA	Lead collection (See Section 11.2.2.2)
South Shooting Range - Sediment Basin	Excess Risk soils	**83**	Excavation of soils, treatment as necessary

11.2.2.1 Project Initiation

Several preliminary activities will be completed prior to the initiation of remediation activities of the shooting range associated soils. These activities include developing project plans and specifications, obtaining applicable permits, and the design and installation of storm water best management practices (BMPs).

Project plans and specifications will provide details of the remediation process including site staging and layout, details regarding the flow of traffic, construction requirements and details of remediation processes, and other general project requirements. In addition, a Site specific Health and Safety Plan (HASP) will be prepared by the contractor and approved by the County prior the initiation of any work. The HASP will include, at a minimum, a description of safety personnel, roles and responsibilities, PPE, emergency response procedures, hazards that are or may be present on the Site, and controls implemented to reduce risk.

Erosion and sediment control permits are necessary as determined by the area of disturbance, which is usually greater than one acre. If the area is less than one acre, it may be included in a larger area of common development. Based on the area that is anticipated to be disturbed, an erosion and sediment control permit, or permits, will be required for the soil remediation portion of this project.

In addition, a CDPHE Colorado Discharge Permit System (CDPS) COR030000 Permit will also be required for this project. The COR030000 Permit is for the regulation of storm water discharges from construction activities. Ground surface disturbing will be among the construction activities and this includes (but not limited to) clearing, grading, excavation, demolition, installation of new or improved haul and access roads, staging areas, stockpiling of fill materials, and borrow areas.

A Storm Water Management Plan (SWMP) will be prepared prior to submittal of erosion and sediment control permit application(s), and the CDPHE CDPS COR030000 Permit. The SWMP will be prepared in compliance with the CDPHE Water Quality Control Division (WQCD) - Storm water Program, Storm water Management Plan Preparation Guidance (CDPHE WQCD, 2011), and the local SWMP requirements.

Included with the SWMP will be site maps depicting locations of BMPs to be installed on-Site. BMPs will be installed at required locations prior to commencing any soil excavation or soil treatment activities.

11.2.2.2 Shooting Range Area Lead Collection

Many areas located in the shooting range areas contain lead fragments and bullet casings on the ground surface, but will not require soil excavation due to low concentrations of Shooting Range COCs found in the soils during the site assessment activities. These areas include portions of the South Shooting Range safety fan and ACA-3. The lead fragments and bullet casings in these areas will be manually collected and consolidated. The manual collection will include a detailed site walk in the target areas by trained personnel. The remediation personnel will collect any visually-observed lead on the ground surface during the site walk. The lead fragments and bullet casings that are collected will be combined with lead removed during excavation and removed from the Site for recycling or disposal.

11.2.2.3 Soil Excavation

The locations, depths, and volumes of estimated Excess Risk soil are discussed in discussed in Section 8. Site assessment activities determined that approximately 2,830 bcy of soil associated with shooting range activities will be excavated, treated (if necessary), and placed on-Site over the landfill and beneath a new soil cover. Soil that cannot be treated to meet leachability requirements will be transported off-Site and disposed. The majority of soil (2,180 bcy) is Excess Risk soil to be excavated from the North and South Shooting Ranges, ACA-1 and -2, and the Stormwater Basin. The remaining 650 bcy of soil to be excavated is from specific South Shooting Range berms. This berm soil is not Excess Risk but may contain surface munitions debris. Estimated soil excavation depths will range from 6 to 30 inches bgs. The locations of Excess Risk soil, munitions-debris containing soil, and estimated cut depths for the North Shooting Range, South Shooting Range, Storm Water Basin, and ACAs are depicted on Figures 12 and 13. Refer to Appendix P for calculations.

The contractor will collect laboratory confirmation soil samples from each excavated Excess Risk sample grid to verify that Excess Risk soil has been sufficiently removed. Following excavation to the design depth in a sample grid, and visual observation that munitions debris has been sufficiently removed, the contractor will collect and analyze one laboratory confirmation soil sample. The sample will be analyzed by an approved laboratory for Total Metals - Shooting Range COCs and TCLP. If the sample does not meet the required EPA RSL and/or fails the TCLP limit, additional soil will be excavated until the Site-specific cleanup criteria are achieved.

Sieving results indicates that approximately 14 sample grids may contain greater than 15% elemental lead by weight. At a minimum, Excess Risk soil in these grids will be first screened, using best practical and available technology, to remove elemental lead from the soil. The elemental lead will be collected, containerized, and temporarily stored in a secure, designated location on-Site. Recovered elemental lead will be transported off-Site for recycling. Following screening to remove elemental lead, the soil will be stockpiled at a designated location on-Site for sampling and treatment, if necessary.

Excavated soil that does not require treatment, based on sampling, will be transported to a designated location within the North Shooting Range floor and placed in a controlled manner as discussed in the landfill cover design. Soil that exceeds acceptable risk criteria, based on sampling, will be treated as discussed in Section 11.2.2.4.

11.2.2.4 Soil Stockpiling, Sampling and Treatment

Excavated soil will be placed in approximate 250 cubic yard stockpiles on treatment pads constructed on the North or South Shooting Range paved range floors. The contractor will provide stormwater management and required BMPs (e.g., silt fencing, berms, water collection sump[s]) for managing stormwater and precipitation to ensure that contaminated water does not leave the treatment pads. A 5-point composite sample will be collected from each pile by compositing five aliquots collected from the top and four cardinal directions of the pile. Each aliquot will be collected from 0 to 6 inches bgs. The five aliquots will be thoroughly mixed and placed into laboratory-provided sample containers. The sample will be placed in a cooler on ice and transported to an accredited analytical laboratory for analysis of TCLP-Lead and SPLP-Lead. The acceptance criteria for TCLP-Lead and SPLP lead are 5 mg/L and 1.1 mg/L, respectively. If the sample result meets the acceptance criteria, the pile will be transported to a designated location within the North Shooting Range floor and placed in a controlled manner as discussed in the landfill cover design. If the soil does not meet the acceptance criteria, the pile will either be re-treated and re-sampled until it meets the acceptance criteria, or the pile will be transported off-Site and disposed in a licensed Subtitle C landfill.

Treatability testing is currently underway to evaluate the efficacy of treating the shooting range berm soil with 1% and 2% ECOBOND® to determine if the acceptance criteria can be met , dependent on analytical results. Following treatment, the soil will again be sampled as described above for excavated soil.

The contractor will be directed to first excavate the North and South Shooting Range impact berm soils, as these soils contain the highest relative concentrations of elemental and adsorbed lead, and construct stockpiles for sampling. Excavation will proceed from the "most relatively" impacted sample grids to "least relatively" impacted sample grids. If the TCLP-Lead and SPLP-Lead stockpiled soil data demonstrate that sampling is not necessary to establish acceptance criteria, Quantum will request that CDPHE approve direct load and transport of shooting range soil to the North Shooting Range gradefill placement area.

11.2.2.5 Demolition of Shooting Range Structures

In addition to excavation of soil from the North Shooting Range, South Shooting Range, ACA-1 and ACA-2, miscellaneous structures located on the shooting range areas will be demolished and removed. Included in this scope are the eyebrows located above the impact berms behind the shooting range areas on the North Shooting Range and South Shooting Range, the wall located to the north of the North Shooting Range, and the asphalt range floor located on the South Shooting Range.

Based on visual observation of the wood used for the eyebrows, there are high concentrations of fragmented lead located in the eyebrows. It will be the responsibility of the remediation contractor performing the soil remediation to collect a sample of the wood eyebrows for analysis of TCLP-Lead prior to disposal. The eyebrows will be removed from their location above the impact berms and disposed of off-Site. If the TCLP analysis indicates concentration of TCLP-Lead above the EPA TC Rule for lead, the contractor may treat the wood to

decrease concentrations of TCLP-Lead, or dispose of the wood in accordance with standard manifesting and permitting protocols at a licensed facility off-Site.

The wall is constructed of steel tubing and sheeting with a wood face. TCLP analysis of the wood in the wall indicated a concentration of TCLP-Lead below the EPA TC Rule for lead.The wood face will be removed and placed on the landfill area, and the steel tubing and sheeting will be recycled.

The asphalt range floor located on the South Shooting Range will be removed by the remediation contractor to allow for access to subsurface soils. The asphalt will be removed from the range floor, sized to a diameter indicated in the project specifications, and placed on the Site landfill area for disposal.

11.2.2.6 Gradefill Cover and Vegetation

Following remediation activities, a clean soil cover will be placed over gradefill on the landfill area using either on-Site or off-Site sourced borrow soil. In addition, this area will be temporarily stabilized until construction of the landfill cover begins, accomplished by temporary seeding or an engineer-approved alternative.

In addition, areas of the South Shooting Range and North Shooting Range, disturbed during remediation activities will be stabilized as necessary in accordance with the SWMP. If necessary, steep slopes found on the South Shooting Range will be graded to reduce slope and to allow vegetation to establish. The North Shooting Range will not require grading at this time, and will be graded as part of construction of the landfill cover.

11.2.2.7 Closure Documentation

When remediation activities of the shooting range areas are complete, a CAP Completion Report will be submitted to CDPHE summarizing remedial activities at the Site shooting range areas. The CAP Completion Report will provide a description of the remediation field activities, the analytical results, photos, waste disposal manifests, descriptions of deviations from the Corrective Action Plan (if necessary) and other pertinent information to show that the remediation was completed as intended and all materials were handled in accordance with the Corrective Action Plan. The CAP Completion Report will also request an NFA determination for the shooting range portions of the Site.

As-built drawings of the final grades for the entire Site will be completed as part of the landfill closure project.

11.3 Landfill Closure Plan

Following remediation of the North and South Shooting Range areas, a closure plan will be submitted to CDPHE for closure of the landfill area. The following sections discuss the proposed plan for this closure, which is proposed to be completed under the CDPHE VCUP.

Burns & McDonnell has completed a conceptual landfill closure plan for the Site, which is included as Appendix S, and a final design package will be completed and submitted to CDPHE with the landfill closure plan. This conceptual plan proposes the design and construction of a Water-Balance Cover (WBC) for the landfill portion of the Site. This WBC cover will provide the cap for the landfill area, including the North Shooting Range area, and will be designed to meet CDPHE requirements for landfill capping. WBCs rely on the storage capacity of a water

storage layer and the capabilities of vegetation to limit percolation through the cover. To bring the WBC area to sufficient grade for drainage, gradefill (as defined in Section 11.3.1.1) will be placed from on-Site and potentially off-Site borrow sources over the landfill area to meet grades specified in the final design documents. Following grading operations and WBC placement, vegetation will be installed for stabilization.

Work performed on-Site under the scope of work described in this section will be performed in accordance with a Site- specific HASP, prepared by the contractor and approved by the County. The HASP will include at a minimum, a description of safety personnel, roles and responsibilities, PPE, emergency response procedures, hazards that are or may be present on the Site, and controls implemented to reduce risk. Portions of the work included in this scope as described in OSHA 29 CFR 1910.120(a)1(i-v) and OSHA 29 CRF1926.65(a)1(i-v) are covered by OSHA's HAZWOPER standard. Contractors performing work within this scope of work must comply with all applicable provisions of OSHA 29 CFR 1926.65 and OSHA 29 CFR 1910.120 and other applicable OSHA standards.

11.3.1 Conceptual Closure Design

The closure of the landfill will consist of the following activities:

- Placement, compaction and grading of gradefill consisting of:
    - Excavated waste from outside the north property limits and placement and compaction of this waste within the property limits and on top of the existing landfill,
    - Spreading and compacting of any debris remaining after removal of the on-Site buildings, other Site structures, and debris atop the landfill,
    - Placement and compaction of other gradefill (i.e., other waste, on-Site and or off-Site borrow soil) necessary to meet design grades, and
    - Placement and grading of an interim cover soil over the waste until final cover can be constructed over it.
- Construction of a storm drain system to replace the existing 30-inch CMP under the landfill and abandonment of the existing 30-inch stormwater drainage pipe (CMP, See Section 11.3.1.1) plus any remaining pipes or conduits left over from the structures removal and oil facility removals,
- Construction of a WBC over the regraded landfill surface,
- Installation of storm water management structures for the conveyance of runoff from the landfill cover,
- Revegetation of the constructed landfill cover,
- Installation of methane monitoring probes around the landfill perimeter, and
- Construction quality assurance (CQA) performed during the above activities.

The design and construction will be performed under the CDPHE-approved landfill closure plan and in general accordance with the CDPHE Regulations Pertaining to Solid Waste Sites and Facilities (CDPHE HMWMD, 2015) and the CDPHE's Final Guidance Document, Water Balance Covers in Colorado (CDPHE HMWMD, 2013).

11.3.1.1 CMP Replacement

As described in the Burns & McDonnell Memorandum, included in Appendix S, storm water west of the Site drains to a 30-inch CMP installed prior to the placement of waste. Drainage in the CMP flows east approximately 920 feet discharging immediately east of Riverdale Road. Based on a CCTV, the CMP was also found to be collapsed and deteriorating. Due to the surrounding topography, the conveyance of the storm water runoff from the Todd Creek development must continue to be conveyed through the Adams County property, therefore replacement of the existing CMP or other means of storm water conveyance is necessary.

One option is to bore a new casing pipe through the landfill waste, or below the landfill waste, on an alignment that would reduce the amount of pipe needed under the landfill to approximately 525 feet. The alignment would start at the existing inlet of the pipe and advance to the southeast exiting the landfill limits to the west of the Armory building. By changing the alignment this option would likely allow some of the boring to take place in native soils.

Another option is the excavation of the waste along the optimized alignment described above. This would allow a drainage swale to be constructed along the alignment to transmit the drainage. Side slopes of the excavation would be 4:1 (horizontal to vertical) or flatter and capped with the final cover. This option would require the excavation of a significant amount (up to 92,000 cy) of waste that would need to be placed as gradefill or disposed of at an approved off-site landfill.

Substantial cost will be involved in either option. As a next step, vertical borings should be performed every 50 feet along the optimized alignment to the depth of the proposed pipe/channel to aid in the evaluation of the options. This information will then be used to refine the cost estimates and technical specifications for either option. Soil borings will be performed in accordance with a new Material Management Plan specific to known and/or assumed contaminants and wastes present on the Site. Additional details and drawings depicting the proposed new alignment are provided in the Memorandum included in Appendix S.

11.3.1.2 Gradefill Placement and Grading

The term "gradefill" means any soil, waste, or debris placed on top of the existing landfill for the purposes of achieving design grades. As previously mentioned, gradefill will be placed over the existing landfill mass from the following sources:

- The treated soil from the remediation of the shooting range. This soil is currently planned to be placed in the northern shooting range area by the shooting range remediation contractor;
- The waste placed north of the northern property limits. This waste will be excavated and placed on the landfill within the property limits;
- Any miscellaneous waste or debris remaining after demolition/removal of the site structures;
- Any waste excavated as part of the CMP abandonment and replacement;
- Clean soil placed over the waste as an interim cover prior to final cover placement; and

- Any additional soil required to achieve those grades shown on the final Gradefill Grading Plan.

The Burns & McDonnell Memorandum estimates approximately 6,000 cubic yards of gradefill will be required to reach design grades. This might require modification if additional gradefill requirements are identified as the design progresses.

11.3.1.3 Final Cover Construction

The WBC will be designed in accordance with the WBC Guidance. A borrow source for the WBC has not been identified so therefore, a design thickness is not yet known. An Inert Fill Permit will be obtained from Adams County Development Services for any off-Site fill material brought to the Site. Drawing C003 of the Burns & McDonnell Memorandum assumes that the cover will be 3-feet thick. The final cover design, construction, and CQA requirements will be consistent with the WBC Guidance except where otherwise approved by CDPHE.

The completed cover will be amended and vegetated with native grasses in accordance with County requirements.

Surface water controls will be designed and incorporated into the landfill cover surface to provide long-term erosional resistance. It is anticipated that a combination of terraces, swales, and possibly let-down channels will be incorporated into the design. Linings for these conveyances will be selected based on slope and the design flow. Linings will be either grasses, temporary or permanent erosion mats, and possibly riprap. These will be designed once the CMP replacement option is selected and the final cover grading plan finalized.

11.3.1.4 Landfill Gas Monitoring Probe Installation

The Solid Waste Regulations require landfill gas monitoring be performed at the landfill perimeter. Monitoring probes will be designed and installed along the landfill perimeter to meet these requirements. These locations will be monitored in accordance with the post-closure operations, maintenance, and monitoring (OM&M) plan, which will be submitted under separate cover.

11.3.2 Construction Quality Assurance

The CQA plan outline for the landfill closure is provided in Attachment C of the Burns & McDonnell Memorandum. The scope of the CQA plan will include the following activities:

- Waste excavation and gradefill placement,
- CMP replacement,
- Final cover placement and vegetation, and
- Surface water controls installation.

The CQA plan will set forth the CQA requirements to be implemented during landfill closure to verify that the construction is completed in accordance with the design drawings and technical specifications. In addition, the plan will define CQA roles, definitions, documentation, meeting, and reporting requirements. Once the closure is completed, a CQA certification report will be submitted to CDPHE. The CQA report will include completed documentation forms, a summary of construction activities, drawings indicating sample and test locations, field

and laboratory test results, as-built surveys, a summary of deviations from the contract documents, justification for the changes, and a description of construction problems and how they were resolved. Additionally, a registered Professional Engineer licensed in the State of Colorado will certify that the construction was conducted in substantial conformance with the approved construction documents.

11.3.3 Maintenance and Monitoring

An OM&M plan will be completed and submitted to CDPHE for approval of landfill cap maintenance activities, groundwater monitoring, and gas monitoring probe installation and monitoring. Following placement of the landfill cover, monitoring will be required for the landfill area. This will include, at a minimum, monitoring for vegetative success of cover vegetation, structural integrity of the landfill cap, groundwater monitoring, and landfill gas monitoring. Post-closure monitoring/maintenance requirements will be specified in a Post-Closure OM&M Plan to be submitted to CDPHE for approval with the Landfill Cover Design.

During the Closure Plan design and construction period (assumed to be 4th Quarter 2016 through 2017, Quantum proposes to continue groundwater monitoring at the Site and will conducting quarterly static water level measurements and quarterly sampling of monitoring of wells AC-MW1, AC-MW3, AC-MW-4, AC-MW5, MW-H05, and AC-P4 for analysis of the Appendix IA and IB constituents. The Long-Term Groundwater Monitoring Plan for the Site will be submitted with, or part of, the OM&M Plan.

11.3.4 Land Use Restrictions

As the land use regulatory authority for this property under State law the County will impose land use restrictions on the property, through a notice of environmental use restrictions, adequate to protect the remedial measures. The County agrees that these restrictions will prohibit residential uses, withdrawal of groundwater for any purpose, and compliance with the Materials Management Plan.

12.0 CERTIFICATION STATEMENT

I certify that I have reviewed this Report and as a qualified groundwater scientist as defined by Section 1.2 of the Regulations Pertaining to Solid Waste Sites and Facilities (6 CCR 1007-2, Part 1) this Report, and all the information presented, to the best of my knowledge and ability, is a true and accurate reflection of the regulatory monitoring and testing performed.

_____

John C. Dellaport, P.E., P.G.
Environmental Division Manager, Quantum Water & Environment

13.0 REFERENCES

Adams County Assessor, 2015 - Assessor Information and Parcel Map.

Bouwer, H., and Rice, R.C., 1976. *A slug test for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells*. Water Resources Research. v. 12, pp. 423-428.

Colorado Department of Natural Resources, Division of Water Resources, 2016. *Rules and regulations for water well construction, pump installation, cistern installation, and monitoring and observation hole/well construction*, 2 CCR 402-2.

Colorado Department of Public Health and Environment, 2014. *Arsenic Concentrations in Soil - Risk management guidance for evaluating.*

Colorado Department of Public Health and Environment, Air Quality Control Commission, 2008. *Part B – Asbestos*, 5 CCR 1001-10, Regulation No. 8.

Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division, 2004. *Indoor Air Guidance.*

Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division, 2013. *Final Guidance Document – Water Balance Covers in Colorado.*

Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division, 2014. *Groundwater Protection Values Soil Cleanup Table.*

Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division, 2015. *Regulations Pertaining to Solid Waste Sites and Facilities*, 6 CCR 1007-2, Part 1, Section 5.5 (Effective December 30, 2015).

Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division, 2016. *Air Screening Concentrations Table.*

Colorado Department of Public Health and Environment, Water Quality Control Commission, 2016. T*he Basic Standards for Ground Water*, 5 CCR 1002-41, Regulation No. 41 (Effective June 30, 2016).

Colorado Department of Public Health and Environment, Water Quality Control Division, 2011. *Stormwater Discharges Associated with Construction Activity – Stormwater Management Plan Preparation Guidance*.

Environmental Protection Agency, 2011. Code of Federal Regulations, Chapter 40, Part 763-Asbestos.

Environmental Protection Agency, 2016. *Regional Screening Levels (RSLs) – Generic Tables (May 2016)*.

Fox Consulting Engineers and Geologists, 1979. *Site Investigation, Design, and Operation Plan for Proposed Regional Sanitary Landfill Facility in Adams County, Colorado* (December 5).

Henderson, J., 2016: Personal Discussion between Jerry Henderson (Colorado Department of Public Health and Environment, Solid Waste Division), John Dellaport (Quantum), and Joe Aiken (JA Environmental). (September 19)

KRW Consulting, Inc., 2003. Subject: *Closed Adams County Landfill (Landfill) - 144th/Riverdale Road (October 6)*

KRW Consulting, Inc., 2004A. Subject: *Final Report for the Construction of Gas Monitoring Probes at the 144th Avenue and Riverdale Road Landfill, Adams County, Colorado* (February 23)

KRW Consulting, Inc. 2004B. Subject: *Monitoring Results on Gas Monitoring Probes at the 144th Avenue and Riverdale Road Landfill, Adams County, Colorado* (April 27).

KRW Consulting, Inc., 2004C. Subject: *Monitoring Results on Gas Monitoring Probes at the 144th Avenue and Riverdale Road Landfill, Adams County, Colorado* (June 15).

Madison, R.J. and Brunett, J.O. 1985. *Overview of the occurrence of nitrate in ground water of the United States, in National Water Summary 1984-Hydrologic Events, Selected Water-Quality Trends, and Ground-Water Resources*: U.S. Geological Survey Water-Supply Paper 2275, pp. 93-105.

Quantum Water & Environment, 2016A. *Phase I Environmental Site Assessment, Adams County Shooting Range.* (January 19)

Quantum Water & Environment, 2016B. *Sampling and Analysis Plan, Revision 1.* (May 14)

Quantum Water & Environment, 2016C. *Addendum 1 to Sampling and Analysis Plan, Revision 1.* (August 3)

Quantum Water & Environment, 2016D. *Addendum 2 to Sampling and Analysis Plan, Revision 1.* (Sept. 21)

Quantum Water & Environment, 2016E. *Treatability Testing Plan to Evaluate Effectiveness of ECOBOND® to Reduce Leachability of Lead from Shooting Range Soils.* (Oct. 7)

Toxic Substances Control Act, 2002. Published 1976, amended.

United States Geological Survey, 1994. - *7.5 Minute Series Topographic Map, Brighton, Colorado*, published 1965, revised.

Figures and Cross Sections

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67W

66W

1S

Property

1 inch = 2,000 feet

0 2,000 4,000 Feet

Figure 1: Site Topography

Adams County Shooting Range
Site Assessment and Closure Plan

Sources:
Boulder Land Consultants, 2016
USGS Topographic Map
(ESRI Basemap)

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Projection: CO State Plane North (2011)
Datum: NAD83
Job Number: 132-15
Prepared By: TLR
Checked By: JCD
Date: October 17, 2016

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Safety

Fan

Back Berm

Impact Berm

Lateral Berm

Lateral Berm

Range

Floor

Lateral Berm

Burn Drum

Munitions Magazine

Riverdale Road

#258253

#164204

Lateral Berm

Range Floor

Range Floor SWAT

Impact Berm

Back Berm

Lateral Berm

Safety Fan

Brantner Ditch

1 inch = 140 feet

0 140 280 Feet

Map Legend

- Adams County Shooting Range Property
- North Shooting Range
- South Shooting Range
- Landfill Delineation
- Stormwater Basin
- Spring (approximate)
- Domestic Well
- 30" Corrugated Metal Pipe
- CMP Culvert Inlet
- Agricultural Property
- Industrial Property
- Residential Property

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Figure 2: Site Plan

Adams County Shooting Range
Site Assessment and Closure Plan

Sources:
Boulder Land Consultants, 2016
Quantum Field Data, 2016
Adams County Assessor

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AC-SB-19
AC-MW2 (dry)
AC-SB-18
AC-SB-09
AC-SB-10
AC-SB-20
A
GMP-1 (5034.6)
AC-SB-44
GMP-2 (dry)
AC-SB-43
AC-SB-13
AC-SB-12
AC-SB-17
AC-SB-15
C
AC-SB-42
AC-SB-11
AC-P1 (dry)
AC-SB-54
AC-SB-14
GMP-3 (dry)
AC-MW3 (4984.96)
AC-SB-41
AC-SB-16
AC-SB-53
AC-SB-36
AC-SB-52
AC-SB-08
AC-SB-40
AC-SB-06
AC-P2 (5003.9)
AC-SB-07
AC-SB-37
AC-SB-39
AC-SB-04
AC-SB-38
AC-SB-35
AC-SB-03
AC-MW4 (5004.4)
AC-P3 (5018.7)
AC-SB-02
AC-MW1 (5037.5)
Detail Figure
AC-SB-05
A'
B
AC-SB-31
AC-SB-01
AC-SB-25
AC-SB-24
AC-SB-27
AC-SB-30
AC-P4 (5021.3)
AC-SB-23
AC-SB-28
AC-SB-29
AC-SB-22
B'
AC-MW5 (5014.2)
AC-SB-21
C'
AC-P5 (5012.8)
GMP-4 (5013.5)

1 inch = 140 feet

0 140 280 Feet

Detail Figure

AC-SB-50
AC-SB-49
AC-SB-33
AC-SB-48
AC-SB-51
AC-SB-26
AC-SB-32
AC-SB-46
AC-SB-47
AC-SB-45
AC-SB-34

Map Legend

Soil Borings

- Deep Boring with No Waste
- Deep Boring with Waste
- Shallow Boring
- Boring with Sludge Waste

Static Groundwater Data Point

- Gas Monitoring Probe
- Monitoring Well
- Piezometer

Elevation Contour
Contour Interval = 5 ft

- Adams County Shooting Range Property
- Approximate Landfill Delineation
- Cross Section Line
- SWL Elevation Contour (Recorded: 08/24/16)
  Contour Interval = 5 ft
- SWL Elevation Contour - Inferred

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Figure 3: Cross-Section Plan View

Adams County Shooting Range Site Assessment and Closure Plan

Sources:
Boulder Land Consultants, 2016
Quantum Field Data, 2016

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Prepared By: TLR
Checked By: JCD
Date: October 17, 2016

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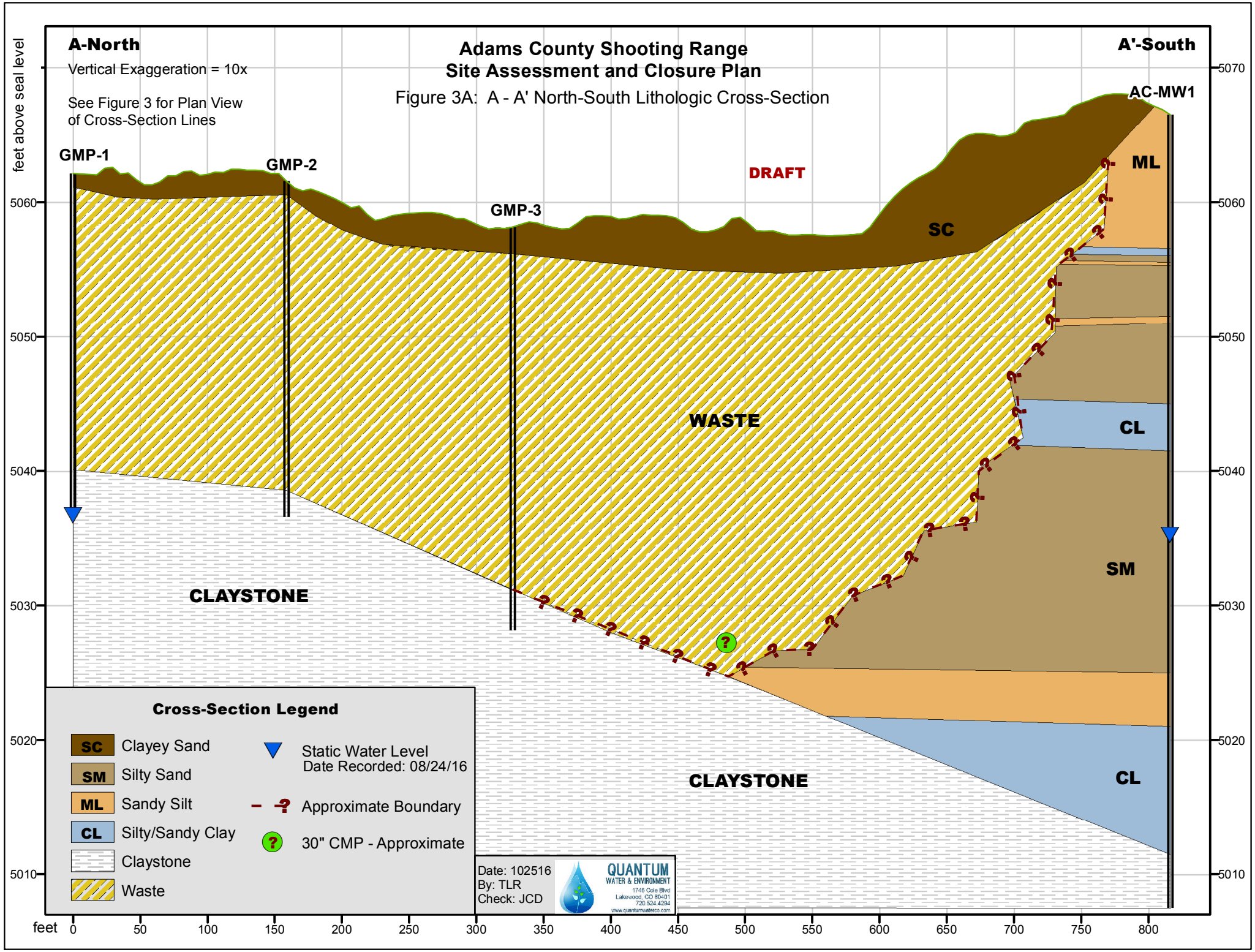
A-North
Vertical Exaggeration = 10x
See Figure 3 for Plan View of Cross-Section Lines
Adams County Shooting Range
Site Assessment and Closure Plan
Figure 3A: A - A' North-South Lithologic Cross-Section
A'-South
DRAFT
feet above seal level
GMP-1
GMP-2
GMP-3
AC-MW1
SC
ML
WASTE
CL
SM
CLAYSTONE
CLAYSTONE
CL
5070
5060
5050
5040
5030
5020
5010
feet
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
Cross-Section Legend
SC Clayey Sand
SM Silty Sand
ML Sandy Silt
CL Silty/Sandy Clay
Claystone
Waste
Static Water Level
Date Recorded: 08/24/16
Approximate Boundary
30" CMP - Approximate
Date: 102516
By: TLR
Check: JCD
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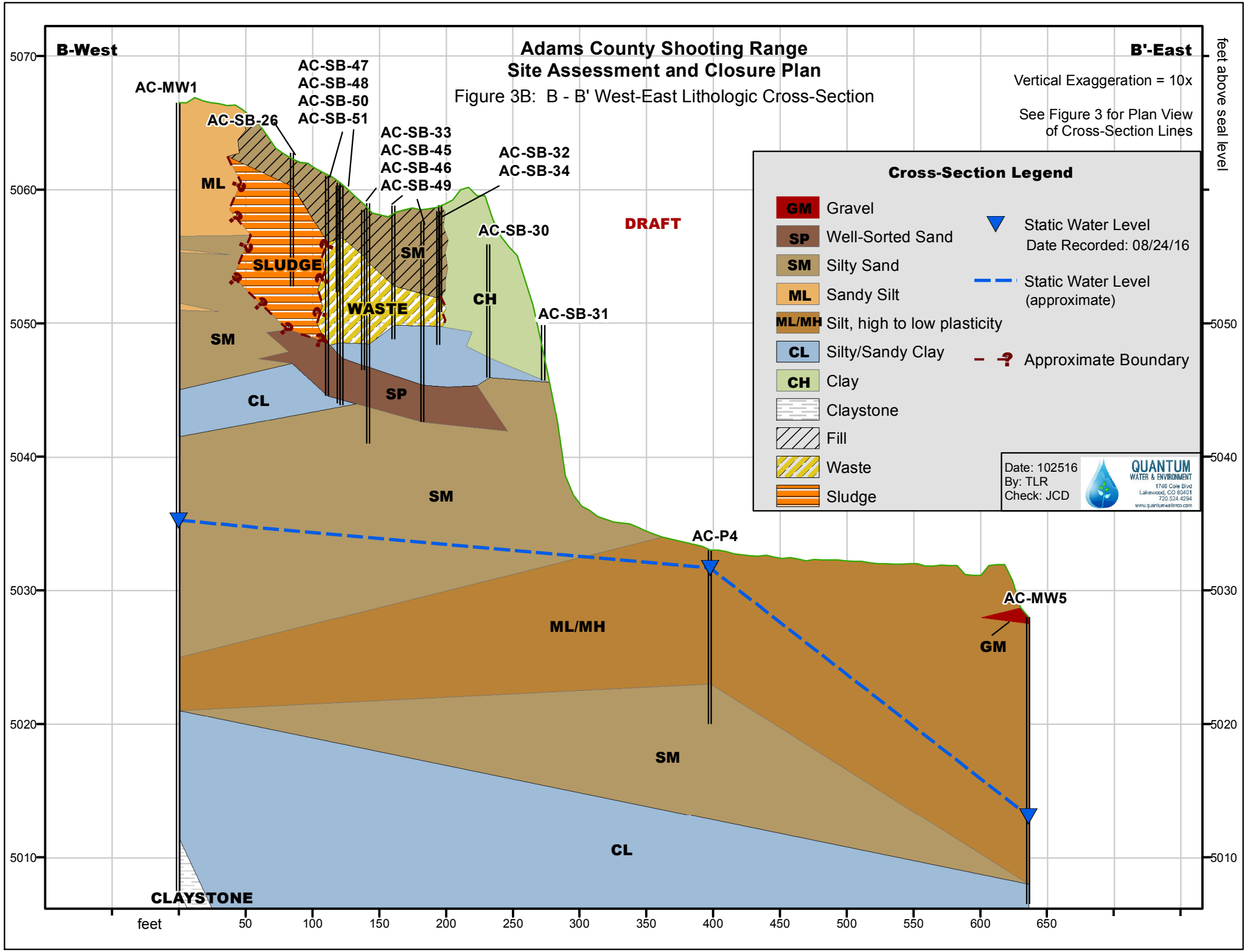
Adams County Shooting Range
Site Assessment and Closure Plan
Figure 3B: B - B' West-East Lithologic Cross-Section



C-North

Vertical Exaggeration = 10x

See Figure 3 for Plan View of Cross-Section Lines

Adams County Shooting Range
Site Assessment and Closure Plan

Figure 3C: C - C' North-South Lithologic Cross-Section

C'-South

DRAFT

feet above seal level

5040 5030 5020 5010 5000 4990 4980 4970

AC-P1 AC-MW3 AC-P2 AC-SB-37 AC-SB-38 AC-MW4 AC-SB-01 AC-MW5 AC-P5

CL ML SM CL SC CH ML SM CL GM CH ML CL

feet 0 50 100 150 200 250 300 350 400 450 500 550 600 650 700 750 800 850 900 950 1000 1050 1100 1150 1200

Cross-Section Legend

- GM Gravel
- SC Clayey Sand
- SM Silty Sand
- ML Sandy Silt
- CL Silty/Sandy Clay
- CH Clay
- Claystone
- Static Water Level Date Recorded: 08/24/16
- Static Water Level (approximate)
- 30" CMP

Date: 102516
By: TLR
Check: JCD

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AC-SB-19
AC-MW2
AC-SB-18
AC-SB-09
AC-SB-20
GMP-1
AC-SB-10
AC-SB-44
GMP-2
AC-SB-13
AC-SB-12
AC-SB-43
AC-SB-17
AC-SB-15
AC-SB-42
AC-SB-11
AC-P1
AC-SB-54
AC-SB-14
GMP-3
AC-SB-41
AC-SB-16
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AC-MW3
AC-SB-52
AC-SB-36
AC-SB-40
AC-SB-06
AC-SB-08
AC-P2
AC-SB-07
AC-SB-37
AC-SB-39
AC-SB-04
AC-SB-38
AC-SB-35
AC-P3
AC-MW4
AC-SB-03
AC-SB-02
AC-MW1
Detail Figure
AC-SB-05
AC-SB-31
AC-SB-25
AC-SB-01
AC-SB-24
AC-SB-27
AC-SB-30
AC-P4
AC-SB-23
AC-SB-28
AC-SB-29
AC-SB-22
AC-MW5
AC-SB-21
AC-P5
GMP-4
1 inch = 140 feet
0
140
280
Feet

Detail Figure
AC-SB-50
AC-SB-49
AC-SB-33
AC-SB-48
AC-SB-51
AC-SB-26
AC-SB-46
AC-SB-32
AC-SB-47
AC-SB-45
AC-SB-34

Map Legend

Soil Borings

- Deep Boring with No Waste
- Deep Boring with Waste
- Shallow Boring
- Boring with Sludge Waste

Wells and Piezometers

- Gas Monitoring Probe
- Monitoring Well
- Piezometer

- Adams County Shooting Range Property
- Approximate Landfill Extent
- Geophysical Survey Extent

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Figure 4: Landfill Delineation

Adams County Shooting Range
Site Assessment and Closure Plan

Sources:
Boulder Land Consultants, 2016
Quantum Field Data, 2016
Fugro Consultants, Inc
USDA NAIP, 1 ft, 2016

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Projection: CO State Plane North (2011)
Datum: NAD83
Job Number: 132-15
Prepared By: TLR
Checked By: JCD
Date: October 17, 2016

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NRSF-1 NRSF-2 NRSF-3 NRSF-4 NRSF-5 NRSF-6 NRSF-7 NRSF-8 NRSF-9 NRSF-10 NRSF-11 NRSF-12 NRSF-13 NRSF-14 NRSF-15 NRSF-16 NRSF-17 NRSF-18 NRSF-19 NRSF-20 NRSF-21 NRSF-22 NRSF-23 NRSF-24

NRBB-1 NRBB-2 NRBB-3 NRBB-4 NRBB-5 NRBB-6 NRBB-7 NRBB-8 NRBB-9 NRBB-10

NRIB-1 NRIB-2 NRIB-3 NRIB-4 NRIB-5

NRLB-1O NRLB-1I NRLB-2O NRLB-2I NRLB-3O NRLB-3I NRLB-4O NRLB-4I NRLB-5O NRLB-5I NRLB-6O NRLB-6I NRLB-7O NRLB-7I NRLB-8O NRLB-8I NRLB-9O NRLB-9I NRLB-10O NRLB-10I NRLB-11O NRLB-11I NRLB-12O NRLB-12I NRLB-13O NRLB-13I NRLB-14O NRLB-14I

NRRF-1 NRRF-2 NRRF-3 NRRF-4 NRRF-5 NRRF-6 NRRF-7 NRRF-8 NRRF-9

1 inch = 80 feet

0 80 160 Feet

Map Legend

Adams County Shooting Range Property

Soil Sample Locations

Discrete Sample Location

5-point Composite Sample

Soil Sample Areas

Safety Fan

Back Berm

Impact Berm

Lateral Berm

Range Floor

Projection: UTM Zone 13N
Datum: NAD83

Job Number: 132-15
Prepared By: TLR
Checked By: JCD
Date: October 20, 2016

Sources:
Boulder Land Consultants, 2016
Quantum Field Data, 2016
USDA NAIP, 1 ft, 2016

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Figure 5A: North Shooting Range Soil Sample Locations

Adams County Shooting Range
Site Assessment and Closure Plan

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1S

N

SRLB-1O
SRLB-1I
SRLB-2O
SRLB-2I
SRLB-3O
SRLB-3I
SRRF-1
SRRF-2
SRRF-3
SRRF-4
SRRF-5
SRRF-6
SRRF-7
SRRF-8
SRRF-9
SRRF-10
SRIB-1
SRIB-2
SRIB-3
SRIB-4
SRIB-5
SRIB-6
SRIB-7
SRIB-8
SRIB-9
SRIB-10
SRIB-11
SRIB-12
SRBB-1
SRBB-2
SRBB-3
SRBB-4
SRBB-5
SRBB-6
STRF-1
STRF-2
SRSF-1
SRSF-2
SRSF-3
SRSF-4NW
SRSF-4C
SRSF-4NE
SRSF-4E
SRSF-4SE
SRSF-5
SRSF-6
SRSF-7
SRSF-8
SRSF-9
SRLB-8I
SRLB-8O
SRLB-7I
SRLB-7O
SRLB-6I
SRLB-6O
SRLB-5I
SRLB-5O
SRLB-4I
SRLB-4O
Text

1 inch = 60 feet

0 60 120 Feet

Figure 5B: South Shooting Range Soil Sample Locations

Adams County Shooting Range
Site Assessment and Closure Plan

Map Legend

Adams County Shooting Range Property

Soil Sample Locations

- 5-Point Composite Sample for Polynuclear Aromatic Hydrocarbons (PAH) Analysis
- 5-Point SRSF Composite Sample
- Discrete Sample Location

Soil Sample Areas

- Safety Fan
- Back Berm
- Impact Berm
- Lateral Berm
- Range Floor
- Range Floor-SWAT
- Skeet Shooting Area

Projection: UTM Zone 13N
Datum: NAD83

Job Number: 132-15
Prepared By: TLR
Checked By: JCD
Date: October 20, 2016

Sources:
Boulder Land Consultants, 2016
Quantum Field Data, 2016
USDA NAIP, 1 ft, 2016

DRAFT

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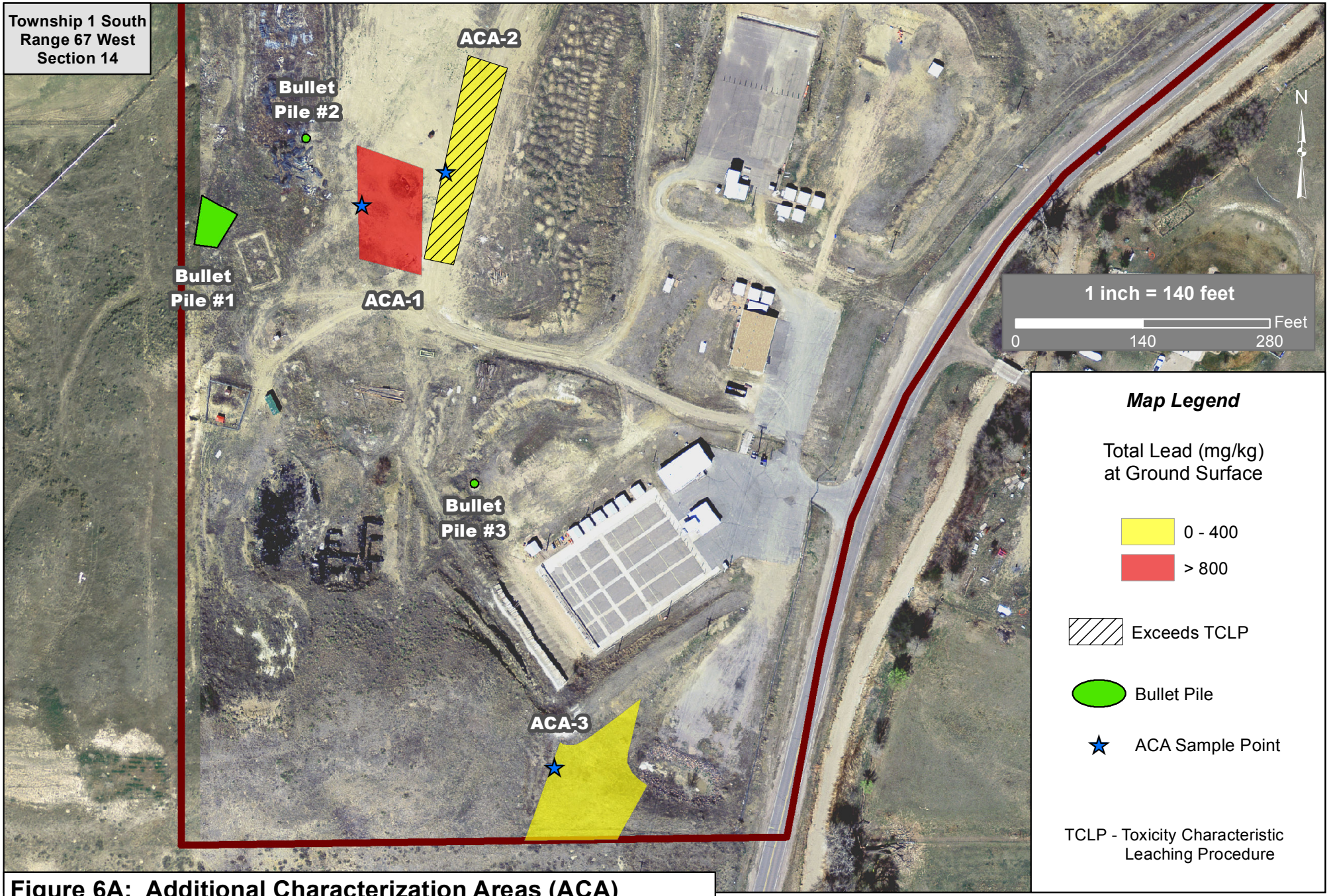

Figure 6A: Additional Characterization Areas (ACA) Sample Total Lead and TCLP Summary at Ground Surface and Bullet Pile Areas

Adams County Shooting Range - Site Assessment and Closure Plan

Job Number: 132-15
Prepared By: TLR
Checked By: JCD/CMK
Date: September 26, 2016

Not a survey map

Projection: UTM Zone 13N
Datum: NAD83
Sources:
Sampling Analysis Plan
Field Data-July 2016
USDA NAIP, 1 ft, 2016

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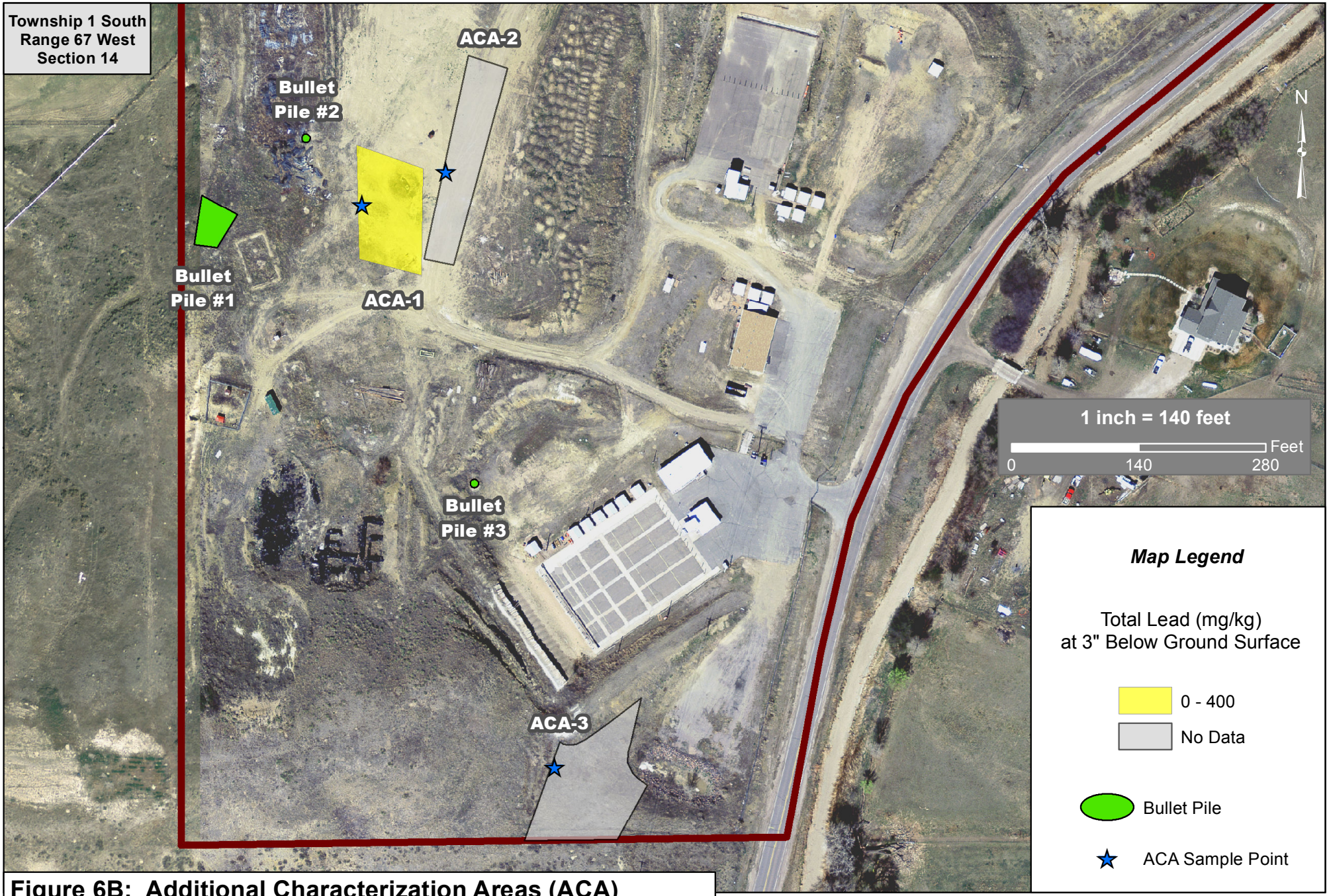

Figure 6B: Additional Characterization Areas (ACA) Sample Total Lead Summary at 3" Below Ground Surface and Bullet Pile Areas

Adams County Shooting Range - Site Assessment and Closure Plan

Job Number: 132-15
Prepared By: TLR
Checked By: JCD/CMK
Date: September 26, 2016

Not a survey map

Projection: UTM Zone 13N
Datum: NAD83
Sources:
Sampling Analysis Plan
Field Data-July 2016
USDA NAIP, 1 ft, 2016

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Q:\...\PROJECTs_ENVIRONMENTAL\Adams_County_Riverdale\MXDs\SoilSampling

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AC-SED-01-0.005

AC-SED-02-0.005

AC-SED-03-0.005

AC-SED-04-0.005

AC-SED-05-0.005

Burn Drum

Oil Tank Containment Dike

Texas Tea Well

Munitions Magazine

Meter Shed

Produced Water Containment Dike

Roll-Off Container

AC-SED-06-0.005	
Constituent	mg/kg
Lead	670

AC-SED-07-0.005	
Constituent	mg/kg
Lead	6200

DRAFT

1 inch = 140 feet

0 140 280 Feet

Map Legend

- Adams County Shooting Range Property
- 30" Corrugated Metal Pipe
- Stormwater Basin
- Underground Flow Line
- Underground Flow Line Gathering Line, approximate

Sample Locations

- (E) Explosives
- (S) Sediment

Note:
Only those constituents that exceed the regulatory limit are shown on this figure.

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Figure 7: Sediment and Explosive Sampling Locations

Adams County Shooting Range
Site Assessment and Closure Plan

Sources:
Boulder Land Consultants, 2016
Quantum Field Data, 2016
Adams County Assessor
USDA NAIP, 1 ft, 2016

DRAFT

Projection: CO State Plane North (2011)
Datum: NAD83
Job Number: 132-15
Prepared By: TLR
Checked By: JCD
Date: October 17, 2016

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1S

N

AC-MW1	
Constituent	mg/L
Chloride	3300
Sulfate	1700
Constituent	µg/L
Selenium	92

AC-MW2	
Constituent	mg/L
Chloride	290
Nitrate as N^2	13
Sulfate	2600
Constituent	µg/L
Selenium	220

AC-MW3	
Constituent	mg/L
Chloride	640
Sulfate	2300

AC-MW4	
Constituent	mg/L
Sulfate	3700

AC-MW5	
Constituent	mg/L
Chloride	730
Sulfate	4300
Constituent	µg/L
cis-1,2-Dichloroethene	20
Vinyl chloride	1.3

AC-SPRING	
Constituent	mg/L
Chloride	780
Sulfate	8900

GMP-1, GMP-2, GMP-3, GMP-4, AC-MW1, AC-MW2, AC-MW3, AC-MW4, AC-MW5, MW-H05, AC-P1, AC-P2, AC-P3, AC-P4, AC-P5, #164204, #258253, AC-SPRING

DRAFT

1 inch = 140 feet

0 140 280 Feet

Map Legend

Sampling Location

- Domestic Well
- Spring
- Gas Monitoring Probe
- Monitoring Well
- Piezometer

- Adams County Shooting Range Property
- SWL Elevation Contour (Recorded: 08/24/16)
  Contour Interval = 5 feet
- SWL Elevation Contour (inferred)
- Elevation Contour
  Contour Interval = 5 feet

Note:
Only those constituents that exceed the regulatory limit are shown on this figure.

G:\PROJECTs_ENV\Adams_County_Riverdale\MXDs\SA_CAP_Figs

Figure 8: Groundwater, Spring, and Soil Vapor Sampling Locations

Adams County Shooting Range
Site Assessment and Closure Plan

Sources:
Boulder Land Consultants, 2016
Quantum Field Data, 2016
Adams County Assessor

DRAFT

Projection: CO State Plane North (2011)
Datum: NAD83

Job Number: 132-15
Prepared By: TLR
Checked By: JCD
Date: October 17, 2016

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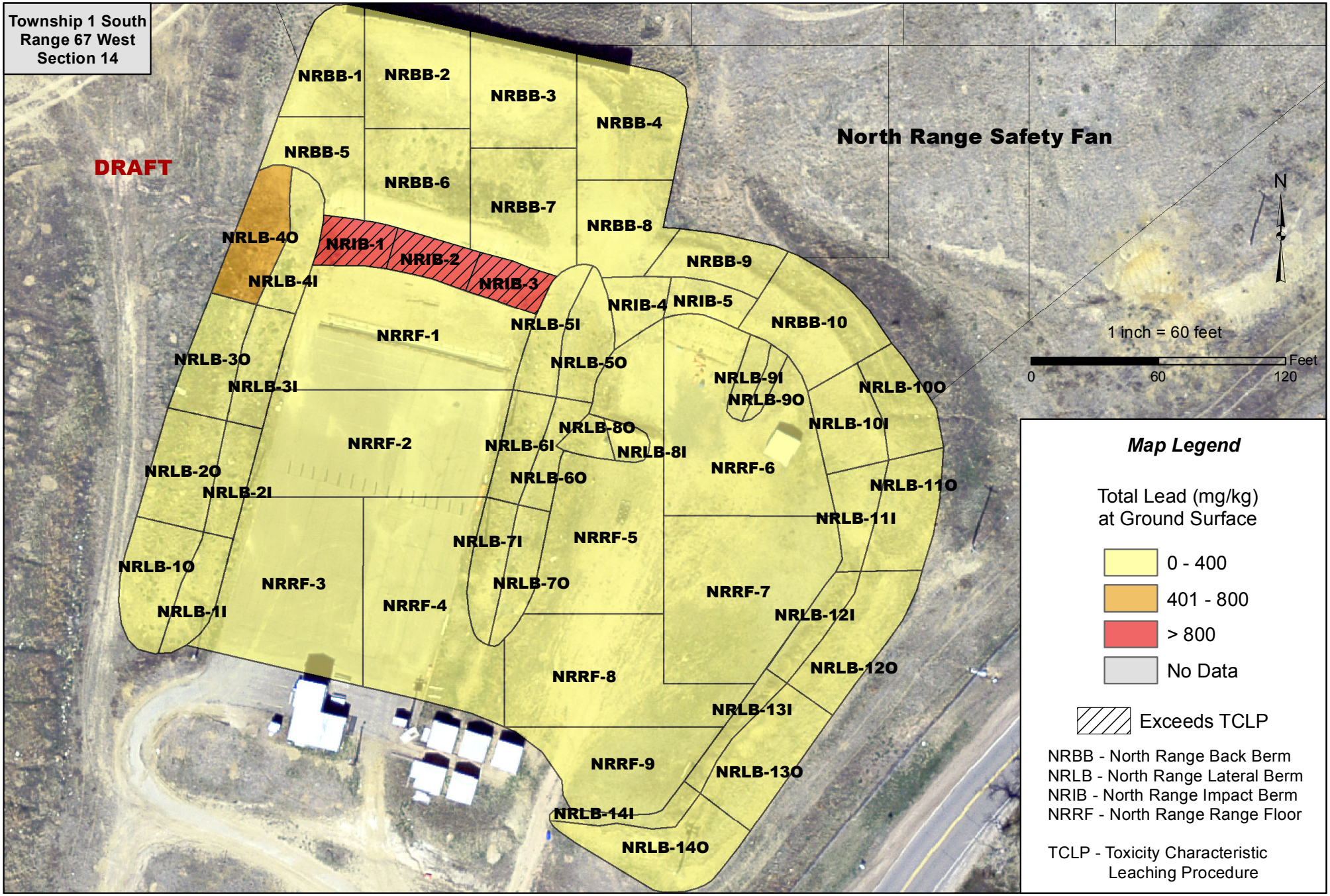

Figure 9A-1: North Shooting Range Soil Sample Total Lead and TCLP Summary at Ground Surface

Adams County Shooting Range - Site Assessment and Closure Plan

Job Number: 132-15
Prepared By: TLR
Checked By: JCD/CMK
Date: September 26, 2016

Not a survey map

Projection: UTM Zone 13N
Datum: NAD83
Sources:
Sampling Analysis Plan
Field Data-July 2016
USDA NAIP, 1 ft, 2016

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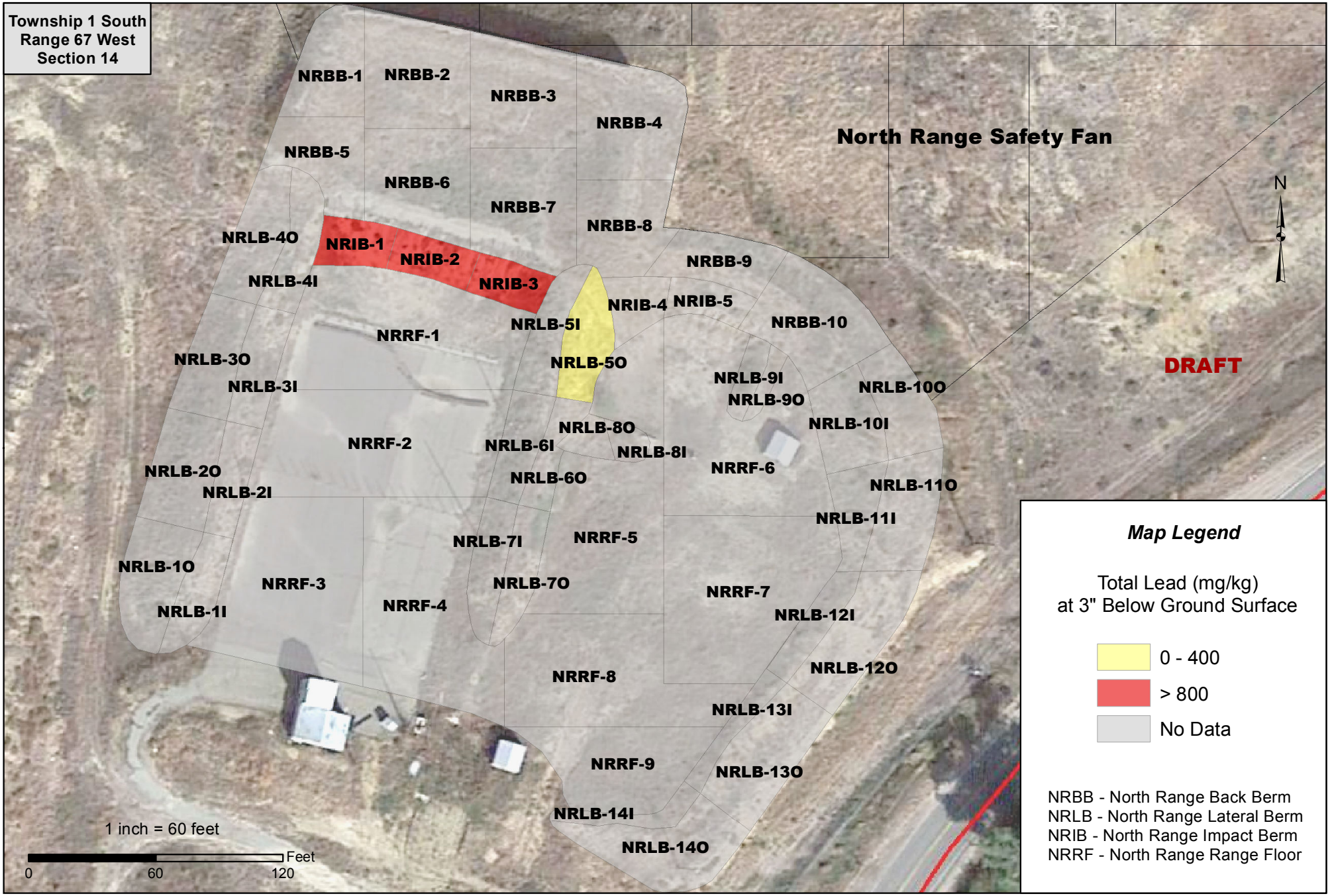

Figure 9A-2: North Shooting Range Soil Sample Total Lead Summary at 3" Below Ground Surface

Adams County Shooting Range - Site Assessment and Closure Plan

Job Number: 132-15
Prepared By: TLR
Checked By: JCD/CMK
Date: September 26, 2016

Not a survey map

Projection: UTM Zone 13N
Datum: NAD83
Sources:
Sampling Analysis Plan
Field Data-July 2016
USDA NAIP, 1 ft, 2016

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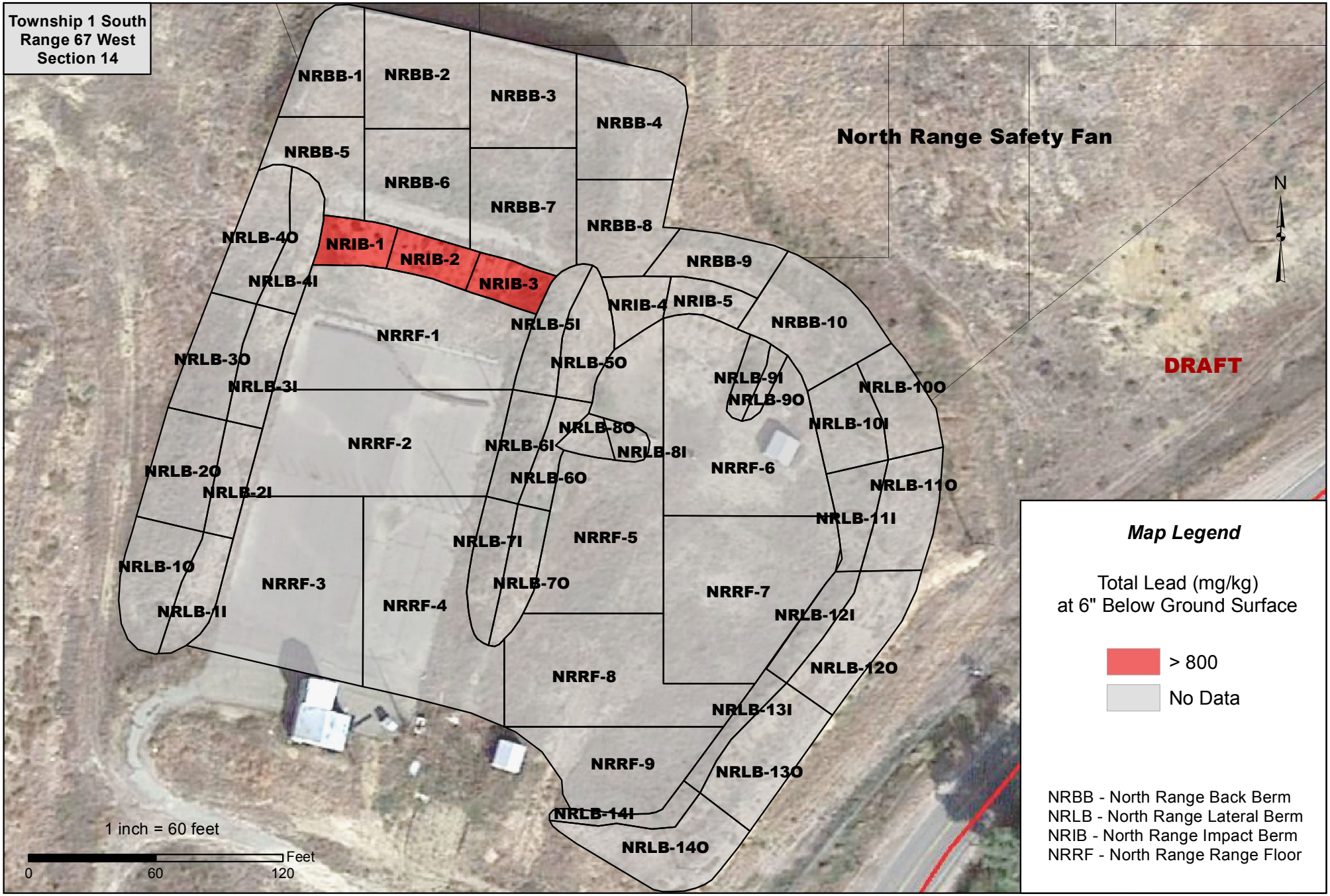

Figure 9A-3: North Shooting Range Soil Sample Total Lead Summary at 6" Below Ground Surface

Adams County Shooting Range - Site Assessment and Closure Plan

Job Number: 132-15
Prepared By: TLR
Checked By: JCD/CMK
Date: September 26, 2016

Not a survey map

Projection: UTM Zone 13N
Datum: NAD83
Sources:
Sampling Analysis Plan
Field Data-July 2016
USDA NAIP, 1 ft, 2016

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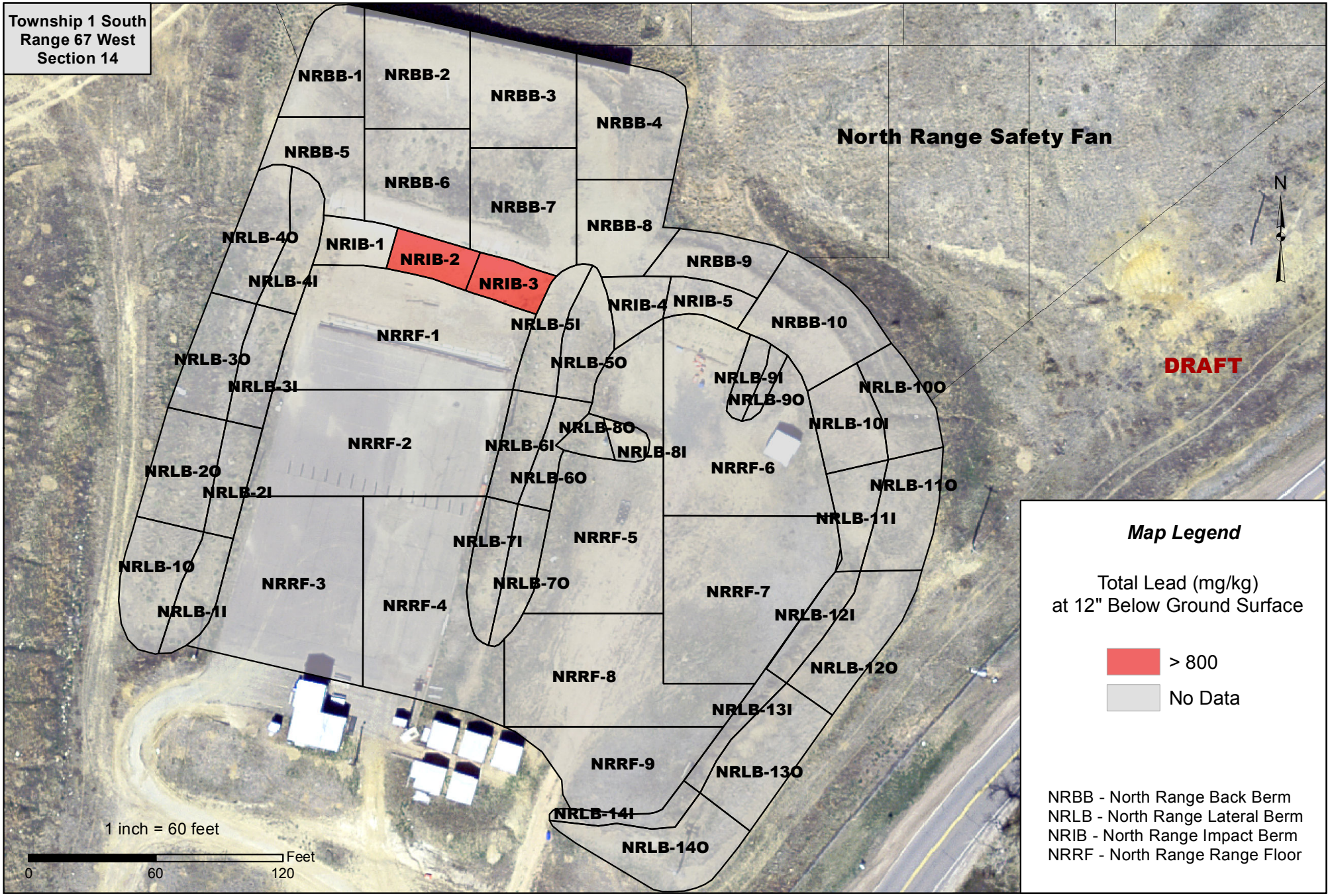

Figure 9A-4: North Shooting Range Soil Sample Total Lead Summary at 12" Below Ground Surface

Adams County Shooting Range - Site Assessment and Closure Plan

Job Number: 132-15
Prepared By: TLR
Checked By: JCD/CMK
Date: September 26, 2016

Not a survey map

Projection: UTM Zone 13N
Datum: NAD83
Sources:
Sampling Analysis Plan
Field Data-July 2016
USDA NAIP, 1 ft, 2016

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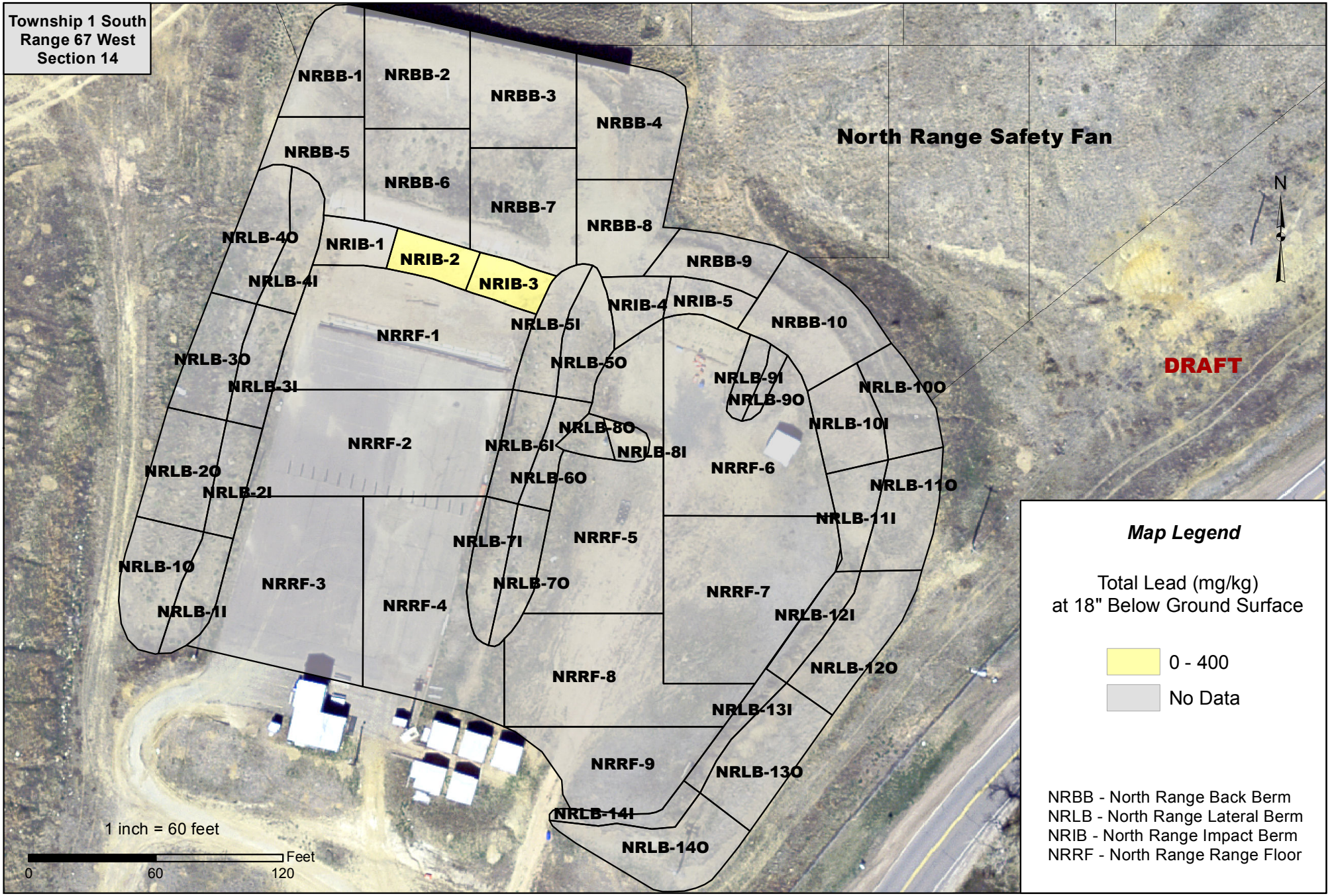

Figure 9A-5: North Shooting Range Soil Sample Total Lead Summary at 18" Below Ground Surface

Adams County Shooting Range - Site Assessment and Closure Plan

Job Number: 132-15
Prepared By: TLR
Checked By: JCD/CMK
Date: September 26, 2016

Not a survey map

Projection: UTM Zone 13N
Datum: NAD83
Sources:
Sampling Analysis Plan
Field Data-July 2016
USDA NAIP, 1 ft, 2016

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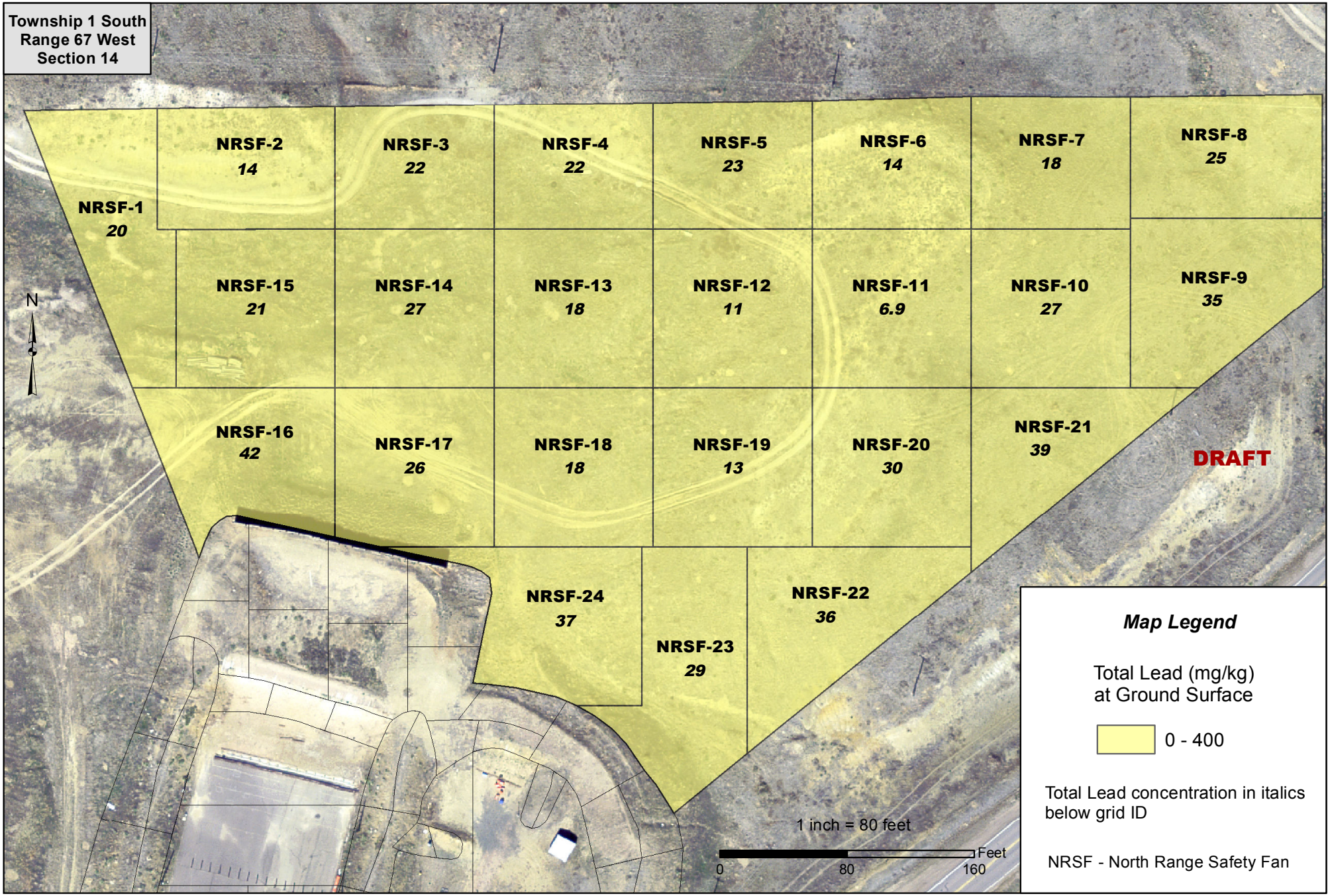

Figure 9B: North Shooting Range Safety Fan Soil Sample Total Lead Summary at Ground Surface

Adams County Shooting Range - Site Assessment and Closure Plan

Job Number: 132-15
Prepared By: TLR
Checked By: JCD/CMK
Date: September 5, 2016

Not a survey map

Projection: UTM Zone 13N
Datum: NAD83
Sources:
Sampling Analysis Plan
Field Data-July 2016
USDA NAIP, 1 ft, 2016

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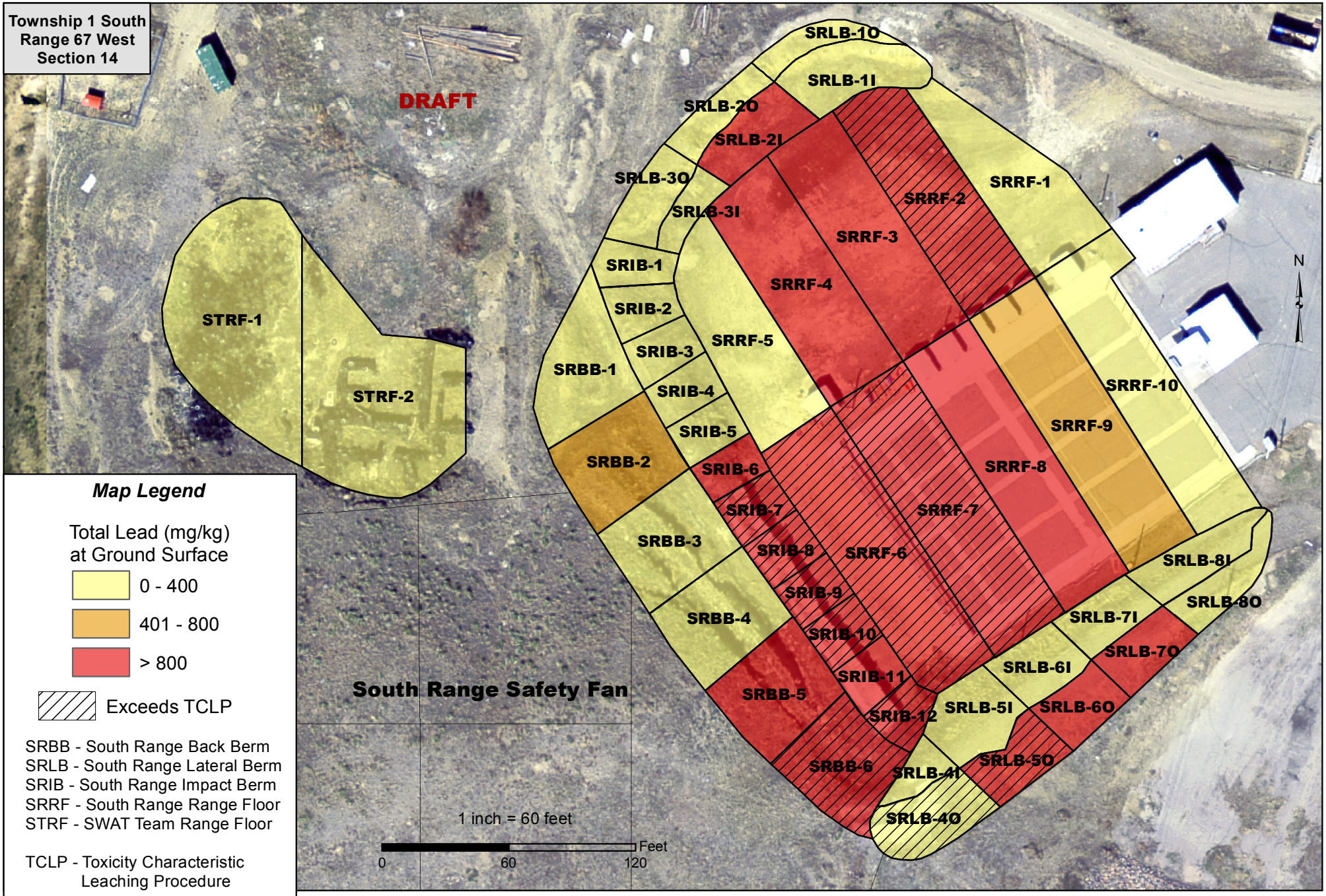

Figure 10A-1: South Shooting Range Soil Sample Total Lead and TCLP Summary at Ground Surface

Adams County Shooting Range - Site Assessment and Closure Plan

Job Number: 132-15
Prepared By: TLR
Checked By: JCD/CMK
Date: September 5, 2016

Not a survey map

Projection: UTM Zone 13N
Datum: NAD83
Sources:
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Field Data-July 2016
USDA NAIP, 1 ft, 2016

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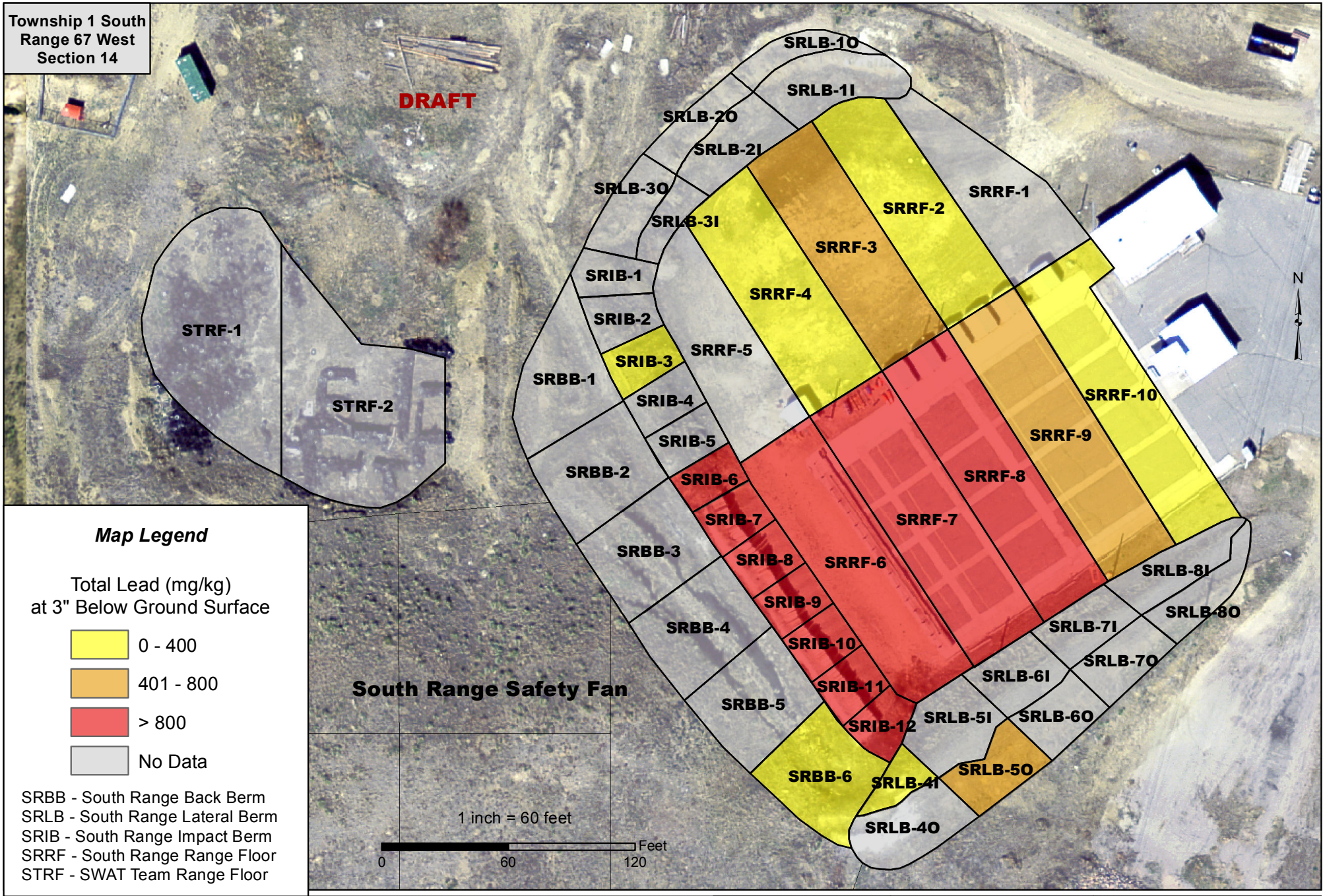

Figure 10A-2: South Shooting Range Soil Sample Total Lead Summary at 3" Below Ground Surface

Adams County Shooting Range - Site Assessment and Closure Plan

Job Number: 132-15
Prepared By: TLR
Checked By: JCD/CMK
Date: September 26, 2016

Not a survey map

Projection: UTM Zone 13N
Datum: NAD83
Sources:
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Field Data-July 2016
USDA NAIP, 1 ft, 2016

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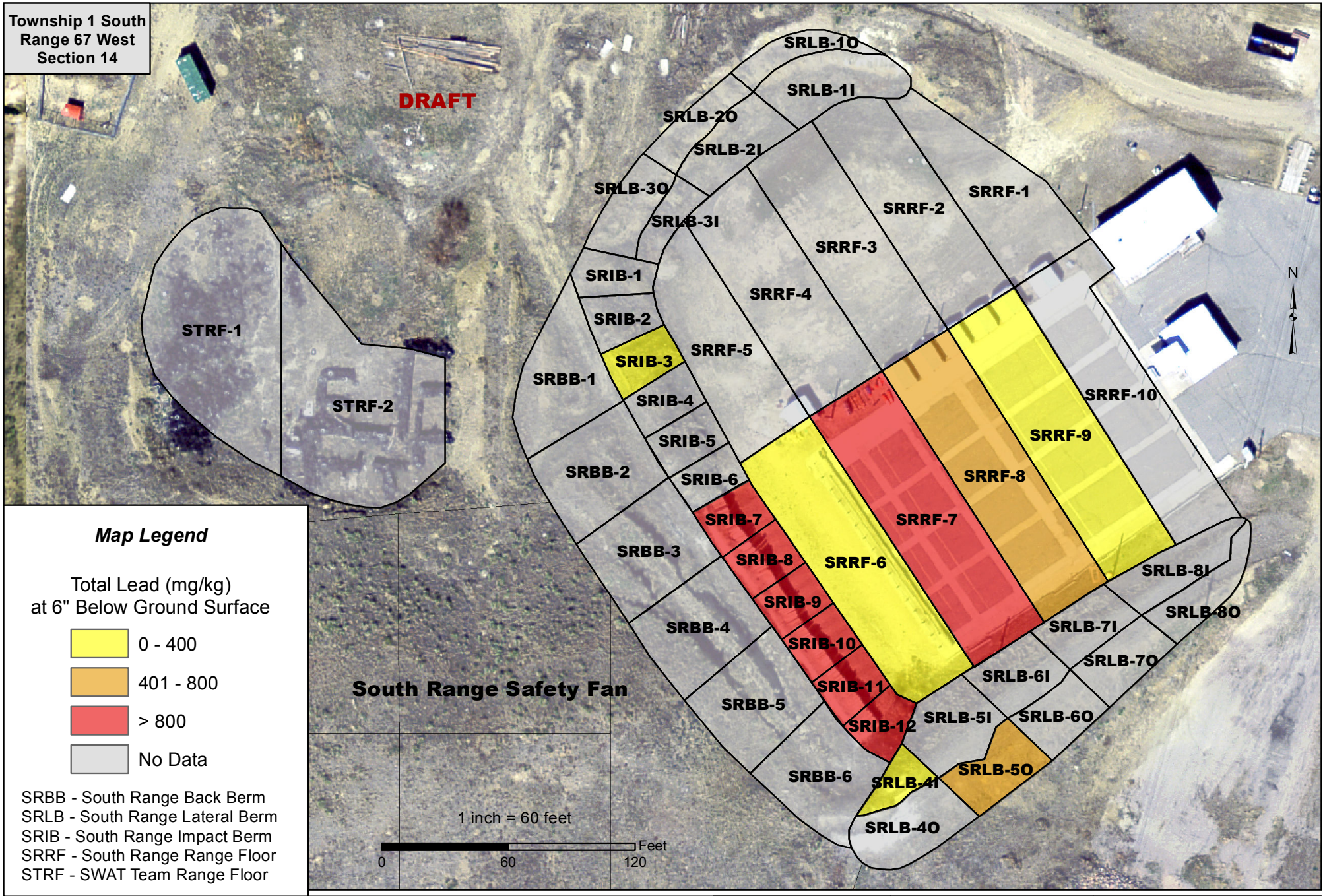

Figure 10A-3: South Shooting Range Soil Sample Total Lead Summary at 6" Below Ground Surface

Adams County Shooting Range - Site Assessment and Closure Plan

Job Number: 132-15
Prepared By: TLR
Checked By: JCD/CMK
Date: September 26, 2016

Not a survey map

Projection: UTM Zone 13N
Datum: NAD83
Sources:
Sampling Analysis Plan
Field Data-July 2016
USDA NAIP, 1 ft, 2016

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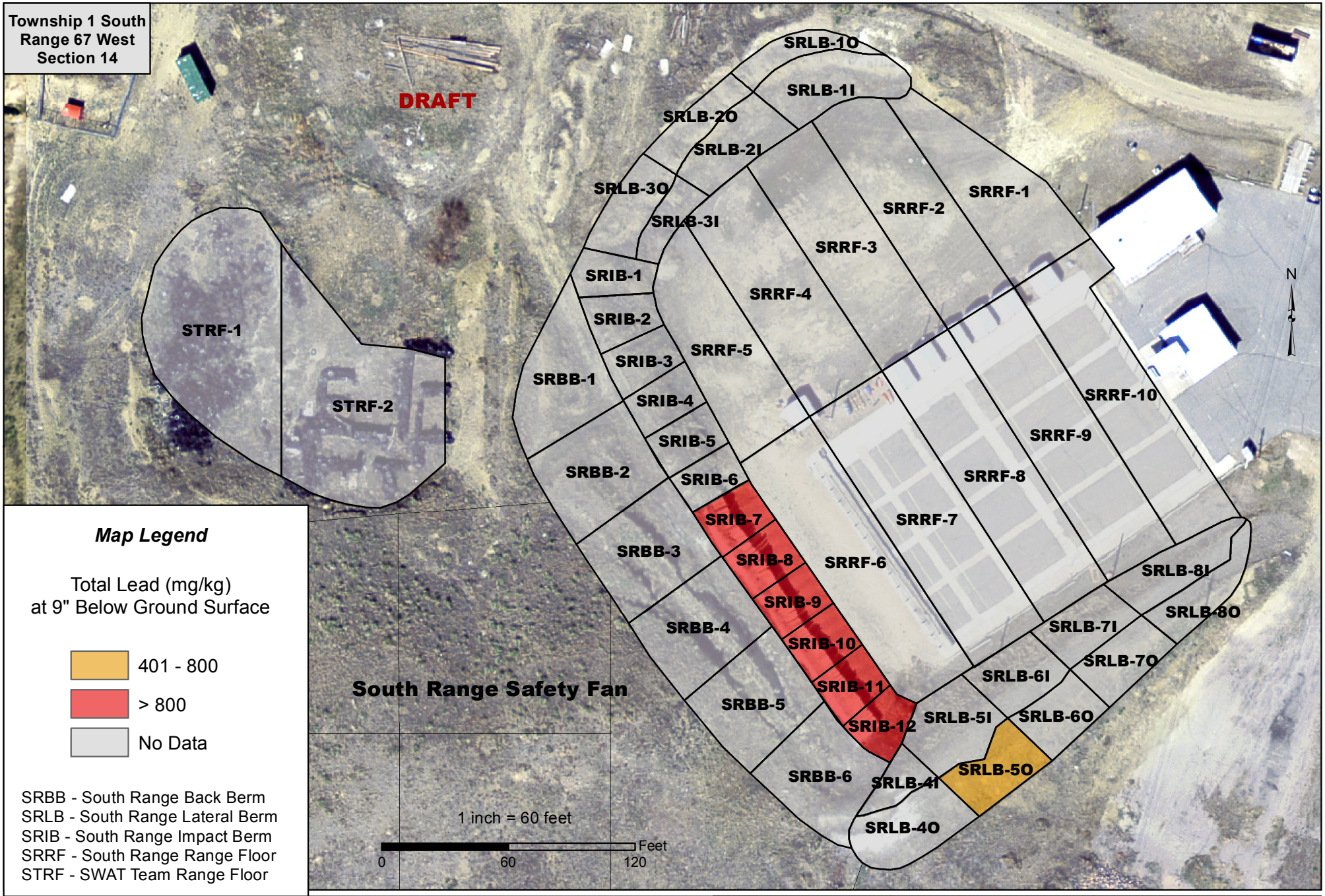

Figure 10A-4: South Shooting Range Soil Sample Total Lead Summary at 9" Below Ground Surface

Adams County Shooting Range - Site Assessment and Closure Plan

Job Number: 132-15
Prepared By: TLR
Checked By: JCD/CMK
Date: September 26, 2016

Not a survey map

Projection: UTM Zone 13N
Datum: NAD83
Sources:
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Field Data-July 2016
USDA NAIP, 1 ft, 2016

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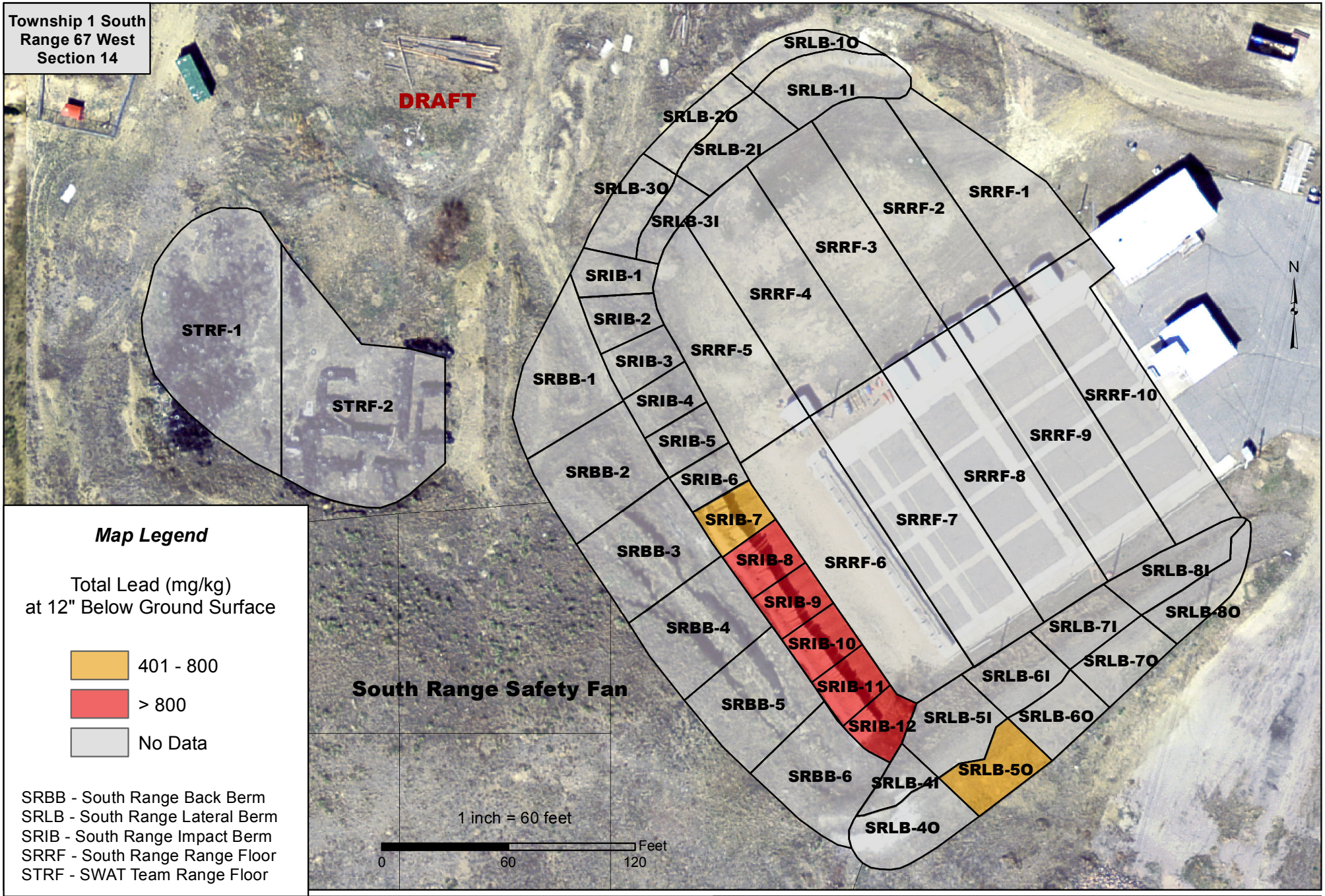

Figure 10A-5: South Shooting Range Soil Sample Total Lead Summary at 12" Below Ground Surface

Adams County Shooting Range - Site Assessment and Closure Plan

Job Number: 132-15
Prepared By: TLR
Checked By: JCD/CMK
Date: September 26, 2016

Not a survey map

Projection: UTM Zone 13N
Datum: NAD83
Sources:
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Field Data-July 2016
USDA NAIP, 1 ft, 2016

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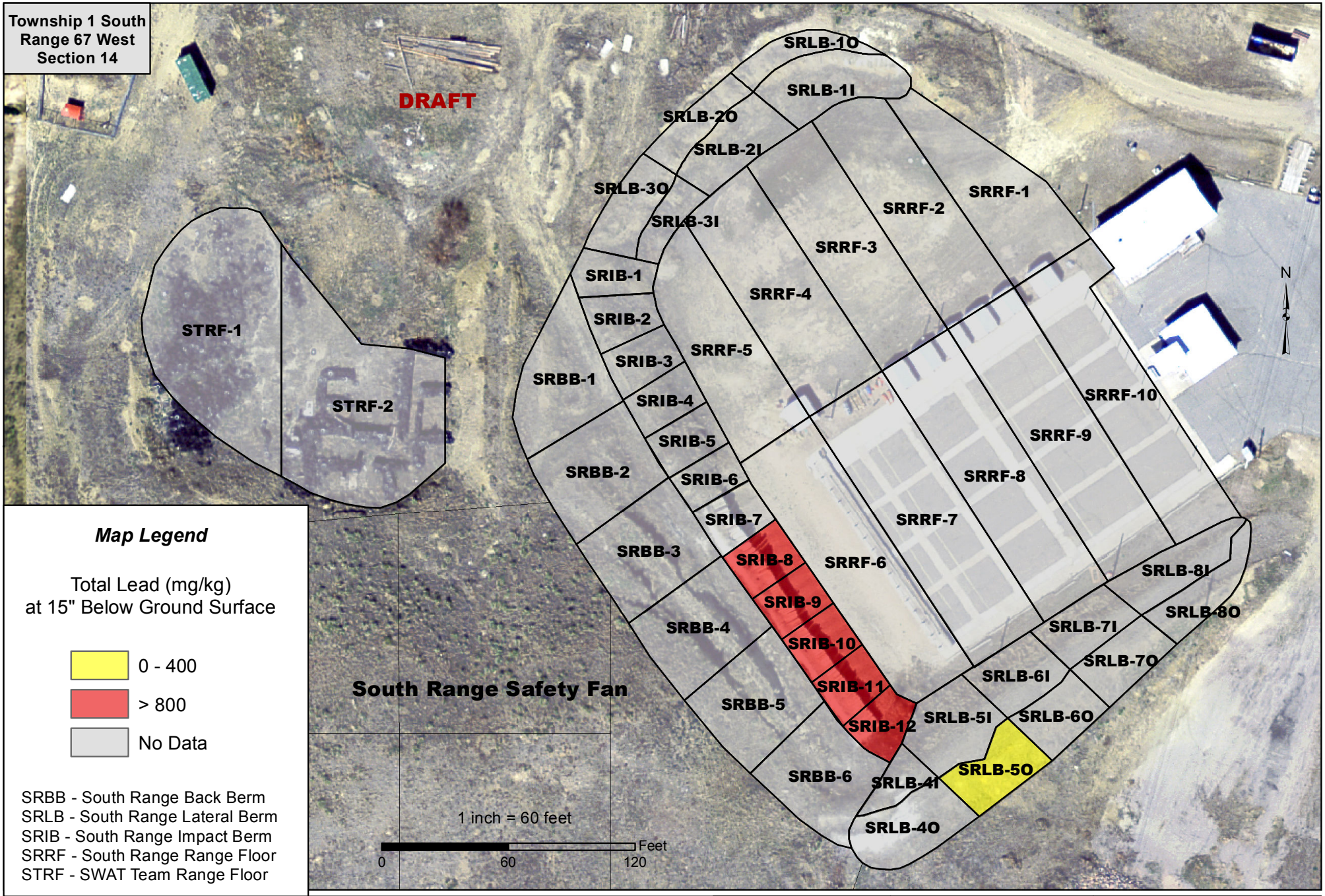

Figure 10A-6: South Shooting Range Soil Sample Total Lead Summary at 15" Below Ground Surface

Adams County Shooting Range - Site Assessment and Closure Plan

Job Number: 132-15
Prepared By: TLR
Checked By: JCD/CMK
Date: September 26, 2016

Not a survey map

Projection: UTM Zone 13N
Datum: NAD83
Sources:
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Field Data-July 2016
USDA NAIP, 1 ft, 2016

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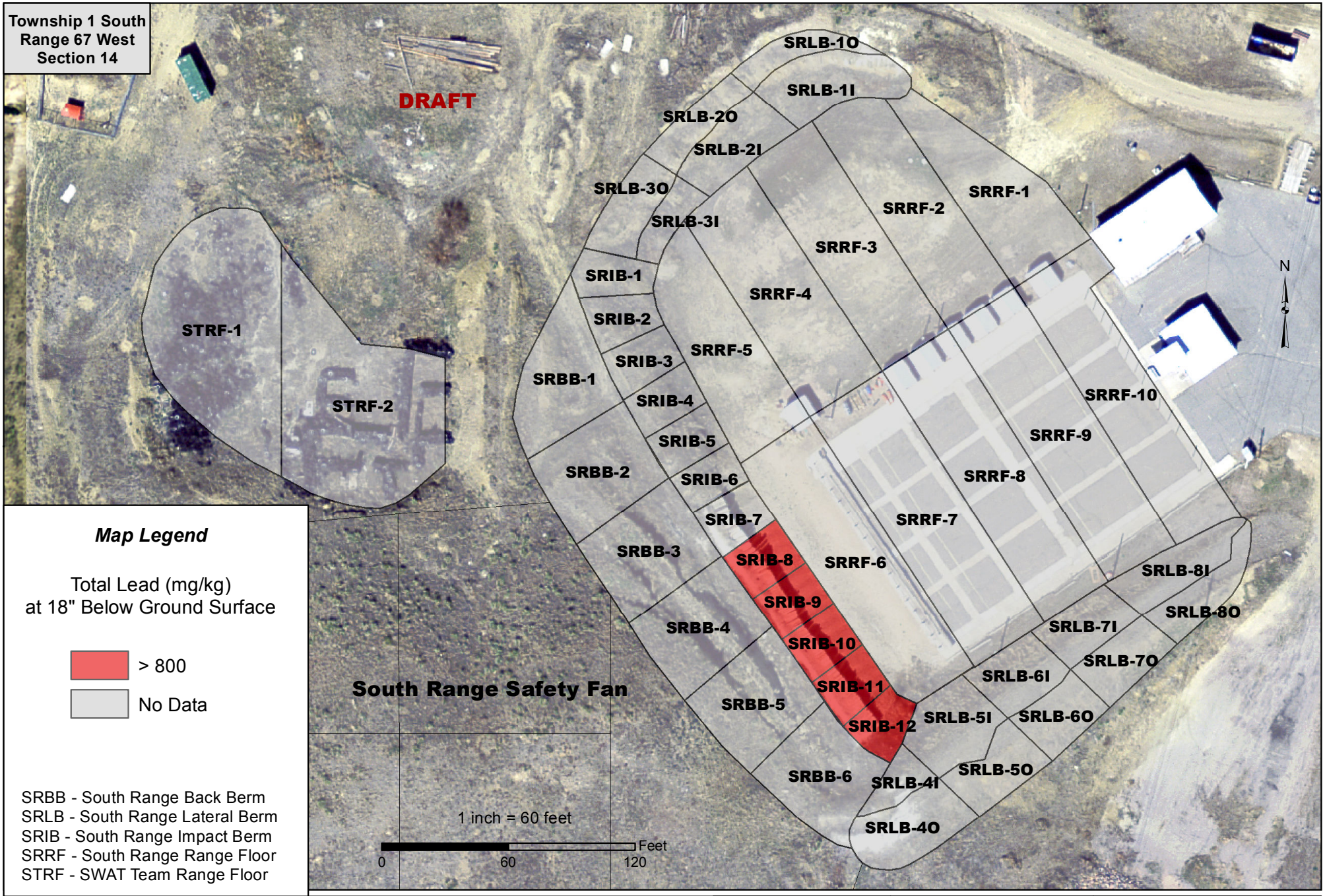

Figure 10A-7: South Shooting Range Soil Sample Total Lead Summary at 18" Below Ground Surface

Adams County Shooting Range - Site Assessment and Closure Plan

Job Number: 132-15
Prepared By: TLR
Checked By: JCD/CMK
Date: September 26, 2016

Not a survey map

Projection: UTM Zone 13N
Datum: NAD83
Sources:
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Field Data-July 2016
USDA NAIP, 1 ft, 2016

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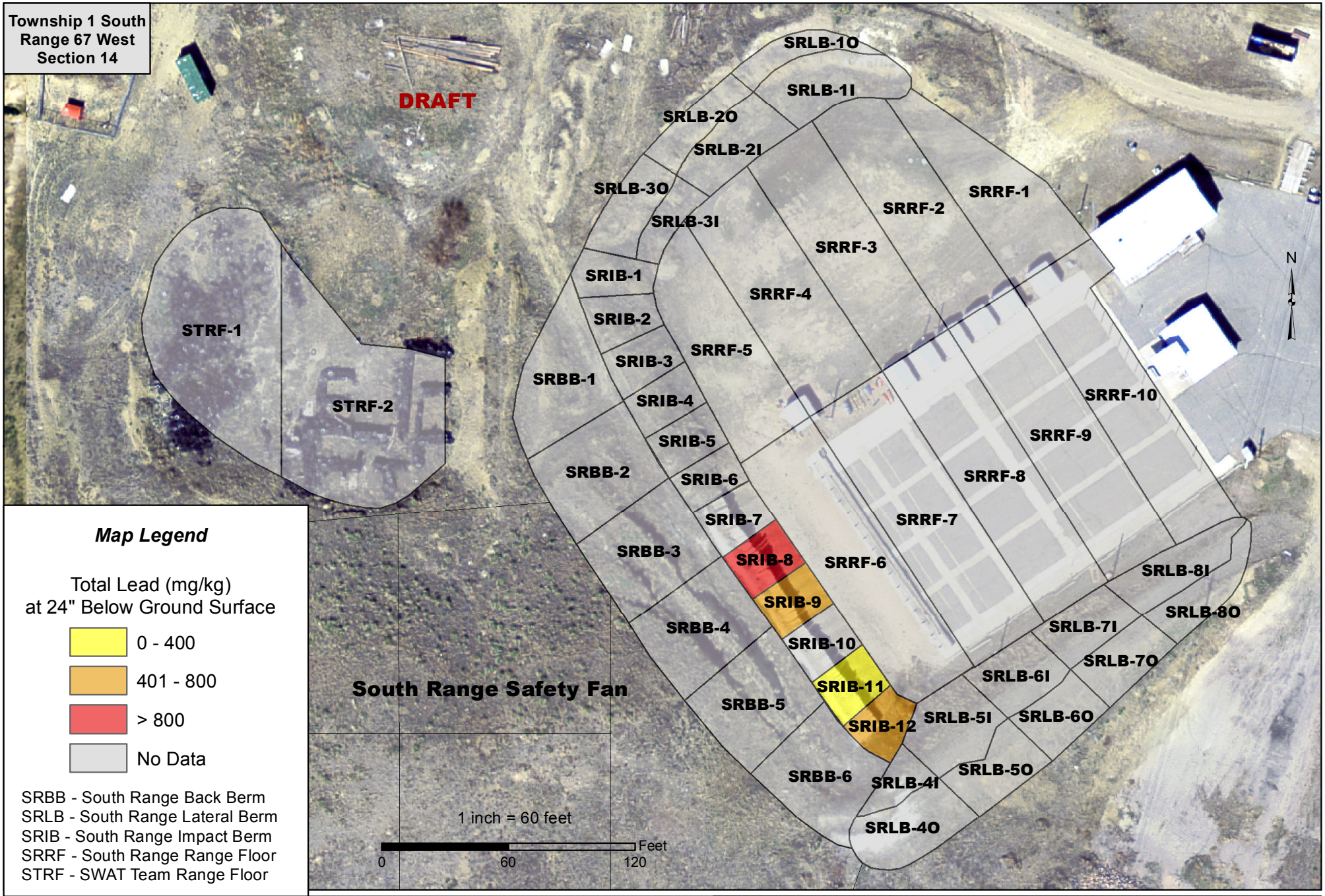

Figure 10A-8: South Shooting Range Soil Sample Total Lead Summary at 24" Below Ground Surface

Adams County Shooting Range - Site Assessment and Closure Plan

Job Number: 132-15
Prepared By: TLR
Checked By: JCD/CMK
Date: September 26, 2016

Not a survey map

Projection: UTM Zone 13N
Datum: NAD83
Sources:
Sampling Analysis Plan
Field Data-July 2016
USDA NAIP, 1 ft, 2016

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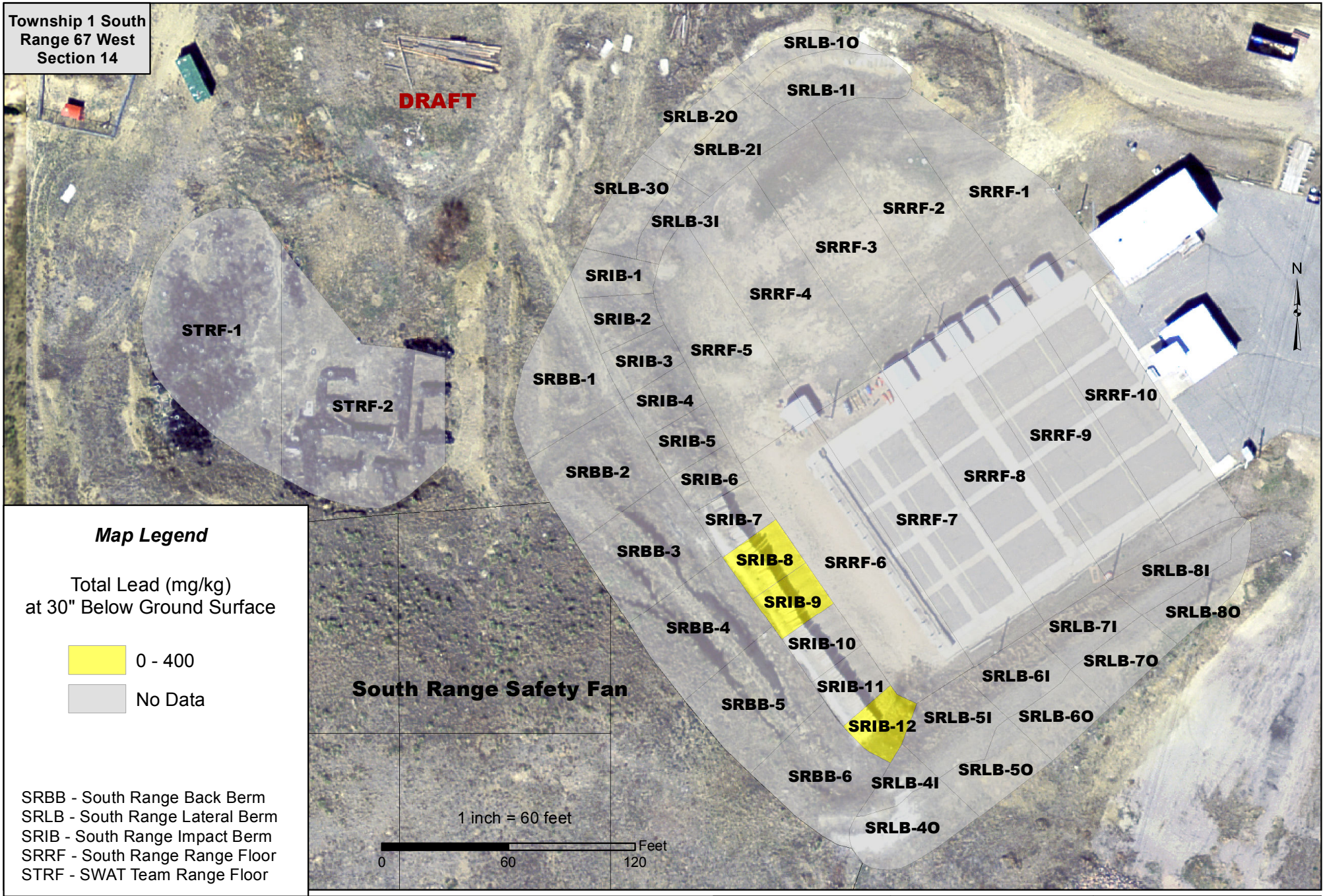

Figure 10A-9: South Shooting Range Soil Sample Total Lead Summary at 30" Below Ground Surface

Adams County Shooting Range - Site Assessment and Closure Plan

Job Number: 132-15
Prepared By: TLR
Checked By: JCD/CMK
Date: September 26, 2016

Not a survey map

Projection: UTM Zone 13N
Datum: NAD83
Sources:
Sampling Analysis Plan
Field Data-July 2016
USDA NAIP, 1 ft, 2016

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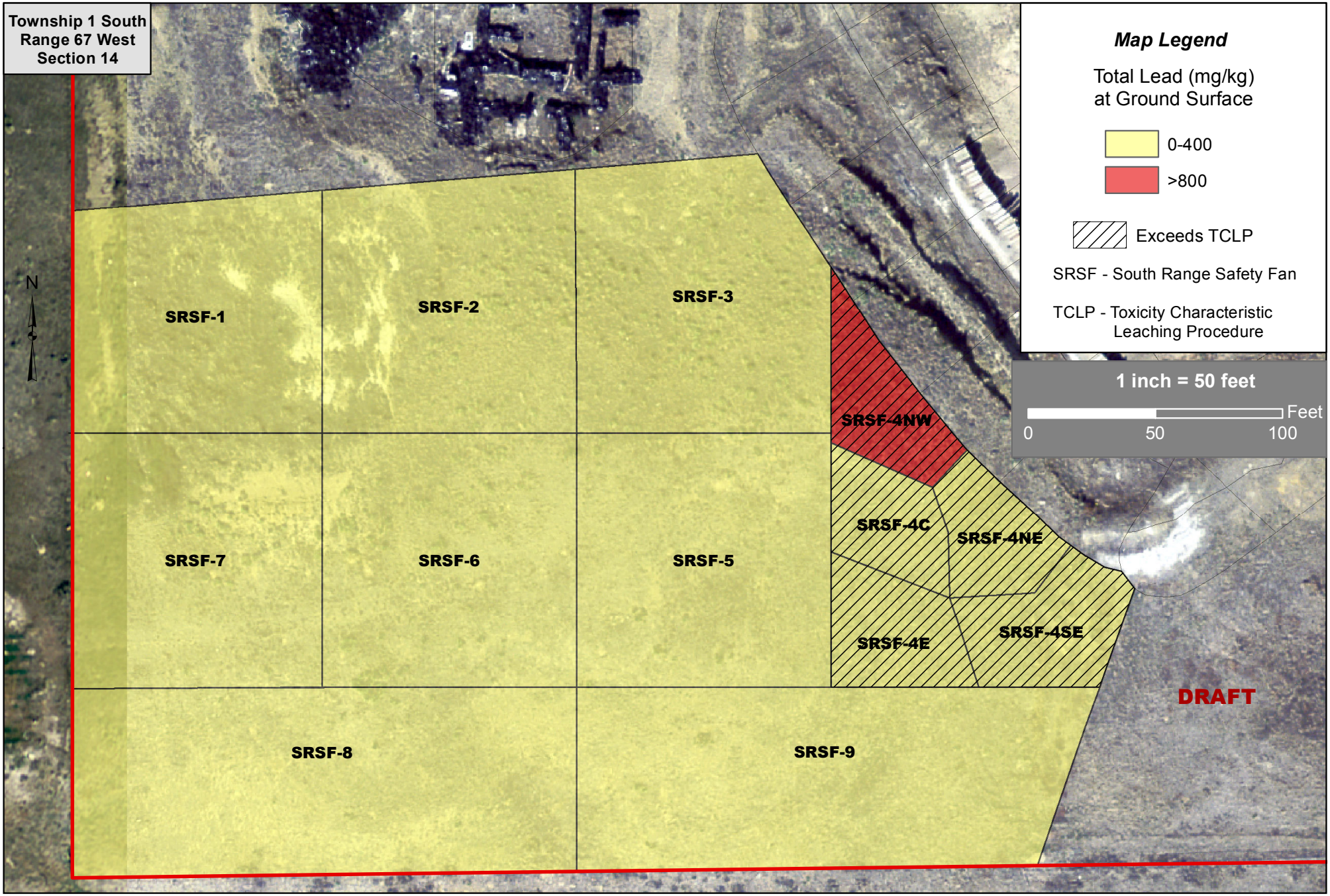

Figure 10B: South Shooting Range Safety Fan Soil Sample Total Lead and TCLP Summary at Ground Surface

Adams County Shooting Range - Site Assessment and Closure Plan

Job Number: 132-15
Prepared By: TLR
Checked By: JCD/CMK
Date: September 5, 2016

Not a survey map

Projection: UTM Zone 13N
Datum: NAD83
Sources:
Sampling Analysis Plan
Field Data-July 2016
USDA NAIP, 1 ft, 2016

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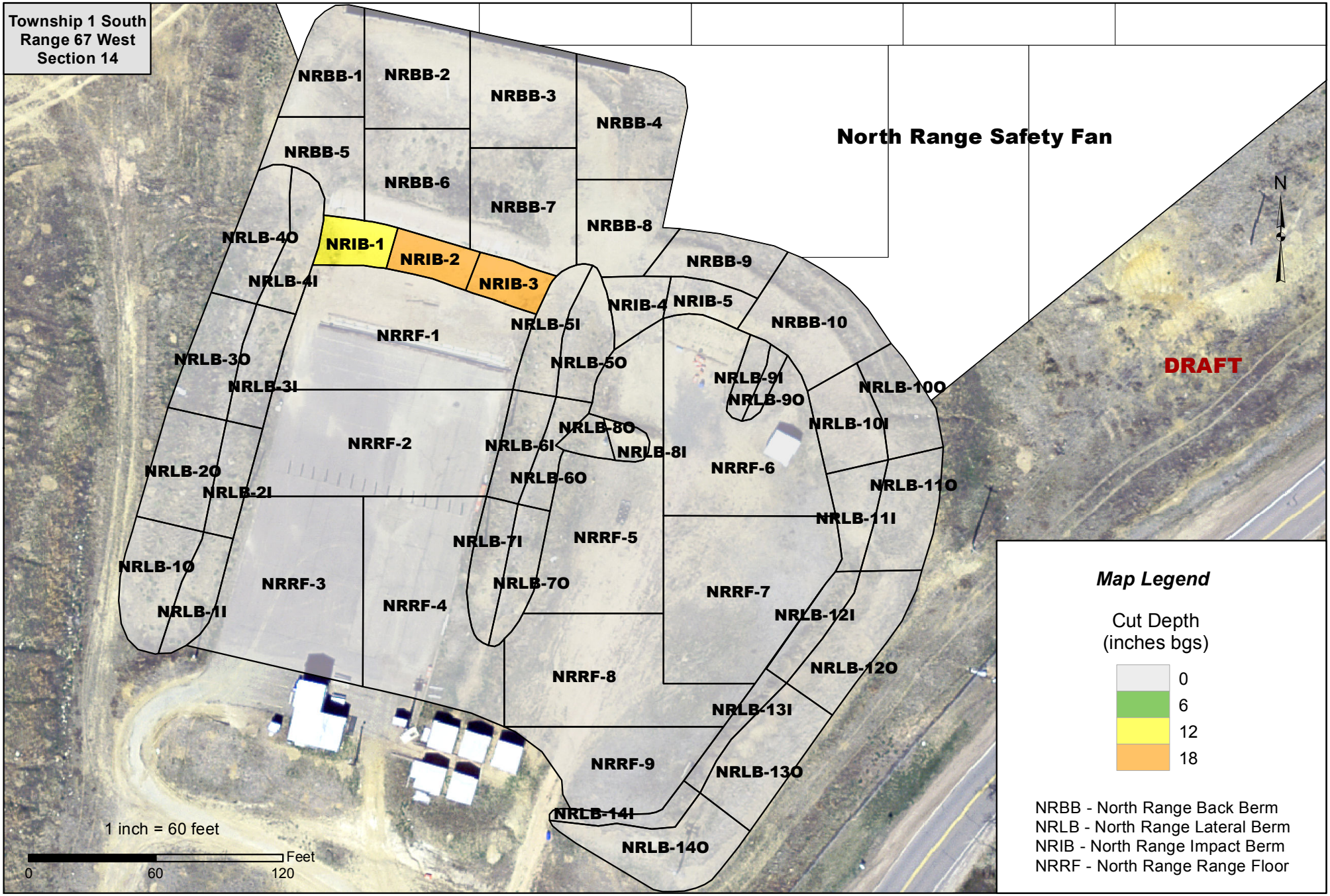

Figure 11: North Shooting Range Proposed Cut Depths

Adams County Shooting Range - Site Assessment and Closure Plan

Job Number: 132-15
Prepared By: TLR
Checked By: JCD
Date: October, 2016

Not a survey map

Projection: UTM Zone 13N
Datum: NAD83
Sources:
Sampling Analysis Plan
Field Data-July 2016
USDA NAIP, 2016

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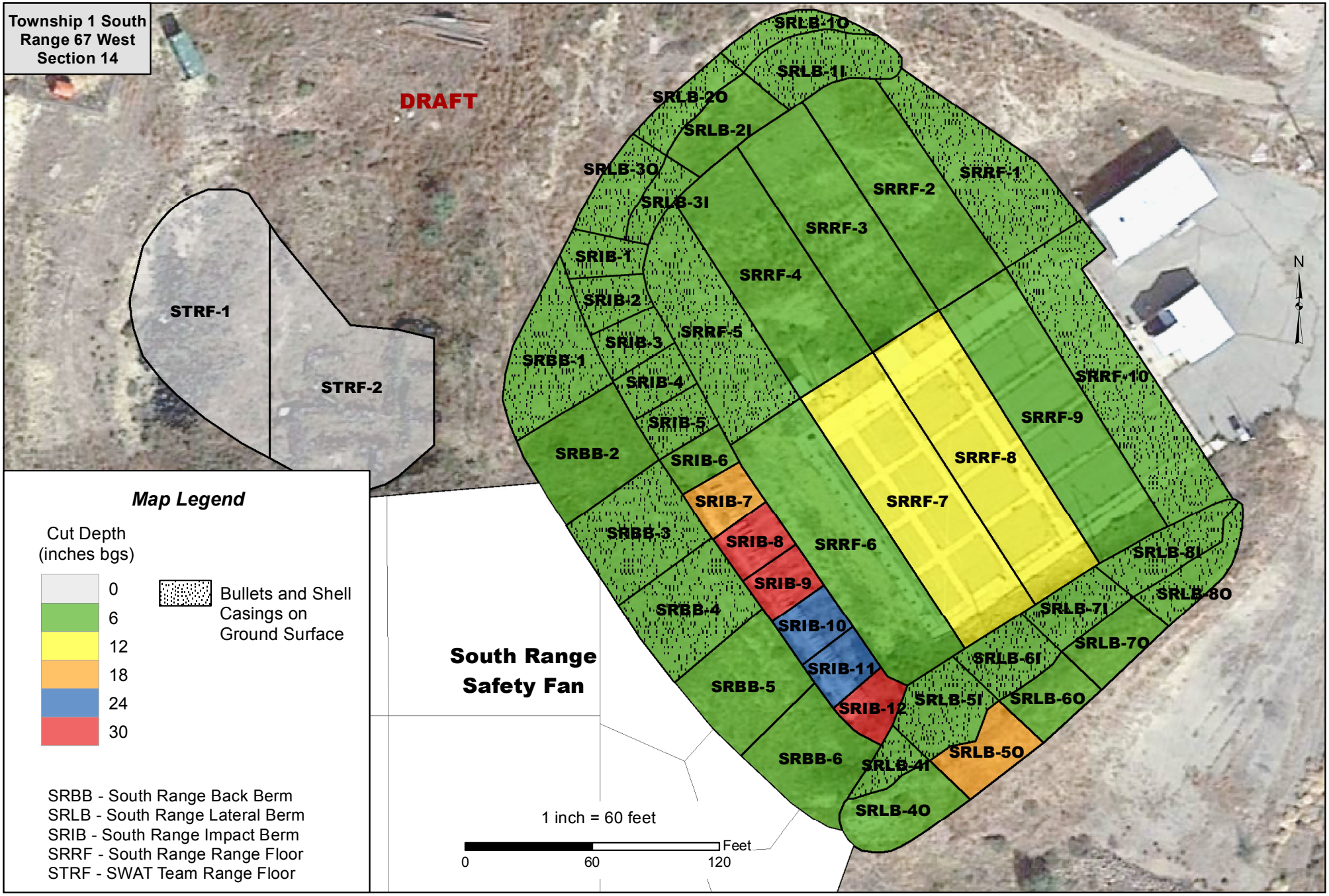

Figure 12A: South Shooting Range Proposed Cut Depths

Adams County Shooting Range - Site Assessment and Closure Plan

Job Number: 132-15
Prepared By: TLR
Checked By: JCD
Date: October, 2016

Not a survey map

Projection: UTM Zone 13N
Datum: NAD83
Sources:
Sampling Analysis Plan
Field Data-July 2016
USDA NAIP, 2016

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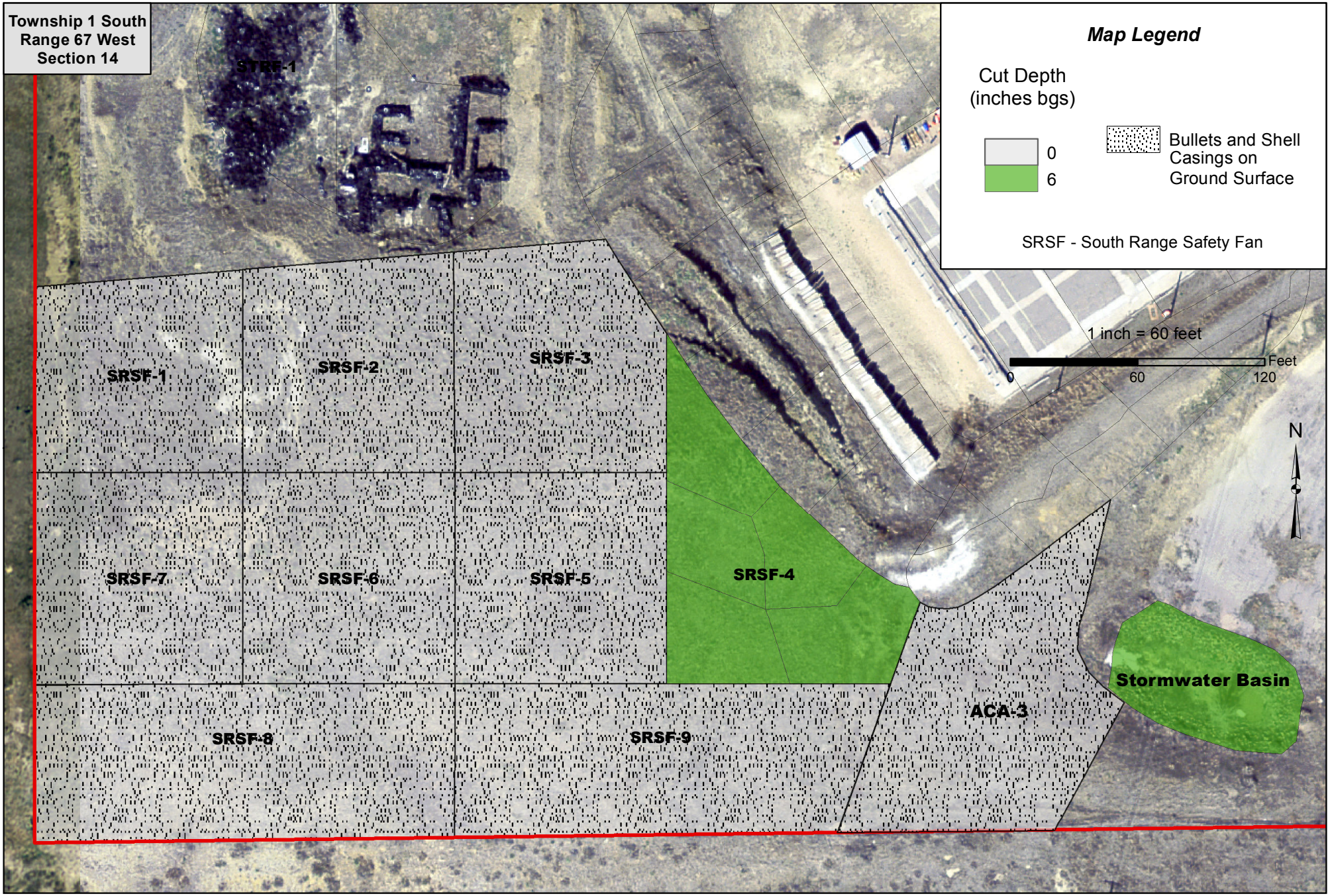

Figure 12B: South Shooting Range Safety Fan, ACA, and Stormwater Proposed Cuts

Adams County Shooting Range - Site Assessment and Closure Plan

Job Number: 132-15
Prepared By: TLR
Checked By: JCD
Date: September 28, 2016

Not a survey map

Projection: UTM Zone 13N
Datum: NAD83
Sources:
Sampling Analysis Plan
Field Data-July 2016; BLC, 2016
USDA NAIP, 1 ft, 2016

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Figure 13: Additional Characterization Areas (ACA) Proposed Cut Depths

Adams County Shooting Range - Site Assessment and Closure Plan

Job Number: 132-15
Prepared By: TLR
Checked By: JCD/CMK
Date: September 26, 2016

Not a survey map

Projection: UTM Zone 13N
Datum: NAD83
Sources:
Sampling Analysis Plan
Field Data-July 2016
USDA NAIP, 1 ft, 2016

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Tables

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Table 1
Adams County Shooting Range - Depth to Groundwater Measurments

Well/Piezo-meter No.	Date of Measurement	Depth to Water (feet below top of casing)	Top of Casing Elevation (feet MSL)	Water Table Elevation (feet MSL)
AC-MW1	7/18/2016	31.67	5068.78	5037.11
	7/21/2016	31.61		5037.17
	8/24/2016	31.27		5037.51
AC-MW2	7/18/2016	DRY	5073.14	DRY
	7/21/2016	DRY		DRY
	8/24/2016	DRY		DRY
AC-MW3	7/18/2016	DRY	5018.71	DRY
	7/21/2016	DRY		DRY
	8/24/2016	33.75		4984.96
AC-MW4	7/18/2016	21.3	5023.34	5002.04
	7/21/2016	20.73		5002.61
	8/24/2016	18.93		5004.41
AC-MW5	7/18/2016	13.25	5029.16	5015.91
	7/21/2016	NM		NM
	8/24/2016	14.93		5014.23
AC-P1	7/18/2016	DRY	5018.84	DRY
	7/21/2016	DRY		DRY
	8/24/2016	DRY		DRY
AC-P2	7/18/2016	18.67	5019.91	5001.24
	7/21/2016	18.9		5001.01
	8/24/2016	16.01		5003.9
AC-P3	7/18/2016	NM	5029.79	NM
	7/21/2016	NM		NM
	8/24/2016	11.09		5018.7
AC-P4	7/18/2016	10.4	5032.67	5022.27
	7/21/2016	10.42		5022.25
	8/24/2016	11.33		5021.34
AC-P5	7/18/2016	12.9	5023.58	5010.68
	7/21/2016	NM		NM
	8/24/2016	10.75		5012.83

Table 1
Adams County Shooting Range - Depth to Groundwater Measurments

Well/Piezo-meter No.	Date of Measurement	Depth to Water (feet below top of casing)	Top of Casing Elevation (feet MSL)	Water Table Elevation (feet MSL)
MW-HO5	7/18/2016	18.3	5018.6	5000.3
	7/21/2016	NM		NM
	8/24/2016	20.08		4998.52
GMP-1	8/24/2016	25.38	5066	5040.62
GMP-2	8/24/2016	DRY	5064.9	DRY
GMP-3	8/24/2016	DRY	5062.6	DRY
GMP-4	8/24/2016	28.5	5046.7	5018.2

Notes
MSL- Mean sea level
NM - Not measured

Table 2
Adams County Shooting Range - Groundwater Sample Detection Summary

		General Chemistry							Metals																		
Sample ID	**Constituent**	**Chloride[3]**	**Nitrate as N[2]**	**Nitrite as N[2]**	**Sulfate[3]**	**Alkalinity**	**Bicarbonate Alkalinity as CaCO3**	**Carbonate Alkalinity as CaCO3**	**Calcium**	**Magnesium**	**Potassium**	**Sodium**	**Antimony[2]**	**Arsenic[2]**	**Barium[2]**	**Beryllium[2]**	**Cadmium[2]**	**Chromium[2]**	**Cobalt[4]**	**Copper[3]**	**Lead[2]**	**Nickel[2]**	**Selenium[2]**	**Silver[2]**	**Thallium[2]**	**Vanadium[4]**	**Zinc[3]**
	Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
	Method	G.C.	G.C.	G.C.	G.C.	G.C.	G.C.	G.C.	6010B	6010B	6010B	6010B	6020A	6020A	6020A	6020A	6020A	6020A	6020A	6020A	6020A	6020A	6020A	6020A	6020A	6020A	6020A
	Colorado Groundwater Standard [1]	250	10	1	250	NS	NS	NS	NS	NS	NS	NS	6	10	2000	4	5	100	50	1000	50	100	50	50	2	100	5000
	Sample Date																										
AC-MW1	8/12/2016	**3300**	1.7 J	<2.5	**1700**	220	220	<5.0	860000	170000	19000	1800000	1.0 J	1.2 J	61	<5.0	<1.0	3.8	2.9	9.2	0.94 J	15	**92**	0.057 J	0.16 J	2.5 J	9.5 J
AC-MW2	DRY	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AC-MW3	9/26/2016	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10/7/2016	**290**	**13**	0.31 J	**2600**	250	250	<5.0	310000	25000	9900	1200000 B	1.4 J	1.7 J	41 ^	0.19 J	<1.0	0.77 J	0.67 J	15	0.21 J	29	**220**	<5.0	0.12 JB	3.9 J	7.6 JB
AC-MW4	8/12/2016	**640**	0.82	<2.5	**2300**	820	820	<5.0	620000	140000	8600	960000	<2.0	1.3 J	42	<1.0	<1.0	1.1 J	0.89 J	3.8	<1.0	13	1.4 J	0.054 J	0.065 J	5	4.5 J
AC-MW5	7/18/2016	190	5.8	<1.0	**3700**	320 B	320	<5.0	370000	85000	8900	1500000 B	0.92 J F1	0.79 J	56 F1	0.18 J	<1.0	3.8 F1	2.4 F1	2.6 F1	1.6	2.7 F1	31	0.057 J	0.073 J F1	11 F1	15 F1
AC-P4	8/12/2016	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-HO5	7/18/2016	**730**	0.32 J	<1.0	**4300**	840 B	840 B	<5.0	560000	120000	2500 J	1200000 B	0.88 J	0.8 J	45	<1.0	0.46 J	0.74 J	2	4.7	15	25	4.0 J	0.056 J	<1.0	1.6 J	9.7 J
AC-164204-081016 (Site Commercial Well)	8/10/2016	3.6	<0.50	<0.50	0.98 J	300 B	270	31	2300	230	1100 J	150000	<2.0	<5.0	23	<1.0	<1.0	10	1.3	18	1.8	6.9	<5.0	<5.0	<1.0	1.8 J	2.7 J
AC-SPRING	9/26/2016	**780**	<2.5	<2.5	**8900**	410 B	410 B	<5.0	450000	320000	5600	3900000	0.73 J	2.5 J	22	<1.0	<1.0	<2.0	1.1	3.5	0.4 J	6.6	2.8 J	0.062 J	<1.0	2.8 J	8.9 J

Notes:

Highlighted - Analyte detected above laboratory detection limit

BOLD - Analyte detected above regulatory limit

B - Compound was found in the laboratory blank and sample.

G.C. - General chemistry

J - Result is less than Reporting Limit but greater than or equal to the Minimum Detection Limit and the concentration is an approximate value.

^ - Instrument QC is outside acceptance limits

R - Results is unusable

UJ - The analyte was analyzed for but, was not detected

NS - No standard

NA - Not Analyzed

VOCs - Volatile Organic Compounds

ug/l - micrograms per liter

< - Indicates concentration shown is laboratory detection limit

1. Drinking Water Standard from the Water Quality Control Commission Regulation No. 41: The Basic Standards for Ground Water, Table A (June 30, 2016)
2. Drinking Water Standard from the Water Quality Control Commission Regulation No. 41: The Basic Standards for Ground Water, Table 1 - Domestic Water Supply - Human Health Standards (June 30, 2016)
3. Drinking Water Standard from the Water Quality Control Commission Regulation No. 41: The Basic Standards for Ground Water, Table 2 - Domestic Water Supply Well - Drinking Water Standards (June 30, 2016)
4. Drinking Water Standard from the Water Quality Control Commission Regulation No. 41: The Basic Standards for Ground Water, Table 3 - Agricultural Standards (June 30, 2016)

Table 2
Adams County Shooting Range - Groundwater Sample Detection Summary

Sample ID	Constituent	Volatile Organic Compounds												
		1,1-Dichloroethane	1,2-Dichloroethane	1,2-Dichloropropane	1,4-Dichlorobenzene	Acetone	Carbon disulfide	Chloroform	cis-1,2-Dichloroethene	Methylene Chloride	trans-1,2-Dichloroethene	Trichloroethene	Trichlorofluoromethane	Vinyl chloride
	Unit	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
	Method	8260B	8260B	8260B	8260B	8260B	8260B	8260B	8260B	8260B	8260B	8260B	8260B	8260B
	Colorado Groundwater Standard 1	NS	0.38 to 5	0.52 to 5	75	6300	NS	3.5	14 to 70	5.6 or 5	140	5	NS	0.023 to 2
	Sample Date													
AC-MW1	8/12/2016	0.9 J	<1.0	0.25 J	<1.0	11	<2.0	0.19 J	0.56 J	NA	<1.0	0.19 J	0.74 J	<1.0
AC-MW2	DRY	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AC-MW3	9/26/2016	<1.0	<1.0	<1.0	<1.0	10	<2.0	<1.0	<1.0	NA	<1.0	<1.0	<2.0	<1.0
	10/7/2016	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AC-MW4	8/12/2016	<1.0	<1.0	0.3 J	<1.0	13	<2.0	<1.0	8.8	NA	0.2 J	0.3 J	<2.0	**0.53 J**
AC-MW5	7/18/2016	<1.0 UJ	<1.0 UJ	<1.0 UJ	<1.0 UJ	2.4 J	<2.0 UJ	<1.0 UJ	<1.0 UJ	<2.0 UJ	<1.0 UJ	<1.0 UJ	<2.0 UJ	<1.0 UJ
AC-P4	8/12/2016	<1.0	<1.0	<1.0	<1.0	2.3 J	0.56 J	<1.0	<1.0	NA	<1.0	0.98 J	<2.0	<1.0
MW-HO5	7/18/2016	<1.0 UJ	0.2 J	0.58 J	0.33 J	<10 UJ	<2.0 UJ	<1.0 UJ	**20**	0.32 J B	0.36 J	0.2 J	<2.0 UJ	**1.3**
AC-164204-081016 (Site Commercial Well)	8/10/2016	<40 R	<40 R	<40 R	<40 R	<400 R	<80 R	<40 R	<40 R	<80 R	<40 R	<40 R	<80 R	<40 R
AC-SPRING	9/26/2016	<1.0	<1.0	<1.0	<1.0	9.4 J	<2.0	<1.0	<1.0	NA	<1.0	<1.0	<2.0	<1.0

Notes:

Highlighted - Analyte detected above laboratory detection limit

BOLD - Analyte exceeded regulatory limit

B - Compound was found in the laboratory blank and sample.

G.C. - General chemistry

J - Result is less than Reporting Limit but greater than or equal to the Minimum Detection Limit and the concentration is an approximate value.

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2. Drinking Water Standard from the Water Quality Control Commission Regulation No. 41: The Basic Standards for Ground Water, Table 1 - Domestic Water Supply - Human Health Standards (June 30, 2016)
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4. Drinking Water Standard from the Water Quality Control Commission Regulation No. 41: The Basic Standards for Ground Water, Table 3 - Agricultural Standards (June 30, 2016)

Table 3
Adams County Shooting Range - Sieve Data

Sample Location	Depth (inches)	Total Weight (grams)	Lead Weight (grams)	Percent Lead by Weight	Percent Lead by Volume	Estimated Volume of Lead in Lift (ft^3)	Estimated Weight of Lead in Lift (pounds)
SRBB-5	0-3	1068	38	4	0.46	NA	NA
SRLB-5O	0-3	827	122	**15**	2.14	5.85	4138
	3-6	663	34	5	0.67	1.83	1292
	6-9	846	80	9	1.29	3.53	2497
	9-12	660	16	2	0.31	NA	NA
SRIB-7	0-6	1934	718	**37**	7.30	27.19	19238
	6-12	1438	102	7	0.94	3.52	2487
	12-18	1311	20	2	0.19	NA	NA
SRIB-8	0-6	1666	579	**35**	6.59	24.74	17503
	6-12	1443	33	2	0.29	NA	NA
SRIB-9	0-6	1182	395	**33**	6.21	22.16	15680
	6-12	1400	115	8	1.11	3.95	2796
	12-18	1159	144	12	1.75	6.26	4432
	18-24	956	82	9	1.16	4.14	2931
	24-30	1030	0	0	0.00	NA	NA
SRIB-10	0-6	1670	724	**43**	9.46	34.60	24483
	6-12	636	9	1	0.18	NA	NA
SRIB-11	0-6	1532	363	**24**	3.84	13.95	9872
	6-12	485	85	**18**	2.63	9.55	6756
	12-18	1165	208	**18**	2.69	9.77	6910
	18-24	726	141	**19**	2.98	10.83	7663
	24-30	2067	0	0	0.00	NA	NA
SRIB-12	0-6	1042	130	12	1.76	6.01	4250
	6-12	1038	140	13	1.93	6.57	4648
	12-18	1100	26	2	0.30	NA	NA
SRRF-3	0-3	1109	69	6	0.82	8.95	6335
	3-6	NA	NA	NA	NA	NA	NA
NRIB-1	0-6	1860	413	**22**	3.53	13.37	9464
	6-12	1617	44	3	0.35	NA	NA
NRIB-2	0-6	2674	900	**34**	6.27	23.57	16676
	6-12	2718	418	**15**	2.25	8.44	5974
	12-18	1652	50	3	0.39	NA	NA
NRIB-3	0-6	2650	1346	**51**	12.76	45.74	32366
	6-12	1705	94	6	0.72	2.59	1830
	12-18	1764	81	5	0.60	NA	NA
Total						**297**	**210222**

Notes:

BOLD - Indicates percent lead by weight greater than or equal to 15 percent

NA - Value not calculated due to percent lead by weight below 15 percent

ft^3 - Cubic feet

Table 3
Adams County Shooting Range - Sieve Data

Assumptions:

1. Samples collected are representative of all soil in the area/lift
2. Density of lead (source: www.engineeringtoolbox.com/metal-alloys-densities-d_50.html)
   11340 kg/m3 708 lb/ft3 320,969 g/ft3
3. Density of Soil (source:www.engineeringtoolbox.com/earth-soil-weight-d_1349.html)
   75-100 lb/ft3 assume average 87.5 lb/ft3 39689 g/ft3

Equations:

$$Percent\ Lead\ by\ Weight = \frac{Weight\ of\ Lead\ in\ Sample\ (g)}{Weight\ of\ Sample\ (g)} x100$$

$$Percent\ Lead\ by\ Volume = \frac{Volume\ of\ Lead\ in\ Sample\ (ft^3)}{Volume\ of\ Sample\ (ft^3)} x100$$

$$Volume\ of\ Lead\ in\ Sample(ft^3) = Weight\ of\ Lead\ in\ Sample\ (g) x\ \frac{1\ ft^3\ of\ lead}{320{,}969\ g\ of\ lead}$$

$$Volume\ of\ Soil\ in\ Sample(ft^3) = (Weight\ of\ Sample\ (g) - Weight\ of\ Lead\ in\ Sample\ (g)) x \frac{1 ft^3 of\ soil}{39{,}689 g\ of\ soil}$$

$$Volume\ of\ Sample(ft^3) = Volume\ of\ Soil\ in\ Sample(ft^3)\ + \text{Volume of Lead in Sample}(ft^3)$$

$$Volume\ of\ Lead\ in\ Area\ Lift(ft^3) = Percent\ \text{Lead by Volume} * \text{Volume of Area}\ (ft^3)$$

$$Weight\ of\ Lead\ in\ Area\ Lift(lbs) = \text{Volumeof Lead in Lift Area}(ft^3) * \frac{708\ lbs\ of\ lead}{1 ft^3\ of\ lead}$$

Table 4
Adams County Shooting Range - Shooting Range Metals/TCLP Assessment Summary

Sample ID	Sample Date	Constituent	XRF Field Measurment	Total Metals (EPA 6010C)							Toxicity Characteristic Leaching Procedure (EPA 6010C)						
				Antimony	Arsenic[4]	Cadmium	Copper	Lead	Tin	Zinc	Zinc	Antimony	Arsenic	Cadmium	Copper	Lead	Tin
		Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		EPA Residential Soil RSL [1]		3.1E+01	6.8E-01	7.1E+01	3.1E+03	4.0E+02	4.7E+04	2.3E+04	NS	NS	NS	NS	NS	NS	NS
		EPA Industrial Soil RSL [1]		4.7E+02	3.0E+00	9.8E+02	4.7E+04	8.0E+02	7.0E+05	3.5E+05	NS	NS	NS	NS	NS	NS	NS
		CDPHE Groundwater Protection Level [2]	300[5]	NS	2.20E-01	1.10E-01	4.40E+00	1.10E+00	NS	NA	NS	NS	NS	NS	NS	NS	NS
		TCLP Limits[3]		NS	NS	NS	NS	NS	NS	NS	NS	NS	5.0	1.0	NS	5.0	NS
		Depth (inches)															
NORTH - BACK BERM																	
NRBB-1 (0)	7/19/2016	0-3	64.5	<1.4	3.8	0.22 J	17 B	32	1.1 J B	34							
NRBB-2 (0)	7/19/2016	0-3	60.8	0.57 J	3	0.33 J	17 B	74	1.2 J B	50							
NRBB-3 (0)	7/19/2016	0-3	46.8	0.6 J	3.2	0.32 J	17 B	240	1.4 J B	53							
NRBB-4 (0)	7/19/2016	0-3	25.3	<1.1	5	0.24 J	13 B	23	0.98 J B	46							
NRBB-5 (0)	7/19/2016	0-3	281	0.4	0.27 J	NA	0.11 J B*	36 B	<0.2	NA	0.024	0.4	0.27 J	<0.10	0.11 J B *	**36 B**	<0.20
NRBB-6 (0)	7/19/2016	0-3	107.7	<1.6	3.2	0.32 J	18 B	120	1.3 J B	48							
NRBB-7 (0)	7/19/2016	0-3	66.6	<1.5	2.7	0.32 J	15 B	34	1.3 J B	51							
NRBB-8 (0)	7/19/2016	0-3	30.3	<1.3	2.6	0.3 J	13 B	18	1.1 J B	52							
NRBB-9 (0)	7/19/2016	0-3	57.9	<1.2	3.6	0.25 J	31 B	55	2.4 J B	45							
NRBB-10 (0)	7/19/2016	0-3	67	<1.2	4.1	0.25 J	20 B	37	1.6 J B	45							
NORTH - IMPACT BERM																	
NRIB-1 (0)	7/25/2016	0-6	**6375**	**190**	**45**	1.0	450 B	**32000**	27 B	79							
NRIB-1 (0)	7/26/2016	0-6	NA	NA	NA	NA	NA	NA	NA	NA	0.83 J	3.0	0.44 J B	0.0076 J	1.7 J B	**710 B**	<0.2
NRIB-1 (6)	7/25/2016	6-12	263.4	**1900**	1.9 J	<2.0	13 B	**52000**	2.1 J B	9.8							
NRIB-2 (0)	7/25/2016	0-6	**6413**	**270**	**96**	0.61	810 B	**34000**	53 B	99	0.72 J	3.0	0.93 B	0.0048 J	2.6 B	**410 B**	<0.2
NRIB-2 (18)	7/25/2016	18-24	25.3	<1.6	4.2	0.092 J	12 B	28	1.6 J B	37							
NRIB-3 (0)	7/25/2016	0-6	**9496**	**240**	**350**	1.6	850 B	**30000**	17 B	130	1.1 J	2.4	.79 B	0.016 J	1.2 J B *	**450 B**	<0.2
NRIB-3 (18)	7/25/2016	18-24	187	1.8	4.4	0.21 J	28 B	310	1.6 J B	34							
NRIB-4 (0)	7/21/2016	0-6	28	<1.5	2.4	0.32 J	21 B	42	2.4 J B	54 B							
NRIB-5 (0)	7/21/2016	0-6	149	<1.4	3.8	0.25 J	43 B	57	3.6 J B	48 B							

Table 4
Adams County Shooting Range - Shooting Range Metals/TCLP Assessment Summary

Sample ID	Sample Date	Constituent	XRF Field Measurment	Total Metals (EPA 6010C)							Toxicity Characteristic Leaching Procedure (EPA 6010C)						
				Antimony	Arsenic[4]	Cadmium	Copper	Lead	Tin	Zinc	Zinc	Antimony	Arsenic	Cadmium	Copper	Lead	Tin
		Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		EPA Residential Soil RSL [1]		3.1E+01	6.8E-01	7.1E+01	3.1E+03	4.0E+02	4.7E+04	2.3E+04	NS	NS	NS	NS	NS	NS	NS
		EPA Industrial Soil RSL [1]		4.7E+02	3.0E+00	9.8E+02	4.7E+04	8.0E+02	7.0E+05	3.5E+05	NS	NS	NS	NS	NS	NS	NS
		CDPHE Groundwater Protection Level [2]	300[5]	NS	2.20E-01	1.10E-01	4.40E+00	1.10E+00	NS	NA	NS	NS	NS	NS	NS	NS	NS
		TCLP Limits[3]		NS	NS	NS	NS	NS	NS	NS	NS	NS	5.0	1.0	NS	5.0	NS
NORTH - LATERAL BERM																	
NRLB-1I (0)	7/19/2016	0-3	37.6	<1.2	3.9	0.19 J	9.2	14 B	1.1 J B	29							
NRLB-1O (0)	7/19/2016	0-3	428	<1.5	3.4	0.18 J	9.2	8.7 B	1.2 J B	31							
NRLB-2I (0)	7/19/2016	0-3	42.7	<1.2	3.4	0.24 J	11	38 B	1.2 J B	35							
NRLB-2O (0)	7/19/2016	0-3	20	<1.3	3.8	0.19 J	9	10 B	1.2 J B	30							
NRLB-3I (0)	7/19/2016	0-3	1.5	<1.4	4.1	0.25 J	14	58 B	1.3 J B	40							
NRLB-3O (0)	7/19/2016	0-3	27	<1.4	7.4	0.15 J	8	14 B	1.2 J B	27							
NRLB-4I (0)	7/19/2016	0-3	63.9	<1.5	4.7	0.21 J	16	100 B	1.6 J B	45							
NRLB-4O (0)	7/19/2016	0-3	231	1.4 J F1 F2	4 F2	0.14 J F2	76 F1 B	**480 F2**	1.7 J F1 F2 B	54							
NRLB-5I (0)	7/19/2016	0-3	34	0.4 J	3	0.34 J	21 B	38	1.1 J B	56							
NRLB-5O (0)	7/21/2016	0-3	**644**	1.4	3.2	0.27 J	66 B	290	4.3 J B	38 B							
NRLB-5O (3)	7/21/2016	3-6	65	<1.4	2.8	0.17 J	15 B	35	1.6 J B	41							
NRLB-6I (0)	7/19/2016	0-3	112	0.88 J	4.2	0.18 J	17 B	86	1.3 J B	44							
NRLB-6O (0)	7/21/2016	0-3	45	<1.4	2.7	0.16 J	12 B	12	1.4 J B	35 B							
NRLB-7I (0)	7/19/2016	0-3	74.1	0.81 J	25	0.26 J	14 B	60	1.3 J B	49							
NRLB-7O (0)	7/21/2016	0-3	18	<1.5	2.8	0.17 J	9.2 B	7.6	1.3 J B	31 B							
NRLB-8I (0)	7/21/2016	0-3	20	<1.4	3.8	0.23 J	17 B	14	1.8 J B	51 B							
NRLB-8O (0)	7/21/2016	0-3	51	<1.5	3.1	0.27 J	19 B	33	1.8 J B	46 B							
NRLB-9I (0)	7/21/2016	0-3	58	0.37 J	4.2	0.37 J	3400 B	45	260 B	69 B							
NRLB-9O (0)	7/21/2016	0-3	55	<1.5	4.9	0.28 J	16 B	18	1.6 J B	54							
NRLB-10I (0)	7/21/2016	0-3	42.9	<1.3	4.1	0.32 J	19 B	24	1.5 J B	55							
NRLB-10O (0)	7/21/2016	0-3	38	<1.4	3.8	0.25 J	14 B	13	1.4 J B	47 B							
NRLB-11I (0)	7/21/2016	0-3	16.8	<1.3	2.5	0.22 J	17 B	11	1.5 J B	51							
NRLB-11O (0)	7/21/2016	0-3	9	<1.4	2.9	0.25 J	18 B	13	1.5 J B	51 B							
NRLB-12I (0)	7/21/2016	0-3	23.9	<1.5	5.2	0.31 J	20 B	33	1.9 J B	63							
NRLB-12O (0)	7/21/2016	0-3	35.8	<1.3	6.2	0.35 J	21 B	20	1.7 J B	66							
NRLB-13I (0)	7/21/2016	0-3	24.6	<1.4	5.3	0.35 J	19 B	17	1.5 J B	59							
NRLB-13O (0)	7/21/2016	0-3	24.3	<1.4	3.3	0.27 J	17 B	12	1.6 J B	52							
NRLB-14I (0)	7/21/2016	0-3	22.6	<1.4	5.2	0.33 J	19 B	17	1.3 J B	59							
NRLB-14O (0)	7/21/2016	0-3	17.9	<1.3	3.2	0.29 J	17 B	11	1.3 J B	50							
NORTH - RANGE FLOOR																	
NRRF-1 (0)	7/19/2016	0-3	131.5	0.72 J	1.4 J	0.11 J	28 B	81	1.5 J B	55							
NRRF-2 (0)	7/19/2016	0-3	29.9	0.3 J	1.1 J	0.083 J	38 B	14	0.95 J B	49							
NRRF-3 (0)	7/19/2016	0-3	23.9	<1.2	2	0.13 J	28 B	6.4	1.4 J B	65							
NRRF-4 (0)	7/19/2016	0-3	16.6	<1.4	3.2	0.12 J	10 B	10	1.2 J B	39							
NRRF-5 (0)	7/21/2016	0-3	41	0.44 J	6	0.36 J	24 B	29	1.8 J B	65							
NRRF-6 (0)	7/21/2016	0-3	43.5	<1.3	3.8	0.25 J	100 B	24	9.9 B	59							
NRRF-7 (0)	7/21/2016	0-3	99.4	<1.3	5.1	0.4 J	26 B	68	1.7 J B	76							
NRRF-9 (0)	7/21/2016	0-3	28.2	<1.5	4.9	0.28 J	16 B	18	1.6 J B	54							

Table 4
Adams County Shooting Range - Shooting Range Metals/TCLP Assessment Summary

Sample ID	Sample Date	Constituent	XRF Field Measurment	Total Metals (EPA 6010C)							Toxicity Characteristic Leaching Procedure (EPA 6010C)						
				Antimony	Arsenic[4]	Cadmium	Copper	Lead	Tin	Zinc	Zinc	Antimony	Arsenic	Cadmium	Copper	Lead	Tin
		Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		EPA Residential Soil RSL [1]		3.1E+01	6.8E-01	7.1E+01	3.1E+03	4.0E+02	4.7E+04	2.3E+04	NS	NS	NS	NS	NS	NS	NS
		EPA Industrial Soil RSL [1]		4.7E+02	3.0E+00	9.8E+02	4.7E+04	8.0E+02	7.0E+05	3.5E+05	NS	NS	NS	NS	NS	NS	NS
		CDPHE Groundwater Protection Level [2]	300[5]	NS	2.20E-01	1.10E-01	4.40E+00	1.10E+00	NS	NA	NS	NS	NS	NS	NS	NS	NS
		TCLP Limits[3]		NS	NS	NS	NS	NS	NS	NS	NS	NS	5.0	1.0	NS	5.0	NS
NORTH - SAFETY FAN																	
NRSF-1	7/22/2016	0-3	33.7	<1.5	3.9	0.35 J B	15	20 B	1.1 J	51 B							
NRSF-2	7/26/2016	0-3	31	<1.2	2.6	0.26 J	11	14	1.4 J B	34							
NRSF-3	7/26/2016	0-3	33.5	<1.4	3.2	0.31 J	18	22	1.6 J B	55							
NRSF-4	7/26/2016	0-3	31.7	<1.2	4.4	0.2 J	11	22	1.4 J B	39							
NRSF-5	7/26/2016	0-3	16.7	<1.2	3.7	0.73	9.3	23	1.2 J B	92							
NRSF-6	7/26/2016	0-3	17.8	<1.3	7.9	0.38 J	9.8	14	1.4 J B	36							
NRSF-7	7/26/2016	0-3	31.9	<1.3	4.5	0.41 J	11	18	1.3 J B	40							
NRSF-8	7/25/2016	0-3	44	<1.2	4.2	0.51	11 B	25 B ^	1.0 J B	38							
NRSF-9	7/25/2016	0-3	44	<1.5	6.0	0.78	14 B	35 B ^	1.3 J B	51							
NRSF-10	7/26/2016	0-3	45.9	<1.3	6.7	0.63	12	27	1.4 J B	45							
NRSF-11	7/26/2016	0-3	12.8	<1.2	4.0	0.086 J	4.2	6.9	1.2 J B	20							
NRSF-12	7/26/2016	0-3	21.4	<1.2	2.5	0.19 J	5.8	11	1.2 J B	31							
NRSF-13	7/26/2016	0-3	45.5	<1.3	3.2	0.29 J	11	18	1.4 J B	50							
NRSF-14	7/22/2016	0-3	61.4	<1.5	4.2	0.5 J B	16	27 B	1.4 J	69 B							
NRSF-15	7/22/2016	0-3	21.7	<1.1	4.6	0.32 J B	14	21 B	0.99 J	51 B							
NRSF-16	7/22/2016	0-3	57.1	<1.3	4.2	0.35 J B	18	42 B	1.1 J	54 B							
NRSF-17	7/22/2016	0-3	23.6	<1.5	4.00	0.34 J B	15	26 B	1.2 J	50 B							
NRSF-18	7/22/2016	0-3	30.5	<1.2	3.4	0.36 J B	17	18 B	1.4 J	48 B							
NRSF-19	7/22/2016	0-3	18.4	<1.1	3.8	0.26 J B	10	13 B	0.76 J	32 B							
NRSF-20	7/22/2016	0-3	26.5	<6.4	6.8 J	0.55 J	17	30 B	<43	55 B							
NRSF-21	7/25/2016	0-3	63	<1.3 F2	5.1	0.84	14 B F2	39	1.2 J B F1	47 F1 F2							
NRSF-22	7/25/2016	0-3	32	<1.3	3.5	0.46	14 B	36	1.1 J B	47							
NRSF-23	7/22/2016	0-3	34.8	<1.1	4.2	0.33 J B	13	29 B	0.88 J	43 B							
NRSF-24	7/22/2016	0-3	37.5	<1.3	4.3	0.26 J B	12	37 B ^	1.1 J	46							
SOUTH - BACK BERM																	
SRBB-1 (0)	7/20/2016	0-3	99	0.55 J	3.6	0.16 J	15	160 B	1.3 J B	35							
SRBB-2 (0)	7/20/2016	0-3	271	1.6	9.9	0.11 J	26	**470 B**	2.1 J B	33							
SRBB-3 (0)	7/20/2016	0-3	22	<1.2	4.2	0.14 J	12	13 B	0.88 J B	39							
SRBB-4 (0)	7/20/2016	0-3	59	<1.0	3	0.089 J	8.7	37 B	0.73 J B	24							
SRBB-5 (0)	7/20/2016	0-3	123	13	5.8	0.1 J	15	**980 B**	1.1 J B	30							
SRBB-6 (0)	7/20/2016	0-3	**552**	20	6.3	0.074 J	13	**2400 B**	13 B	18	<2	0.036 J	<0.5	<0.1	0.087 J B	**6.5 B**	<0.2
SRBB-6 (3)	7/20/2016	3-6	98	<1.1	3.7	0.081 J	9.6	87 B	0.9 J B	16							

Table 4
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Sample ID	Sample Date	Constituent	XRF Field Measurment	Total Metals (EPA 6010C)							Toxicity Characteristic Leaching Procedure (EPA 6010C)						
				Antimony	Arsenic[4]	Cadmium	Copper	Lead	Tin	Zinc	Zinc	Antimony	Arsenic	Cadmium	Copper	Lead	Tin
		Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		EPA Residential Soil RSL [1]		3.1E+01	6.8E-01	7.1E+01	3.1E+03	4.0E+02	4.7E+04	2.3E+04	NS	NS	NS	NS	NS	NS	NS
		EPA Industrial Soil RSL [1]		4.7E+02	3.0E+00	9.8E+02	4.7E+04	8.0E+02	7.0E+05	3.5E+05	NS	NS	NS	NS	NS	NS	NS
		CDPHE Groundwater Protection Level [2]	300[5]	NS	2.20E-01	1.10E-01	4.40E+00	1.10E+00	NS	NA	NS	NS	NS	NS	NS	NS	NS
		TCLP Limits[3]		NS	NS	NS	NS	NS	NS	NS	NS	NS	5.0	1.0	NS	5.0	NS
SOUTH - IMPACT BERM																	
SRIB-1 (0)	7/20/2016	0-6	172	0.69 J	2.9	0.14 J	11	120 B	1.8 J B	34							
SRIB-2 (0)	7/20/2016	0-6	80.5	1.9	2.9	0.2 J	14	270 B	3.2 J B	37							
SRIB-3 (0)	7/20/2016	0-6	408	0.89 J	3.2	0.15 J	14	180 B	1.9 J B	34							
SRIB-3 (6)	7/20/2016	6-12	82.3	0.77 J	3.7	0.23 J	19	150 B	1.8 J B	47							
SRIB-4 (0)	7/20/2016	0-6	296	1.1 J	3.4	0.2 J	23	340	2.4 J	41 ^							
SRIB-5 (0)	7/20/2016	0-6	109	<1.3	4.6	0.23 J	14	28	1.1 J	41 ^							
SRIB-6 (0)	7/20/2016	0-6	**327.6**	5.7	4.9	0.22 J	51	**1400**	3 J	43 ^							
SRIB-6 (3)	7/20/2016	3-6	136.3	**1100**	70	<0.44 L	83	**34000**	400	46 ^							
SRIB-7 (0)	7/25/2016	0-6	**5481**	**140**	36	0.32 J	820 B	**25000**	29 B	110	1.1 J	1.4	0.12 J B	0.0048 J	0.33 J B	**1100 B**	<0.2
SRIB-7 (12)	7/25/2016	12-18	114.9	2.3	2	0.075 J	110 B	**650 B ^**	2.4 J B	31							
SRIB-8 (0)	7/25/2016	0-6	**5522**	**1400**	**410 F2**	<0.41	740 B F2	**130000 ^ F2**	66 F2 F1 B	110	3.3	2.8	0.14 J B	0.0089 J	2.0 B	**1300 B**	<0.2
SRIB-8 (30)	7/25/2016	30-36	20.6	1.5	2.7	0.071 J	8.7 B	52 B ^	1.1 J B	27							
SRIB-9 (0)	7/25/2016	0-6	**13,131**	**100**	16	0.41	8300	**34000 ^**	40 B	820	2	2.2	0.13 J B	0.0081 J	1.2 J B *	**1200 B**	<0.2
SRIB-9 (30)	7/25/2016	30-36	67.3	<1.4	2.8	0.13 J	14 B	110 B ^	1.4 J B	32							
SRIB-10 (0)	7/25/2016	0-6	**11,410**	**450**	31	0.47	1900 B	**86000 ^**	80 B	190	2.1	2.2	.28 JB	0.011 J	.46 JB *	**1500 B**	<0.2
SRIB-10 (18)	7/25/2016	18-24	267	1.6	3.4	0.16 J	18 B	**980 B ^**	4.2 J B	40							
SRIB-11 (0)	7/25/2016	0-6	**9320**	**1300**	**130**	0.39 J	21000	**170000 ^**	320 B	100							
SRIB-11 (24)	7/25/2016	24-30	65	<1.6	3.5	0.15 J	12 B	40 B ^	1.4 J B	37							
SRIB-12 (0)	7/25/2016	0-6	**3566**	**90**	32	1.0	860 B	**18000 ^**	26 B	120	5.6	2.0	0.11 J B	0.014 J	1.8 J B	**790 B**	<0.2
SRIB-12 (30)	7/25/2016	30-36	21	1.4 J	4.5	0.19 J	24 B	180 B ^	1.5 J B	39							
SOUTH - LATERAL BERM																	
SRLB-1I (0)	7/20/2016	0-3	78.6	<1.1	5.2	0.16 J	49	80	1.1 J	42 ^							
SRLB-1O (0)	7/20/2016	0-3	33	<1.4	2.9	0.2 J	18	23 B	1.3 J B	54							
SRLB-2I (0)	7/20/2016	0-3	42	18	6.8	0.12 J	12	**940**	4.8 J	34 ^							
SRLB-2O (0)	7/20/2016	0-3	33	<1.2	3.8	0.21 J	17	20 B	1.3 J B	50							
SRLB-3I (0)	7/20/2016	0-3	8.2	<1.4	4.7	0.22	11	61	1.1	30							
SRLB-3O (0)	7/20/2016	0-3	214	0.62 J F2	3.7	0.32 J	15	150 F1	1.6 J	43 ^							
SRLB-4I (0)	7/20/2016	0-3	**410**	0.81 J	2.9	0.2 J	28	330	1.6 J	40 ^							
SRLB-4I (6)	7/20/2016	0-3	242	<1.6	3.7	0.17 J	20	100	1.3 J	44 ^							
SRLB-4O (0)	7/20/2016	0-3	20	<1.3	2.1	0.37 J	18	13	1.2 J	51 ^							
SRLB-4 ACA-3 (0-3)	8/17/2016	0-3	65	0.4 J	2.8	0.16 J	19	100	1.3 J B	39	0.031 J B	0.044 J	0.025 J	<0.1	0.027 J B	**7**	<0.2
SRLB-5I (0)	7/20/2016	0-3	101.1	0.4 J	2.8	0.36 J	31 B	110	1.6 J B	47 B							
SRLB-5O (0)	7/20/2016	0-3	**1295**	**40**	8.8	0.16 J	21	**4000**	25	42 ^	<2	0.31	0.053 J	0.0026 J	0.094 J B	**64 B**	<0.2
SRLB-5O (15)	7/20/2016	15-18	**698**	<1.1	2.9	0.37 J	18	21	1.1 J	43 ^							
SRLB-6I (0)	7/21/2016	0-3	39.5	<1.5	3.5	0.32 J	19 B	37	1.6 J B	42 B							
SRLB-6O (0)	7/20/2016	0-3	30	**58**	11	0.22 J	18	**5400**	5.8 J	39 ^							
SRLB-7I (0)	7/20/2016	0-3	71.5	<1.2	2.7	0.37 J	22	68	1.3 J	46 ^							
SRLB-7O (0)	7/20/2016	0-3	181	**73**	12	0.1 J	13	**4600**	43	29 ^							
SRLB-8I (0)	7/20/2016	0-3	82.8	<1.1	4.3	0.21 J	11	31	0.93 J	31 ^							
SRLB-8O (0)	7/20/2016	0-3	29	<1.2	3.4	0.19 J	10	16	1 J	31 ^							

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Sample ID	Sample Date	Constituent	XRF Field Measurment	Total Metals (EPA 6010C)							Toxicity Characteristic Leaching Procedure (EPA 6010C)						
				Antimony	Arsenic[4]	Cadmium	Copper	Lead	Tin	Zinc	Zinc	Antimony	Arsenic	Cadmium	Copper	Lead	Tin
		Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		EPA Residential Soil RSL [1]		3.1E+01	6.8E-01	7.1E+01	3.1E+03	4.0E+02	4.7E+04	2.3E+04	NS	NS	NS	NS	NS	NS	NS
		EPA Industrial Soil RSL [1]		4.7E+02	3.0E+00	9.8E+02	4.7E+04	8.0E+02	7.0E+05	3.5E+05	NS	NS	NS	NS	NS	NS	NS
		CDPHE Groundwater Protection Level [2]	300[5]	NS	2.20E-01	1.10E-01	4.40E+00	1.10E+00	NS	NA	NS	NS	NS	NS	NS	NS	NS
		TCLP Limits[3]		NS	NS	NS	NS	NS	NS	NS	NS	NS	5.0	1.0	NS	5.0	NS
SOUTH - RANGE FLOOR																	
SRRF-1 (0)	7/20/2016	0-3	29.3	<1.2	3.6	0.24 J	15	34 B	1.1 J B	41							
SRRF-2 (0)	7/20/2016	0-3	**786**	5.2	3.2	0.29 J	85	**1200 B**	3.4 J B	41	0.048	0.12 J	<0.5	0.0022 J	0.28 J B	**18 B F1**	<0.2
SRRF-2 (3)	7/20/2016	3-6	29.2	0.82 J	3.4	0.21 J	44	220	1.6 J	40^							
SRRF-3 (0)	7/21/2016	0-3	219.2	13	3.8	0.31 H	100 B	**2400**	6.4 J B	48							
SRRF-3 (3)	7/21/2016	3-6	141.7	3.3	2.6	0.29 J	37	**770 B**	2.1 J B	43							
SRRF-4 (0)	7/21/2016	0-3	**483**	30	7.5	0.24 J	40	**3900 B**	34 B	51							
SRRF-4 (3)	7/21/2016	3-6	95.4	<1.2	4.2	0.18 J	21	110 B	1.4 J B	39							
SRRF-5 (0)	7/21/2016	0-3	270	0.82 J	2.7	0.14 J	13	220 B	2 J B	29							
SRRF-6 (0)	7/21/2016	0-3	**3398**	9.2	5.2	0.43 J	160 B	**2200**	4.7 J B	55 B	0.25 J	0.27	<0.5	0.0076 J	0.84 J B	**13 B**	<0.2
SRRF-6 (6)	7/21/2016	6-9	144.5	0.55 J	1.9	0.053 J	18 B	58	2.2 J B	16 B							
SRRF-7 (0)	7/19/2016	0-3	1.01	**1800 F2**	**670 F2**	<1.0 L F2	95 B F1 F2	**55000 F2**	78 B F1 F2	55 F1 F2	NA	1.1	0.26 J	NA	0.73 J B	**300 B**	<0.2
SRRF-7 (6-9)	7/19/2016	6-9	89	24	8.9	0.14 J	34 B	**5800**	8.6 J B	41 B							
SRRF-8 (0)	7/22/2016	0-3	**1113**	26	8	0.15 J	47 B	**1800**	14 B	43 B							
SRRF-8 (6)	7/19/2016	6-9	209.1	4.8	**45**	0.14 J	33 B	**580**	4.1 J B	47							
SRRF-9 (0)	7/21/2016	0-3	**804**	7.4	**12**	0.26 J	46 B	**690**	4.2 J B	83							
SRRF-9 (6-9)	7/21/2016	6-9	218.3	0.89 J	**14**	0.23 J	19 B	150	1.8 J B	46 B	<2.0	<0.2	<0.5	<0.1	0.06 J B	0.31 J B	<0.2
SRRF-10 (0-3)	7/19/2016	0-3	**328**	3.1	**15**	0.28 J	21 B	350	3.0 J B	64 B							
SRRF-10 (3-6)	7/19/2016	3-6	292	4.3	**13**	0.24 J	30 B	350	2.9 JB	53							
SRRF-PAH	7/26/2016	0-3	NA	NA	NA	NA	NA	NA	NA	NA	0.29 J	0.16 J	0.041 J B	0.0076 J	1.1 J B	**20 B**	<0.2
SOUTH - SAFETY FAN																	
SRSF-1 (0)	7/22/2016	0-3	25	<1.4	4.9	0.24 J B	10	17 B	0.97 J	39 B							
SRSF-2 (0)	7/22/2016	0-3	169	<1.1	6.3	1.0 B	15	80 B	1.1 J	51 B							
SRSF-3 (0)	7/22/2016	0-3	**350**	<1.4	6.8	1.4 B	18	220 B ^	1.6 J	66	0.041 J	<0.2	<0.5	0.0061 J	0.1 J B	0.32 J B	<0.2
SRSF -3B (0)	7/22/2016	0-3	227.3	<1.2	7.6	1.4 B	21	220 B	1.4 J	61 B							
SRSF -3A (0)	7/22/2016	0-3	261	<1.5	7	1.7 B	18	160 B	1.4 J	69 B							
SRSF -3E (0)	7/22/2016	0-3	**310**	<1.3	5.7	1.6 B	19	260 B ^	1.4 J	66							
SRSF -3C (0)	7/22/2016	0-3	39.2	0.58 J F1 F2	6.3	1.4 B	20	340 F2 B ^	2 J F1	64 F1							
SRSF -3D (0)	7/22/2016	0-3	**335**	<1.1	6.5	0.43 B	11	72 B ^	0.93 J	33							
SRSF -3C (3)	7/22/2016	3-6	75	<1.5	9.3	0.48 J B	13	38 B ^	1.2 J	40							
SRSF -3E (3)	7/22/2016	3-6	143.3	<1.5	8.5	0.83 B	15	74 B ^	1.1 J	49							
SRSF-4 (0)	7/22/2016	0-3	**431**	<1.5	3.8	1.2 B	14	200 B ^	1.4 J	43	0.12 J	2	0.14 J	0.024 J	0.055 J B	**40 B**	<0.2
SRSF-4NW (0)	7/22/2016	0-3	178	**2600**	**68**	1.4 B	35	**150000 B**	200	55							
SRSF-4C (0)	7/22/2016	0-3	269	3.9	5.1	2.1 B	17	240 B ^	1.7 J	67							
SRSF-4NE (0)	7/22/2016	0-3	165	0.62 J	6.7	0.88 B	13	160 B ^	1.4 J	44							
SRSF-4SE (0)	7/22/2016	0-3	113	0.35 J	5.2	0.38 J B	13	120 B ^	1.2 J	38							
SRSF-5 (0)	7/22/2016	0-3	139	<1.1	5.6	1.4 B	14	140 B	1.1 J	140							
SRSF-6(0)	7/22/2016	0-3	105.1	<1.2	6.7	1.5 B	14	74 B	1.0 J	61							
SRSF-7(0)	7/22/2016	0-3	47.3	<1.1	5.9	0.99 B	12	48 B	0.79 J	49							
SRSF-8(0)	7/22/2016	0-3	137	<1.1 F2	5.9	1.3 B	13	56 B	0.91 J	52 B							
SRSF-9(0)	7/22/2016	0-3	140	<1.3	8.5	1.3 B	11	88 B	1.1 J	54 B							

Table 4
Adams County Shooting Range - Shooting Range Metals/TCLP Assessment Summary

Sample ID	Sample Date	Constituent	XRF Field Measurment	Total Metals (EPA 6010C)							Toxicity Characteristic Leaching Procedure (EPA 6010C)						
				Antimony	Arsenic[4]	Cadmium	Copper	Lead	Tin	Zinc	Zinc	Antimony	Arsenic	Cadmium	Copper	Lead	Tin
		Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		EPA Residential Soil RSL [1]		3.1E+01	6.8E-01	7.1E+01	3.1E+03	4.0E+02	4.7E+04	2.3E+04	NS	NS	NS	NS	NS	NS	NS
		EPA Industrial Soil RSL [1]		4.7E+02	3.0E+00	9.8E+02	4.7E+04	8.0E+02	7.0E+05	3.5E+05	NS	NS	NS	NS	NS	NS	NS
		CDPHE Groundwater Protection Level [2]	300[5]	NS	2.20E-01	1.10E-01	4.40E+00	1.10E+00	NS	NA	NS	NS	NS	NS	NS	NS	NS
		TCLP Limits[3]		NS	NS	NS	NS	NS	NS	NS	NS	NS	5.0	1.0	NS	5.0	NS
SOUTH - RANGE FLOOR SWAT																	
STRF-1 (0)	7/21/2016	0-3	17.8	1.3 J	4.8	0.57	14 B	43	1.4 J B	54							
STRF-2 (0)	7/22/2016	0-3	81.2	<1.4	5.4	0.71	16 B	52	1.3 J B	88							
ADDITIONAL CHARACTERIZATION AREAS																	
ACA-1 (0-3)	8/17/2016	0-3	**785**	25 F1 F2	9.7 F1	0.43 J	150	**3100 F2**	3.4 J B F1	58 F1	0.083 J B	0.19 J	0.066 J	<0.1	0.31 J B	0.21 J	<0.2
ACA-1 (3-6)	8/17/2016	3-6	**709**	3.5	3.6	0.47	52	370	2.3 J B	52							
ACA-2 (0-3)	8/17/2016	0-3	234	1.8	3.9	0.15 J	18	200	3.0 J B	40	0.026 J B	0.51	0.059 J	<0.1	0.028 J B	**60**	<0.2
ACA-3.2(0-3)	10/3/2016	0-3	NA	<1.1	7.0 F1	0.59	13 B	65 F1	1.3 J	40							

Notes:

Highlighted	- Analyte detected above laboratory detection limit
BOLD	- Analyte detected above a regulatory limit
F2:	- MS/MSD RPD exceeds control limits
B	- Compound was found in the blank and sample
F1	- MS and/or MSD Recovery is outside acceptance limits
^	- ICV, CCV, ICB, CCB, ISA, ISB, CRI, CRA, DLCK, or MRL standard: Instrument related QC is outside acceptance limits
J	- Result is less than the RL but greater than or eqaul to the MDL and the concentration is an approximate value
*	- LCS or LCSD is outside acceptance limits

mg/kg - Miligrams per kilgram
mg/L - Miligram per liter
< - Indicates concentration shown is laboratory reporting limit
1. EPA Regional Screening Level (RSL) (May 2016)
2. Colorado Department of Public Health and Environment (CDPHE) Hazardous Materials and Waste Management Division - Groundwater protection Value (March 2014)
3. Environmental Protection Agency TC Rule
4. Standard for arsenic based on CDPHE Arsenic Concentrations in Soil, Risk Management Guidance for Evaluating (July 2014), which sets a limit of 11 mg/kg if a release could not have occurred at a site, based on historical data and process knowledge. Arsenic concentrations bolded indicate exceedance of regulatory concentration are above 11 mg/kg.
5. XRF Field Screening Level

Table 5
Adams County Shooting Range - Groundwater Detections Permit # 258253

		Total Metals			Anions		
Sample ID	**Constituent**	**Barium[1]**	**Iron[2]**	**Lead[1]**	**Chloride[2]**	**Fluoride[1]**	**Sulfate[2]**
	Units	ug/l	ug/l	ug/l	mg/l	mg/l	mg/l
	Method	200.8	200.8	200.8	300.0	300.0	300.0
	Colorado Groundwater Standard	2000	300	50	250	4	250
	Sample Date						
258253-012316	1/23/16	24.7	25	1.5	85.4	1.5	**338**

Notes:

BOLD - Analyte detected above regulatory limit

ug/L - microgram per liter

mg/L - miligram per liter

1. Drinking Water Standard from the Water Quality Control Commission Regulation No. 41: The Basic Standards for Ground Water, Table 1 - Domestic Water Supply - Human Health Standards (June 30, 2016)

2. Drinking Water Standard from the Water Quality Control Commission Regulation No. 41: The Basic Standards for Ground Water, Table 2 - Domestic Water Supply Well - Drinking Water Standards (June 30, 2016)

Table 6
Adams County Shooting Range - Sediment Sample Detection Summary

Sample ID	LOCATION	Constituent	Methylene Chloride	Bis (2-ethylhexyl) phthalate	Endrin Ketone	Arsenic[3]	Barium	Cadmium	Chromium[4]	Lead	Selenium	Copper	Tin	Zinc	Antimony	Mercury
		Unit	µg/kg	µg/kg	µg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/kg
		Method	8260B	8270C	8081B	6010C	6010C	6010C	6010C	6010C	6010C	6010C	6010C	6010C	6010C	7471B
		EPA Residential RSL[1]	5.7E+04	3.9E+04	NS	0.68	1.5E+04	71	1.2E+05	400	390	3.1E+03	4.7E+04	2.3E+04	31	1.1E+04
		EPA Industrial RSL[1]	1.0E+06	1.6E+05	NS	3.00	2.2E+05	980	1.8E+06	800	5800	4.7E+04	7.0E+05	3.5E+05	470	4.6E+04
		CSEV GW Protection[2]	60	1.0E+06	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		Sample Date														
AC-SED-01-0.005	CULVERT INLET	8/11/2016	3.9 JB	48 J	0.74 Jp	**6.3** F2	150 B	1.7 F2	13 B	28	1 J F2	NA	NA	NA	NA	22 F2
AC-SED-02-0.005	CULVERT OUTLET	8/11/2016	7.7 B	<47	<0.49	**6.1**	130 B	0.46	10 B	25	<0.69	NA	NA	NA	NA	24
AC-SED-03-0.005	NORTH END EAST DRAINAGE	8/11/2016	8.5 B	<49	<0.52	**8.9**	120 B	0.39 J	13 B	38	<0.76	NA	NA	NA	NA	41
AC-SED-04-0.005	CENTRAL EAST DRAINAGE	8/11/2016	NA	NA	NA	**4.4**	NA	0.31 J	NA	140	NA	24	1.4 J	82 B	<0.27	NA
AC-SED-05-0.005	SOUTH END EAST DRAINAGE	8/11/2016	NA	NA	NA	**6.3**	NA	0.34 J	NA	350	NA	33	2.9 J	91 B	<0.37	NA
AC-SED-06-0.005	BASIN WEST	8/11/2016	NA	NA	NA	**2.4**	NA	0.29 J	NA	**670**	NA	76	2.1 J	140 B	2.7	NA
AC-SED-07-0.005	BASIN EAST	8/11/2016	NA	NA	NA	**8.4**	NA	1.0	NA	**6200**	NA	420	11	130 B	21	NA

Notes

Highlighted - Analyte detected above laboratory detection limit

BOLD - Analyte detected above regulatory limit

NA - Not Analyzed

NS - No standard

Pending - No current CSEV GW Protection value

mg/kg - miligram per kilogram

ug/kg - micrograms per kilogram

< - Indicates concentration shown is laboratory detection limit

J - Results less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

B - Compound was found in the blank and sample

p - The relative percent difference (%RPD) between the primary and confirmation column/detectr is >40%. The lower value has been reported.

F2 - MS/MSD RPD exceeds the control limits.

1. EPA Regional Screening Level (May 2016)
2. CDPHE Hazardous Materials and Waste Management Division, Colorado Soil Evaluation Tables (July 2011)
3. CDPHE Arsenic Concentrations in Soil, Risk Management Guidance for Evaluating (July 2014) sets a limit of 11 mg/kg if a release could not have occurred at a site, based on historical data and process knowledge.
4. EPA Trivalent Chormium (Chromium (III)) RSL (May 2016)

Table 7
Adams County Shooting Range - Soil Vapor Sample Summary

Sample ID	Constituent	Methane	Hydrogen Sulfide	Vinyl Chloride	1,1-Dichloroethene	Methylene Chloride	1,1-Dichloroethane	Chloroform	1,2-Dichloroethane	1,1,1-Trichloroethane	Benzene	Carbon Tetrachloride	1,2-Dichloropropane	Trichloroethene	1,1,2-Trichloroethane	Toluene	Tetrachloroethene	Chlorobenzene	Ethylbenzene	m,p-Xylene	Styrene	o-Xylene	1,1,2,2-Tetrachloroethane	1,4-Dichlorobenzene	1,2-Dichlorobenzene
	Unit	**ppmV**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**
	Method	TO-3	ASTM 5504	TO-15	TO-15	TO-15	TO-15	TO-15	TO-15	TO-15	TO-15	TO-15	TO-15	TO-15	TO-15	TO-15	TO-15	TO-15	TO-15	TO-15	TO-15	TO-15	TO-15	TO-15	TO-15
	EPA Residential RSL[1]	NS	2.10	0.17	210	100	1.80	0.12	0.11	5200	0.36	0.47	0.28	0.48	0.18	5200	11	52	1.10	100	1000	100	0.048	0.3	210
	Sample Date																								
AC-GMP-2	8/24/2016	140000	<11	**320**	<10	<10	<10	<10	<10	<10	**76**	<10	<10	**32**	<10	52	<10	<10	**32**	54	<10	24	<10	<10	<10
AC-GMP-4	8/24/2016	190	<11	<2	<2	<2	<2	<2	<2	<2	**4.7**	<2	<2	2.80	<2	35	<2	<2	**19**	75	<2	30	<2	<2	<2
AC-P2	8/24/2016	61	<11	<2	<2	<2	4.5	**2.90**	<2	<2	**3.3**	<2	<2	**8.7**	<2	33	**110**	<2	**20**	82	<2	32	<2	<2	<2

Notes

Highlighted cells - Concentration above the laboratory detection limit

BOLD - Concentration exceeds regulatory limit

NS - No standard

ppmV - Parts per million volume

ug/m^3 - micrograms per cubic meter

< - Indicates concentration shown is laboratory detection limit

1. EPA Residential Air Regional Screening Level (May 2016)

Table 8
Adams County Shooting Range - Sludge Sample Detection Summary

Sample ID	Constituent	2-Butanone (MEK)	Chloroform	trans-1,2-Dichloroethene	Methylene Chloride	Trichloroethene	Tetrachloroethene	Phenanthrene	Anthracene	Acenaphthene	Acenaphthylene	Fluorene	Pyrene	2-Methylnaphthalene	Naphthalene	Aluminium	Arsenic	Barium	Cadmium
	Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
	Method	8260B	8260B	8260B	8260B	8260B	8260B	8270C	8270C	8270C	8270C	8270C	8270C	8270C	8270C	6010C	6010C	6010C	6010C
	EPA Residential RSL[1]	2.70E+04	3.20E-01	1.60E+03	5.70E+01	9.40E-01	2.40E+01	NS	1.80E+04	3.60E+03	NS	2.40E+03	1.80E+03	2.40E+02	3.80E+00	7.70E+04	6.80E-01	1.50E+04	NS
	EPA Industrial RSL[1]	1.90E+05	1.40E+00	2.30E+04	1.00E+03	6.00E+00	1.00E+02	NS	2.50E+05	4.50E+04	NS	3.00E+04	2.30E+04	3.00E+03	1.70E+01	1.10E+06	3.00E+00	2.20E+05	NS
	CSEV GW Protection[2]	1.80E+01	8.50E-02	5.40E+00	1.00E+03	6.80E-01	1.9 6.35	NS	1.00E+03	1.00E+03	NS	1.00E+03	1.00E+03	7.40E+00	2.30E+01	NS	NS	NS	NS
	Sample Date																		
AC-SB-45-51	8/11/2016	0.017 J	0.00056 J	0.001 J	0.0036 JB	0.0034 J	0.0033 J	0.0067 J	0.0012 J	0.0031 J	0.0035 J	0.0014 J	0.0019 J	0.017	0.047	14000 B	**4.8**	190 B	0.5 J
AC-SB-46 (4-8)	8/11/2016	<0.03	<0.015	<0.0038	0.0025 JB	<0.0076	<0.0076	NA	NA	NA	NA	NA	NA	NA	NA	22000 B	**5.3**	270 B	0.23 J
AC-SB-47 (4-8)	8/11/2016	NA	NA	NA	NA	NA	NA	0.0035 J	<0.0086	0.00094 J	0.0012 J	<0.0086	<0.0086	0.0044 J	0.02	NA	NA	NA	NA

Notes

Highlighted - Analyte detected above laboratory detection limit

BOLD - Concentration exceeds regulatory limit

NA - Not Analyzed

NS - No standard

Pending - No current CSEV GW Protection value

mg/kg - miligram per kilogram

ug/kg - micrograms per kilogram

< - Indicates concentration shown is the laboratory detection limit

J - Results less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

B - Compound was found in the blank and sample

p - The relative percent difference (%RPD) between the primary and confirmation column/detectr is >40%. The lower value has been reported.

F1 - MS and/or MSD Recovery is outside acceptance limits.

F2 - MS/MSD RPD exceeds the control limits.

1. EPA Regional Screening Level (May 2016)

2. CDPHE Hazardous Materials and Waste Management Division, Colorado Soil Evaluation Tables (July 2011)

3. CDPHE Arsenic Concentrations in Soil, Risk Management Guidance for Evaluating (July 2014) sets a limit of 11 mg/kg if a release could not have occurred at a site, based on historical data and process knowledge.

4. EPA Trivalent Chormium (Chromium (III)) RSL (May 2016)

Table 8
Adams County Shooting Range - Sludge Sample Detection Summary

Sample ID	Constituent	Chromium [4]	Lead	Selenium	Mercury	Flashpoint	Cyanide, Total	Free Liquid	pH ajd. To 25 deg C
	Unit	mg/kg	mg/kg	mg/kg	mg/kg	Degrees F	mg/kg	mg/L	SU
	Method	6010C	6010C	6010C	7471B	1020A	9012B	9095A	9045D
	EPA Residential RSL[1]	1.20E+05	4.00E+02	3.90E+02	1.10E+01	NS	2.30E+01	NS	NS
	EPA Industrial RSL[1]	1.80E+06	8.00E+02	5.80E+03	4.60E+01	NS	1.50E+02	NS	NS
	CSEV GW Proteciton[2]	NS	NS	NS	NS	NS	NS	NS	NS
	Sample Date								
AC-SB-45-51	8/11/2016	18 F1	12	3.4 J	0.018 J	>211	<0.83	YES	8.4
AC-SB-46 (4-8)	8/11/2016	16	12	<4.1	0.024 J	NA	NA	NA	NA
AC-SB-47 (4-8)	8/11/2016	NA	NA	NA	NA	>211	0.49 JB	NO	8.7

Notes

Highlighted - Analyte detected above laboratory detection limit

BOLD - Concentration exceeds regulatory limit

NA - Not Analyzed

NS - No standard

Pending - No current CSEV GW Protection value

mg/kg - miligram per kilogram

ug/kg - micrograms per kilogram

< - Indicates concentration shown is the laboratory detection limit

J - Results less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

B - Compound was found in the blank and sample

p - The relative percent difference (%RPD) between the primary and confirmation column/detectr is >40%. The lower value has been reported.

F1 - MS and/or MSD Recovery is outside acceptance limits.

F2 - MS/MSD RPD exceeds the control limits.

1. EPA Regional Screening Level (May 2016)
2. CDPHE Hazardous Materials and Waste Management Division, Colorado Soil Evaluation Tables (July 2011)
3. CDPHE Arsenic Concentrations in Soil, Risk Management Guidance for Evaluating (July 2014) sets a limit of 11 mg/kg if a release could not have occurred at a site, based on historical data and process knowledge.
4. EPA Trivalent Chormium (Chromium (III)) RSL (May 2016)

Table 9A

Adams County Shooting Range - Shooting Range Soil Relative Percent Difference Summary

Analyte	Unit	Sample ID	Sample Duplicate	RPD (%)
		NRLB-5I (0)	DUPE-1	
Antimony	mg/kg	0.4 J	< 1.1	NA
Arsenic	mg/kg	3	2.8	6.9
Cadmium	mg/kg	0.34 J	0.39 J	NA
Copper	mg/kg	21 B	21 B	0.0
Lead	mg/kg	38	110 J	97.3
Tin	mg/kg	1.1 J B	1.2 J B	NA
Zinc	mg/kg	56 59	59	5.2
		SRLB-6O (0)	DUPE-3	
Antimony	mg/kg	58	< 1.1 J	192.6
Arsenic	mg/kg	11	3.6 J	101.4
Cadmium	mg/kg	0.22 J	0.39	55.7
Copper	mg/kg	18	20	10.5
Lead	mg/kg	5400	29 J	197.9
Tin	mg/kg	5.8 J	1.1 J	NA
Zinc	mg/kg	39 ^	44 ^	12.0
		SRRF-2 (0)	DUPE-2	
Antimony	mg/kg	5.2	18 J	110.3
Arsenic	mg/kg	3.2	3.8	17.1
Cadmium	mg/kg	0.29 J	0.28 J	NA
Copper	mg/kg	85	82	3.6
Lead	mg/kg	1200 B	1700	34.5
Tin	mg/kg	3.4 J B	15 J	126.1
Zinc	mg/kg	41	53 ^	25.5
		NRRF-6 (0)	DUPE-4	
Antimony	mg/kg	< 1.3	< 1.1	NA
Arsenic	mg/kg	3.8	4.1	7.6
Cadmium	mg/kg	0.25 J	0.26 J	NA
Copper	mg/kg	100 B	22 JB	127.9
Lead	mg/kg	24	28	15.4
Tin	mg/kg	9.9 B	2 J B	132.8
Zinc	mg/kg	59	59	0.0
		SRRF-7 (6-9)	DUPE-5	
Antimony	mg/kg	24	7.2 J	107.7
Arsenic	mg/kg	8.9	5	56.1
Cadmium	mg/kg	0.14 J	0.11 J	NA
Copper	mg/kg	34 B	36 B	5.7
Lead	mg/kg	5800	1000 J	141.2
Tin	mg/kg	8.6 J B	6.5 J B	NA
Zinc	mg/kg	41 B	39	5.0
		SRSF-6	DUPE-6	
Antimony	mg/kg	< 1.2	< 1.1	NA
Arsenic	mg/kg	6.7	6	11.0
Cadmium	mg/kg	1.5 B	1.3 B	14.3
Copper	mg/kg	14	13	7.4
Lead	mg/kg	74 B	66 B	11.4
Tin	mg/kg	1 J	0.76 J	NA
Zinc	mg/kg	61	55 B	10.3

Table 9A

Adams County Shooting Range - Shooting Range Soil Relative Percent Difference Summary

Analyte	Unit	Sample ID	Sample Duplicate	RPD (%)
		NRLB-5I (0)	DUPE-1	
		NRIB-3 (0)	DUPE-7	
Antimony	mg/kg	240	2200 J	160.7
Arsenic	mg/kg	350	45 J	154.4
Cadmium	mg/kg	1.6	1.1 J	37.0
Copper	mg/kg	850 B	250 JB	109.1
Lead	mg/kg	30000	81000 J	91.9
Tin	mg/kg	17 B	14 B	19.4
Zinc	mg/kg	130	56	79.6
		NRSF-3	DUPE-9	
Antimony	mg/kg	< 1.4	< 1.1	NA
Arsenic	mg/kg	3.2	3.1	3.2
Cadmium	mg/kg	0.31 J	0.31 J	NA
Copper	mg/kg	18	19	5.4
Lead	mg/kg	22	23	4.4
Tin	mg/kg	1.6 J B	1.5 J B	NA
Zinc	mg/kg	55	56	1.8
		NRSF-2	DUPE-10	
Antimony	mg/kg	< 1.2	< 1.1	NA
Arsenic	mg/kg	2.6	2.4	8.0
Cadmium	mg/kg	0.26 J	0.32 J	NA
Copper	mg/kg	11	12	8.7
Lead	mg/kg	14	16	13.3
Tin	mg/kg	1.4 J B	1.5 J B	NA
Zinc	mg/kg	34	37	8.5
		ACA-1 (0-3)	DUPE-ACA	
Antimony	mg/kg	25 F1 F2	16	43.9
Arsenic	mg/kg	9.7 F1	3.5 J	93.9
Cadmium	mg/kg	0.43 J	0.39	9.8
Copper	mg/kg	150	130	14.3
Lead	mg/kg	3100 F2	2300	29.6
Tin	mg/kg	3.4 J B F1	4.9 J B	NA
Zinc	mg/kg	58 F1	59	1.7

Notes:

mg/kg - Miligram per kilogram

F2 - MS/MSD RPD exceeds control limits

B - Compound was found in the blank and sample

F1 - MS and/or MSD Recovery is outside acceptance limits

^ - ICV, CCV, ICB, CCB, ISA, ISB, CRI, CRA, DLCK, or MRL standard: Instrument related QC is outside acceptance limits

J - Result is less than the RL but greater than or eqaul to the MDL and the concentration is an approximate value

* - LCS or LCSD is outside acceptance limits

< - Indicates laboratory reporting limit

RPD - Relative Percent Difference

NA - RPD not calculated for analyte due to estimated concentration of analytes or concentrations below the laboratory reporting limit

Table 9B

Adams County Shooting Range - Groundwater Sample Detection Relative Percent Difference Summary

Analyte	Unit	Sample ID	Sample Duplicate	RPD
		AC-MW-5	DUPE1	
Chloride	mg/L	190	190	0.0
Nitrate as N	mg/L	5.8	6.3	8.3
Sulfate	mg/L	3700	3800	2.7
Alkalinity	mg/L	320 B	320 B	0.0
Bicarbonate Alkalinity as $CaCO_3$	mg/L	320	320	0.0
Calcium	ug/L	370000	350000	5.6
Magnesium	ug/L	85000	82000	3.6
Potassium	ug/L	8900	8900	0.0
Sodium	ug/L	1500000	1500000 B	0.0
Antimony	ug/L	0.92 J	0.69 J	NA
Arsenic	ug/L	0.79 J	1.1 J	NA
Barium	ug/L	56	78	32.8
Beryllium	ug/L	0.18 J	0.52 J	NA
Chromium	ug/L	3.8	6.2	48.0
Cobalt	ug/L	2.4	5.5	78.5
Copper	ug/L	2.6	4.7	57.5
Lead	ug/L	1.6	3.8	81.5
Nickel	ug/L	2.7	4.7	54.1
Selenium	ug/L	31.0	32.0	3.2
Silver	ug/L	0.057 J	0.056 J	NA
Thallium	ug/L	0.073 J	0.13 J	NA
Vanadium	ug/L	11.0	19	53.3
Zinc	ug/L	15.0	29	63.6
Acetone	ug/L	2.4 J	< 1.9 UJ	NA

Notes:

ug/l - micrograms per liter

B - Compound was found in the laboratory blank and sample.

J - Result is less than Reporting Limit but greater than or equal to the Minimum Detection Limit and the concentration is an approximate value.

UJ - The analyte was analyzed for but, was not detected

< - Indicates value shown is the laboratory reporting limit

RPD - Relative Percent Difference

NA - Relative percent difference not calculated for analyte due to estimated concentrations or concetration below the laboratory reporting limit

Table 9C

Adams County Shooting Range -Soil Vapor Sample Relative Percent Difference Summary

	Sample ID	AC-GMP-2	DUPE-V	
	Sample Date	8/24/2016	8/24/2016	
Analyte	Unit			RPD
Hydrogen Sulfide	µg/m^3	<11	<11	NA
Methane	ppmV	140000	110000	24
Vinyl Chloride	µg/m^3	320	490	42.0
1,1-Dichloroethene	µg/m^3	<10	<10	NA
Methylene Chloride	µg/m^3	<10	<10	NA
1,1-Dichloroethane	µg/m^3	<10	<10	NA
Chloroform	µg/m^3	<10	<10	NA
1,2-Dichloroethane	µg/m^3	<10	<10	NA
1,1,1-Trichloroethane	µg/m^3	<10	<10	NA
Benzene	µg/m^3	76	92	19.0
Carbon Tetrachloride	µg/m^3	<10	<10	NA
1,2-Dichloropropane	µg/m^3	<10	<10	NA
Trichloroethene	µg/m^3	32	36	11.8
1,1,2-Trichloroethane	µg/m^3	<10	<10	NA
Toluene	µg/m^3	52	60	NA
Tetrachloroethene	µg/m^3	<10	<10	NA
Chlorobenzene	µg/m^3	<10	<10	NA
Ethylbenzene	µg/m^3	32	61	62.4
m,p-Xylenes	µg/m^3	54	62	13.8
Styrene	µg/m^3	<10	<10	NA
o-Xylene	µg/m^3	24	30	22.2
1,1,2,2-Tetrachloroethane	µg/m^3	<10	<10	NA
1,4-Dichlorobenzene	µg/m^3	<10	<10	NA
1,2-Dichlorobenzene	µg/m^3	<10	<10	NA

Notes:

µg/m3 - Microgram per cubic meter

RPD - Relative Percent Difference

< - Inidicates concentration shown is laboratory reporting limit

NA - RPD not calcuated for analyte due to concentrations below laboratory detection limit

Table 9D

Adams County Shooting Range - Sediment Sample Detection Relative Percent Difference Summary

Analyte	Unit	Sample ID	Sample Duplicate	RPD
		AC-SED-02-0.005	DUPE-SED	
Chloroform	µg/kg	< 11	0.42 J	NA
Methylene Chloride	µg/kg	7.7 B	4.5 JB	52.5
Arsenic	mg/kg	6.1	6.3	3.2
Barium	mg/kg	130 B	130 B	0.0
Cadmium	mg/kg	0.46	0.41	11.5
Chromium	mg/kg	10 B	10 B	0.0
Lead	mg/kg	25	27	7.7
Mercury	µg/kg	24	28	15.4

Notes:

µg/kg - Microgram per kilogram

mg/kg - Miligram per kilogram

< - Indicates concentration shown in the laboratory detection limit

B - Compound was found in the laboratory blank and sample.

J - Result is less than Reporting Limit but greater than or equal to the Minimum Detection Limit and the concentration is an approximate value.

RPD - Relateive Percent Difference

NA - RPD not calculated for analyte due to comparison of laboratory detection limit to estimated analyte concentration

Appendix A - Correspondence

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Mike Goins
DIRECTOR

ADAMS COUNTY
COLORADO

Facility Operations & Planning Department
4430 South Adams County Parkway
1st Floor, Suite 1700
Brighton, CO 80601-8208
PHONE 720.523.6006
FAX 720.523.6008
www.adcogov.org

April 11, 2016

Mr. Robert Beierle
Corrective Action Unit
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, CO 80246-1530

RE: Corrective Action Plan Application
Sheriff's Old Shooting Range Remediation
14451 Riverdale Road, Brighton, Colorado

Dear Mr. Beierle:

The Adams County Facility Operations & Planning Department is submitting this Corrective Action Plan Permit Application for the planned phased site assessment and remediation of the former Sheriff's Shooting Range located at 14451 Riverdale Road, Brighton, Colorado (site). Adams County operated the shooting range from approximately 1993 through 2013.

In 2015 Quantum Water & Environment (Quantum) was retained by Adams County to provide consultation services to the Coutny for the remediation of this property. To that end, Quantum has done site investigation, preliminary assessment, and proposed plans for moving forward:

On December 17, 2015, Quantum submitted a copy of the Phase I Environmental Site Assessment (ESA) report for the Site to the Colorado Department of Public Health and Environment (CDPHE).

On March 31, 2016, Quantum submitted a site-specific Sampling and Analysis Plan (SAP) and Health and Safety Plan (HASP) to CDPHE for review. The HASP and SAP provide the health and safety measures, site assessment activities, field sampling locations, data collection procedures, and data evaluation processes to ensure that appropriate levels of data quality are obtained.

Pursuant to Section 100.26 (Corrective Action Plan) of the Colorado Hazardous Waste Regulations, Adams County is submitting this application for a Correction Action Plan Permit. Adams County will implement the site assessment activities upon CDPHE's review and concurrence with the proposed SAP. The results of the site assessment will be compiled into a

Site Assessment Report and a Corrective Action Plan with feasible remedial alternates developed in accordance with applicable state standards, risk-based cleanup goals, and closure requirements acceptable to CDPHE.

Specific information required to be included in this request according to Section 100.26 is listed below:

1. Owner: Adams County, 4430 South Adams County Parkway
   Brighton, CO 80601-8208

2. Operator: Adams County Facility Operation & Planning Department
   4430 South Adams County Parkway, Suite 1700
   Brighton, CO 80601-8208

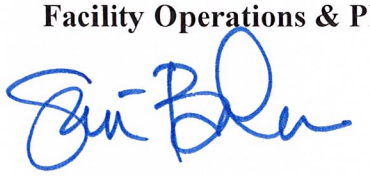
3. Contact: Mr. Sean Braden, Project Manager
   Facility Planning and Operations
   Office Phone: 720-523-6003
   Email: sbraden@adcogov.org

4. EPA Identification Number: *Applied for*

Requirements, according to 100.26, are included in the text of this letter. Please confirm your receipt of this Corrective Action Plan Permit Request, and please contact me if you require any additional information or have questions.

Sincerely,

Adams County
Facility Operations & Planning



Sean Braden,
Project Manager

cc: Mike Goins: Facility Operations Director, Adams County
Jen Rutter: Environmental Analyst, Adams County
John Dellaport: Environmental Division Manager, Quantum Water & Environment

COLORADO
Department of Public Health & Environment

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April 22, 2016

Sean Braden
Former Sheriffs Shooting Range / Adams County Public Works Department
4955 E 74th Ave
Commerce City, CO 80022

RE: Notification of Hazardous Waste Activity EPA ID Number: **COR000241265**

Dear Sean Braden:

The Hazardous Materials & Waste Management Division of the Colorado Department of Public Health and Environment has received a Notification of Hazardous Waste Activity (EPA Form 8700-12) by your company for the following location:

14451 RIVERDALE RD
BRIGHTON, CO 80602

In accordance with state regulations, the EPA ID number listed above has been assigned to the following above referenced location: (Future correspondence should include this number.)

ONE-TIME LARGE QUANTITY GENERATOR

Any change in location would require a new Notification of Hazardous Waste Activity (EPA Form 8700-12) to be filed, as EPA ID numbers are location specific. Failure to have an EPA ID number for a new location or use of the wrong EPA ID number in shipping hazardous wastes may result in Enforcement Action under the Colorado Hazardous Waste Act (Sections 25-15-308 through 310, C.R.S.). In accordance with Part 99 of the Regulations, if any of the following changes occur, this office must be notified in writing at the above address: 1) mailing address; 2) name of facility; 3) generator status or other notified activity; 4) contact name or phone number; 5) ownership; or 6) site is closed.

Please be aware that the handling and management of hazardous waste, including the generation, transportation, treatment, storage, and disposal of hazardous waste, is regulated under the Colorado Hazardous Waste Regulations (6 CCR 1007-3) Part 260 through 268; Part 2, 99 and 100. A copy of the *Guide to Generator Requirements of the Colorado Hazardous Waste Regulations* is available online at https://www.colorado.gov/pacific/cdphe/hwguidance select the link: "Applicable to all generators." And a copy of the regulations (6 CCR 1007-3) is available at https://www.colorado.gov/pacific/cdphe/hazardous-waste-regulations.

If you have any questions, or need further information, please contact me at (303) 692-3360.

Sincerely,

Laura K. Gurule

Laura Gurule
Hazardous Waste Notification Coordinator

M&E: 1.6

MAIL FORM TO:
CDPHE
HMWMD-B2
4300 Cherry Creek Dr. S.
Denver, CO 80246-1530

COLORADO HAZARDOUS WASTE NOTIFICATION FORM

Replaces EPA Form 8700-12, 8700-13A/B, and Page 1 of 8700-23

APR 15 2016
HAZARDOUS MATERIALS AND WASTE MANAGEMENT

Colorado Department of Public Health and Environment

1. Reason for Submittal: (Mark 'X' in the appropriate boxes)

- [X] Initial notification and obtain an EPA ID Number for hazardous waste, universal waste, or used oil activities.
- [ ] Subsequent notification to update information **(Sec. 2-6 and 10 must be completed)**.
- [ ] Initial or Revised RCRA Hazardous Waste Part A Permit Application (Page 3-7 of 8700-23 must also be submitted).
- [ ] Component of a biennial Hazardous Waste Report and a subsequent notification.

2. Site EPA ID Number: COR000241265	County Name: Adams
3. Site Legal Name/Operator: Former Sheriff's Shooting Range/Adams County Public Works Department	
4. Site Location Information: Street Address: 14451 Riverdale Road	
City or Town: Brighton / State: CO / Zip Code: ~~80246~~ 80602	
5. Site Land Type: ☐ Private ☒ County ☐ District ☐ Federal ☐ Indian ☐ Municipal ☐ State ☐ Other	
6. North American Industry Classification System (NAICS) Code(s) for the Site: A. 713990 / B. 562212 / C.	
7. Site Mailing Address Same as ☐Location Street Address: 4955 E. 74th Avenue	
City or Town: Commerce City / State: CO / Zip Code: 80022	
8. Site Contact Person First Name: Sean / MI: / Last Name: Braden	
Job Title: Project Manager, Facility Planning and Ops. / Phone Number: 720-523-6003 / Extension:	
Address same as ☐Location ☒Mailing Street Address: 4430 South Adams County Parkway, Suite 1700	
City or Town: Brighton / State: CO / Zip Code: 80601-8208	
E-mail Address: sbraden@adcogov.org	
9. **Name of Site's Owner:** Adams County	Phone Number: 720-523-6003
Address same as ☐Location ☒Mailing ☐Contact Owners Street Address: 4430 South Adams County Parkway	
City or Town: Brighton / State: CO / Zip Code: 80601	
Owner Type: ☐ Private ☒ County ☐ District ☐ Federal ☐ Indian ☐ Municipal ☐ State ☐ Other	

10. Type of Regulated Waste Activity (Mark 'X' in the appropriate boxes for all current activities in Sections 10. A-C).

A. Hazardous Waste Activities For Items 3 through 7, check all that apply:

1. Generator of Hazardous Waste (regular monthly generation rate/choose only one)

- ☐ a. **LQG**: Greater than 1,000 kg/mo (2,200 lbs.) of non-acute hazardous waste; or
- ☐ b. **SQG**: 100 to 1,000 kg/mo (220 - 2,200 lbs.) of non-acute hazardous waste; or
- ☐ c. **CESQG**: Less than 100 kg/mo of non-acute hazardous waste

NOTE: The Department recommends that a facility that episodically or sporadically generates more waste than their regular monthly generation rate allows notify at the larger generator status in order to maintain a consistent waste management system and avoid continual re-notification.

2. One-Time Generation (not normally a hazardous waste generator or one-time exceedance of regular monthly generation rate)

☒ Large Quantity Generator; or ☐ Small Quantity Generator; or ☐ Conditionally Exempt Generator

NOTE: A one-time generator number is active for only one month. If the facility needs to keep their number active for more than one month or if they exceed their regular generation rate for more than one month, they should check the appropriate box in 10.A.1 and notify the Department when the number is no longer needed or they return to their regular monthly generation rate.

3. United States Importer of Hazardous Waste ☐

4. Mixed Waste Generator (hazardous and radioactive) ☐

A. Hazardous Waste Activities (continued)

- ☐ 5. Transporter of Hazardous Waste
- ☐ 6. Hazardous Waste Transfer Facility
- ☐ 7. Treater, Storer, or Disposer of Hazardous Waste requiring a hazardous waste Part A permit for this activity.
- ☐ 8. Recycler of Hazardous Waste
  Note: A hazardous waste permit may be required for this activity.
- 9. Exempt Boiler and/or Industrial Furnace
  - ☐ a. Small Quantity On-site Burner Exemption
  - ☐ b. Smelting, Melting, Refining Furnace Exemption
- ☐ 10. Underground Injection Control

B. Universal Waste Activities

1. Large Quantity Handler of Universal Waste
Indicate types of universal waste generated and/or consolidated at your site. Mark Consolidated if received from other Universal Waste Handlers. (check all boxes that apply):

	Generated	Consolidated
a. Aerosol Cans	☐	☐
b. Electronic Devices and/or Components	☐	☐
c. Mercury-containing Devices	☐	☐
d. Batteries		☐
e. Lamps		☐
f. Pesticides		☐
g. Mercury-containing equipment		☐

☐ 2. Destination Facility for Universal Waste
Note: A hazardous waste permit may be required for this activity.

C. Used Oil Activities (check all boxes that apply):

- 1. Used Oil Transporter ☐ a. Transporter ☐ b. Transfer Facility
- 2. Used Oil Processor and/or Re-refiner ☐ a. Processor ☐ b. Re-refiner
- ☐ 3. Off-Specification Used Oil Burner ☐ 5. Used Oil Collection Center
- 4. Used Oil Fuel Marketer ☐ a. Marketer Who Directs Shipment of Off-Spec. Used Oil to an Off-Spec. Used Oil Burner ☐ b. Marketer Who First Claims the Used Oil Meets the Specifications

11. Description of Hazardous Wastes List waste codes of the hazardous wastes handled at your site. List in order presented in the regulations (e.g., D001, D003, F007, U112). Use an additional page if needed.

Ignitable (D001) ☐ Corrosive (D002) ☐ Reactive (D003) ☐ Toxic ☒ (List specific codes below)

D008											

12. Comments

13. Certification. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person(s) who manage the system, or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature of owner, operator, or an authorized representative	Name and Official Title (type or print)	Date Signed
[signature]	SEAN BRADEN, PROJECT MANAGER	4/8/2016

COLORADO
Department of Public Health & Environment

Dedicated to protecting and improving the health and environment of the people of Colorado

May 16, 2016

Mr. Sean Braden
Adams County Facility Operation & Planning Department
4430 South Adams County Parkway, Suite 1700
Brighton, CO 80601-8208

SENT VIA EMAIL TO: sbraden@adcogov.org

RE: **Sampling and Analysis Plan, Rev. 1 _ *Approval***
Former Adams County Shooting Range and Landfill, 14451 Riverdale Road, Brighton, Colorado
EPA ID No.: COR000241265
M&E / 1.4

Mr. Braden:

The Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division (the Division) has reviewed the document titled *Sampling and Analysis Plan, Rev.1,* and dated May 14, 2016 (the SAP). The SAP was written, compiled and submitted by Quantum Water & Environment on behalf of Adams County Facility Operations and Planning Department.

The purpose of the SAP, prepared in accordance with Section 100.26 of the Colorado Hazardous Waste Regulations (6 CCR 1007-3), is to investigate potential sediment, soil, and groundwater impacts at 14451 Riverdale Road in Brighton, Colorado (the Facility). The SAP also proposes to investigate for soil vapors. The Facility was previously used as a shooting range, special weapons attack team training site, landfill, and was also used for oil and gas production. The results of implementing the SAP will drive additional investigations, remediation and the capping of landfill extents.

The Division hereby approves the SAP and looks forward to continuing the open communication that has occurred up to date. The SAP proposes a schedule at the end of Section 3.0. Please keep Jill Parisi and me informed of modifications to this schedule. Lastly, one electronic and one hardcopy of the Site Assessment Report is preferred to be submitted to the Division for review and approval; however, the Division requires at a minimum that one complete electronic copy of the report be submitted.

If there are any questions regarding the referenced facility or this correspondence please contact me at (303) 692-3332 or Ms. Jill Parisi at (303) 692-3348.

Sincerely,

Richard Mruz, Jr., REHS
Hazardous Waste Corrective Action Unit
Hazardous Materials and Waste Management Division
Colorado Department of Public Health and Environment

EC: Mr. John Dellaport, Quantum Water and Environment
Mr. Chris Krajicek, Quantum Water and Environment
Ms. Jill Parisi, CDPHE – HMWMD
Ms. Jen Rutter, Adams County
Mr. Timothy Gablehouse, Gablehouse Granberg, LLC

COLORADO
Department of Public Health & Environment

Dedicated to protecting and improving the health and environment of the people of Colorado

October 19, 2016

Mr. Sean Braden
Facility Operation and Planning Department
Adams County

Ms. Jen Rutter
Senior Environmental Analyst
Adams County

SENT VIA EMAIL TO: sbraden@adcogov.org **and** jrutter@adcogov.com

RE: **October 7, 2016 Treatability Testing Plan _ *Approval***
Former Adams County Shooting Range and Landfill, 14451 Riverdale Road, Brighton, Colorado
EPA ID No.: COR000241265
M&E / 1.4

Mr. Braden and Ms. Rutter:

The Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division (the Division) has reviewed the October 7, 2016 *Treatability Testing Plan* (the Plan). The Plan was written and submitted by Quantum Water and Environment on behalf of Adams County, the owners of the referenced facility. Generally, the Plan proposes to collect soil samples, treat soil samples to reduce the leachability of Lead (Pb), and send to a laboratory for analysis to determine efficacy of treatment. The Plan is hereby approved with the following comments and without modification.

The Plan completely addressed concerns the Division had with an October 5, 2016 draft. The Plan memorialized agreements the Division made with Quantum Water and Environment during a phone call on October 7, 2016. Lastly, on October 11, 2016 the Division provided a verbal approval to begin implementation of the Plan.

If there are any questions regarding this correspondence, or Lead impacted soil at the referenced facility, please contact me at (303) 692-3332 or via email at richard.mruz@state.co.us. Ms. Jill Parisi may also be contacted at (303) 692-3348 or via email at jill.parisi@state.co.us for any solid waste or water balance cover question, comment, or concern.

Sincerely,

Richard Mruz, Jr., REHS
Hazardous Waste Corrective Action Unit
Hazardous Materials and Waste Management Division
Colorado Department of Public Health and Environment

EC: Ms. Jill Parisi, CDPHE-HMWMD
Mr. John Dellaport, Quantum Water and Environment
Mr. Timothy Gablehouse, Gablehouse Granberg, LLC

John Dellaport

From: Jen Rutter <JRutter@adcogov.org>
Sent: Tuesday, September 06, 2016 2:35 PM
To: John Dellaport
Subject: Fwd: Summary from Today's Meeting at Adams County #1 Well

Jen Rutter
Senior Environmental Analyst
Community & Economic Development Department
Adams County, Colorado
O: 720.523.6841 | *jrutter@adcogov.org*

-------- Original message --------
From: "Kulmann - DNR, Dave" <dave.kulmann@state.co.us>
Date: 9/6/16 2:33 PM (GMT-07:00)
To: Jen Rutter <JRutter@adcogov.org>, Chris Simmons <CSimmons@adcogov.org>, Mike Leonard - DNR <mike.leonard@state.co.us>, Margaret Ash - DNR <margaret.ash@state.co.us>, Diana Burn - DNR <diana.burn@state.co.us>, John Axelson - DNR <john.axelson@state.co.us>
Subject: Summary from Today's Meeting at Adams County #1 Well

All,

Thanks for meeting on the Adams County #1 site today to discuss plans to plug and abandon that well. Below is a summary of what was discussed. Let me know if I forgot something or mis-stated anything. Thanks all.

Summary

1. COGCC is going through the procurement process to hire a vendor to do the plugging and abandoning of this well. The plan is to have an onsite with all potential vendors the week of September 19th. The exact date is TBD.
2. Once the onsite date is finalized, Diana Burn will contact both Chris and Jen for access to the site and for their participation in the onsite.
3. COGCC will be meeting with one debtor who expressed potential interest in taking over the well. COGCC has to at least entertain the idea but it will be a high bar for them to pass to take over this well.
4. Once the decision is made to plug the well, the following is what will be done by the COGCC.
    - Well will be plugged and cut at least 4 feet below ground.
    - All wellhead equipment will be removed.
    - The above ground flowline from the wellhead to the separator will be removed.
    - The separator piping will be removed.
    - The below ground flowlines to the old oil tank battery and produced water tank will be removed.
    - The oil tank piping will be removed.
    - The produced water tank piping will be removed.

- The rig anchors to the north of the well will be removed.

5. As part of the well plugging and removal of piping at the separator site and oil tank site, COGCC will remove all stained soil and will perform an environmental assessment. If this assessment shows a larger problem area than just the stained soil, a more detailed site assessment including potential delineation will occur.
6. COGCC does not have to perform reclamation as the work Adams County is planning will address reclamation.
7. COGCC will contact the electric company about removal of the transformers and electric wire.
8. Adams County will follow up with Encana regarding the meter shed and associated gathering line as this is not related to the Texas Tea Adams County #1 well.
9. Adams County will follow up with Anadarko regarding their valve station / pipeline as this is not related to the Texas Tea Adams County #1 well.

--
Dave Kulmann
Deputy Director -- Field Operations

P 303.894.2100 x 5189 | F 303.894.2109 | C 720.630.0687
1120 Lincoln Street, Suite 801, Denver, CO 80203
dave.kulmann@state.co.us | www.colorado.gov/cogcc

Appendix B - KRW Gas Monitoring Probe Logs

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Southwest 1/4 Section 14
T1S, R67W, 6th P.M.

Gas Monitoring Probe # 5
Proj Northing=1775621 26
Proj Easting=3177848 38
Ortho Hgt =5046 81

Gas Monitoring Probe # 6
Proj Northing=1775493.29
Proj Easting=3177799.74
Ortho Hgt =5038 80

Gas Monitoring Probe # 7
Proj Northing=1775340.41
Proj Easting=3177806.53
Ortho Hgt.=5035 34

Gas Monitoring Probe # 8
Proj Northing=1775088 97
Proj Easting=3177836.42
Ortho Hgt.=5048.15

Gas Monitoring Probe # 9
Proj Northing=1774815 90
Proj Easting=3177880 55
Ortho Hgt.=5079.23

Gas Monitoring Probe # 10
Proj Northing=1774545 13
Proj Easting=3177877 96
Ortho Hgt =5103 46

Gas Monitoring Probe # 1
Proj Northing=1775633 31
Proj Easting=3178116 00
Ortho Hgt =5061.30

Gas Monitoring Probe # 2
Proj Northing=1775525 34
Proj Easting=3178002 07
Ortho Hgt.=5060 86

Gas Monitoring Probe # 3
Proj Northing=1775360 77
Proj Easting=3178030 78
Ortho Hgt =5058 12

Site

Riverdale Road

Found Iron Rod & Alum Cap
Stamped "CP-17N"
Latitude=39°57'28.70729"
Longitude=104°51'54 49044"
Ellipsoid Hgt =1538 323(m)
Proj Northing=1774485 144
Proj Eastings=3178014 200
Ortho Hgt =5105 12

Gas Monitoring Probe # 4
Proj Northing=1774412 65
Proj Easting=3178390 08
Ortho Hgt.=5042 58

Found Iron Rod & Alum Cap
SW Corner Sec 14
Latitude=39°57'27.63726"
Longitude=104°51'55 56840"
Ellipsoid Hgt =1533 368(m)
Proj Northing=1774375 875
Proj Easting=3177931 506
Ortho Hgt.=5088 87

200 0 200 400

SCALE IN FEET
1" = 200'

AS-BUILT GAS MONITORING PROBE LOCATIONS
RIVERDALE ROAD
ADAMS COUNTY, COLORADO
PREPARED FOR THE COUNTY OF ADAMS

DATE	REVISIONS	DESIGNED	FIGURE
		DRAWN	1
		CHECKED	SHEET NO
		APPROVED	1 OF 1
		DATE	SHOWN

KRW CONSULTING, INC.
8000 W 14TH AVENUE, SUITE 200
LAKEWOOD, COLORADO
(303) 940-0011

Project Name: Riverdale Road Landfill

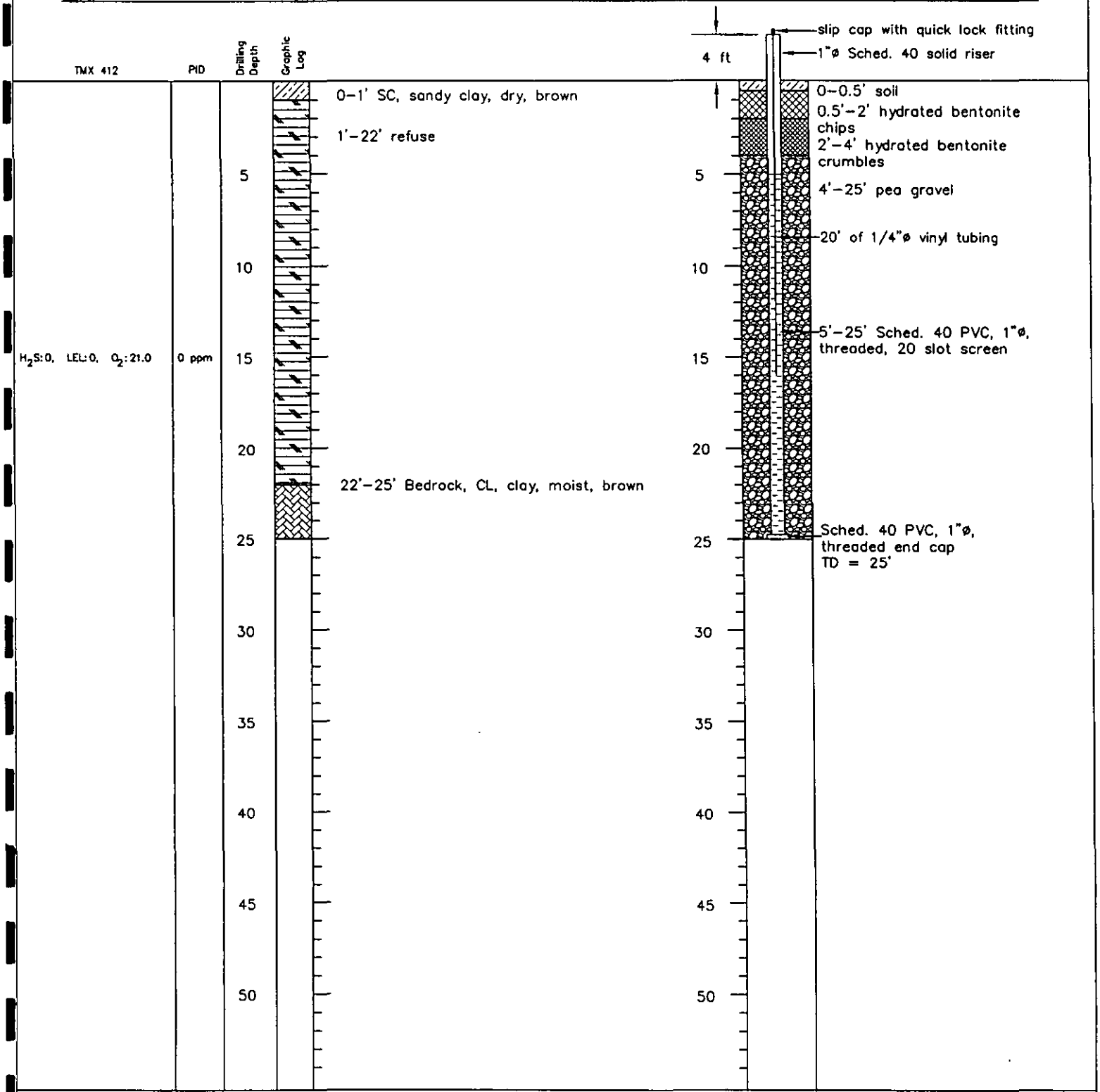
Project Address: 0310-01

Date: 01/05/2004

Boring No.: GMP-1

Logged By: B.V.

Sheet: 1 of 1



Drilling Method: Hollow Stem Auger

Hole Diameter: 6" outside diameter

Rig Type: CME-75

Test Boring Elevation: _____

Location Coordinates: _____

KRW CONSULTING, INC.
8000 W. 14th St. Suite 200
Lakewood, CO. 80214
(303)239-9011

Project Name: Riverdale Road Landfill

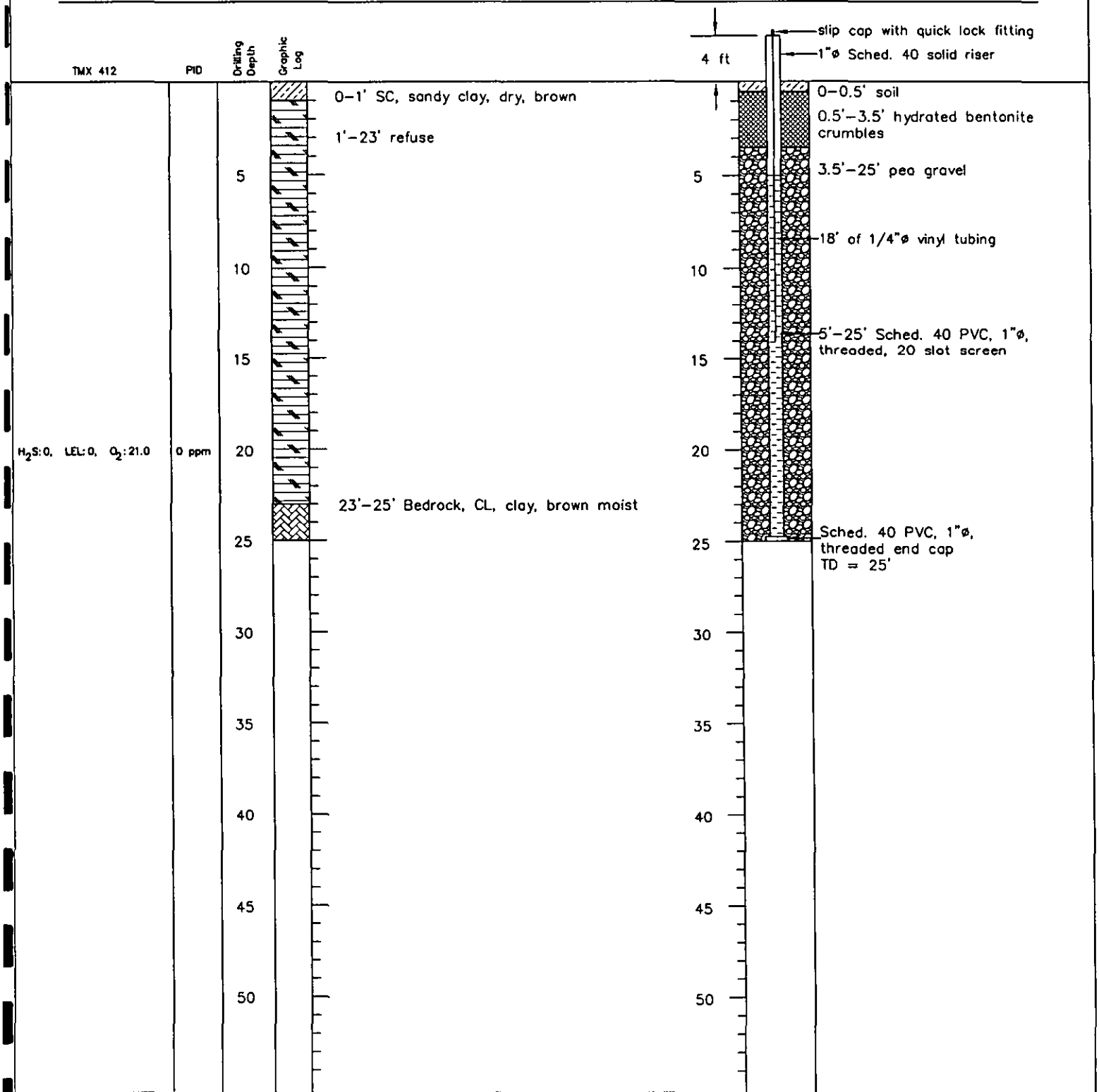
Project Address: 0310-01

Date: 01/05/2004

Boring No.: GMP-2

Logged By: B.V.

Sheet: 1 of 1



Drilling Method: Hollow Stem Auger

Hole Diameter: 6" outside diameter

Rig Type: CME-75

Test Boring Elevation:

Location Coordinates:

KRW CONSULTING, INC.
8000 W. 14th St. Suite 200
Lakewood, CO. 80214
(303)239-9011

Project Name: Riverdale Road Landfill

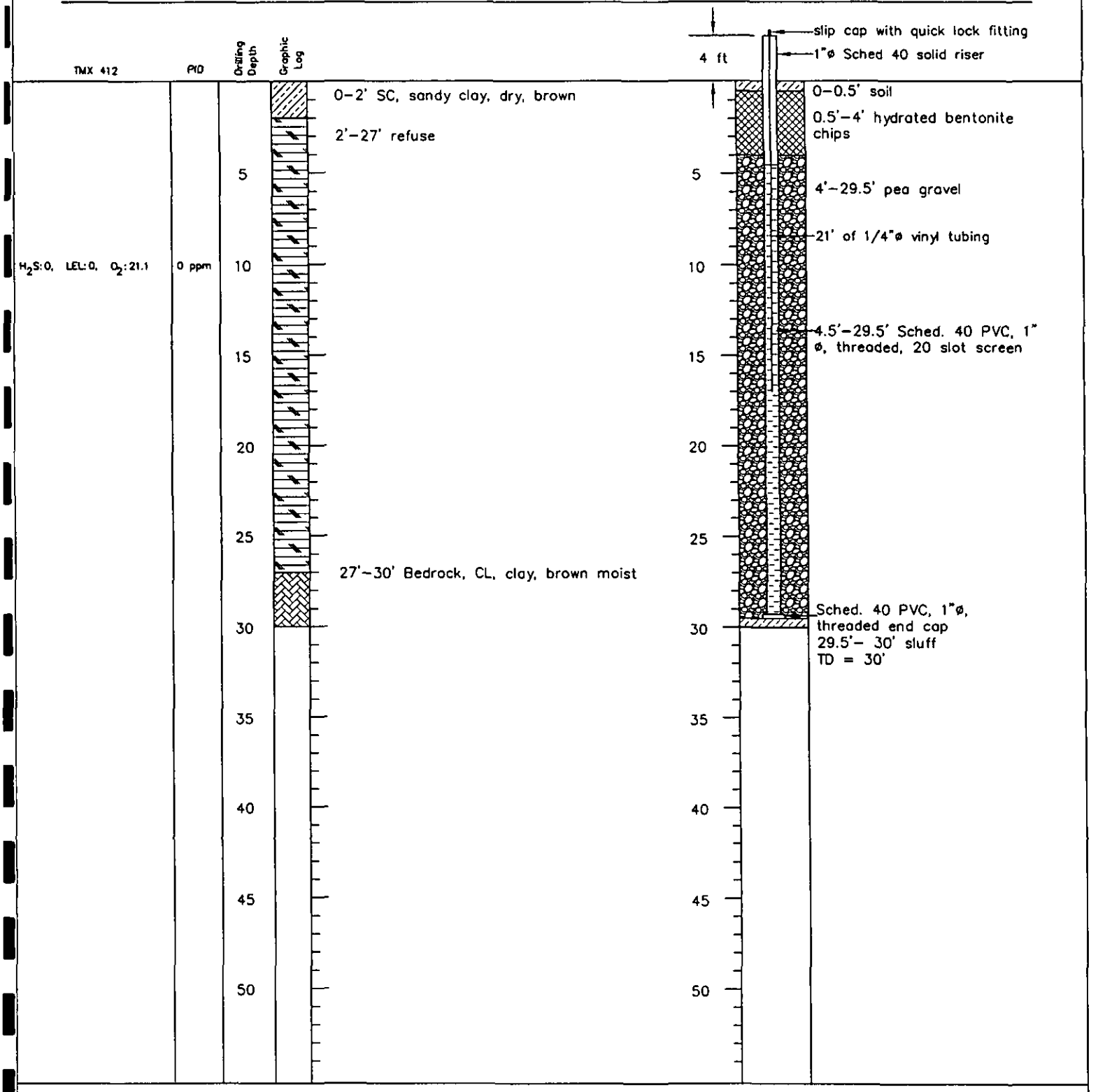
Project Address: 0310-01

Date: 01/13/2004

Boring No.: GMP-3

Logged By: B.V.

Sheet: 1 of 1



Drilling Method: Hollow Stem Auger

Hole Diameter: 6" outside diameter

Rig Type: CME-55

Test Boring Elevation:

Location Coordinates:

KRW CONSULTING, INC.
8000 W. 14th St. Suite 200
Lakewood, CO. 80214
(303)239-9011

Project Name: Riverdale Road Landfill

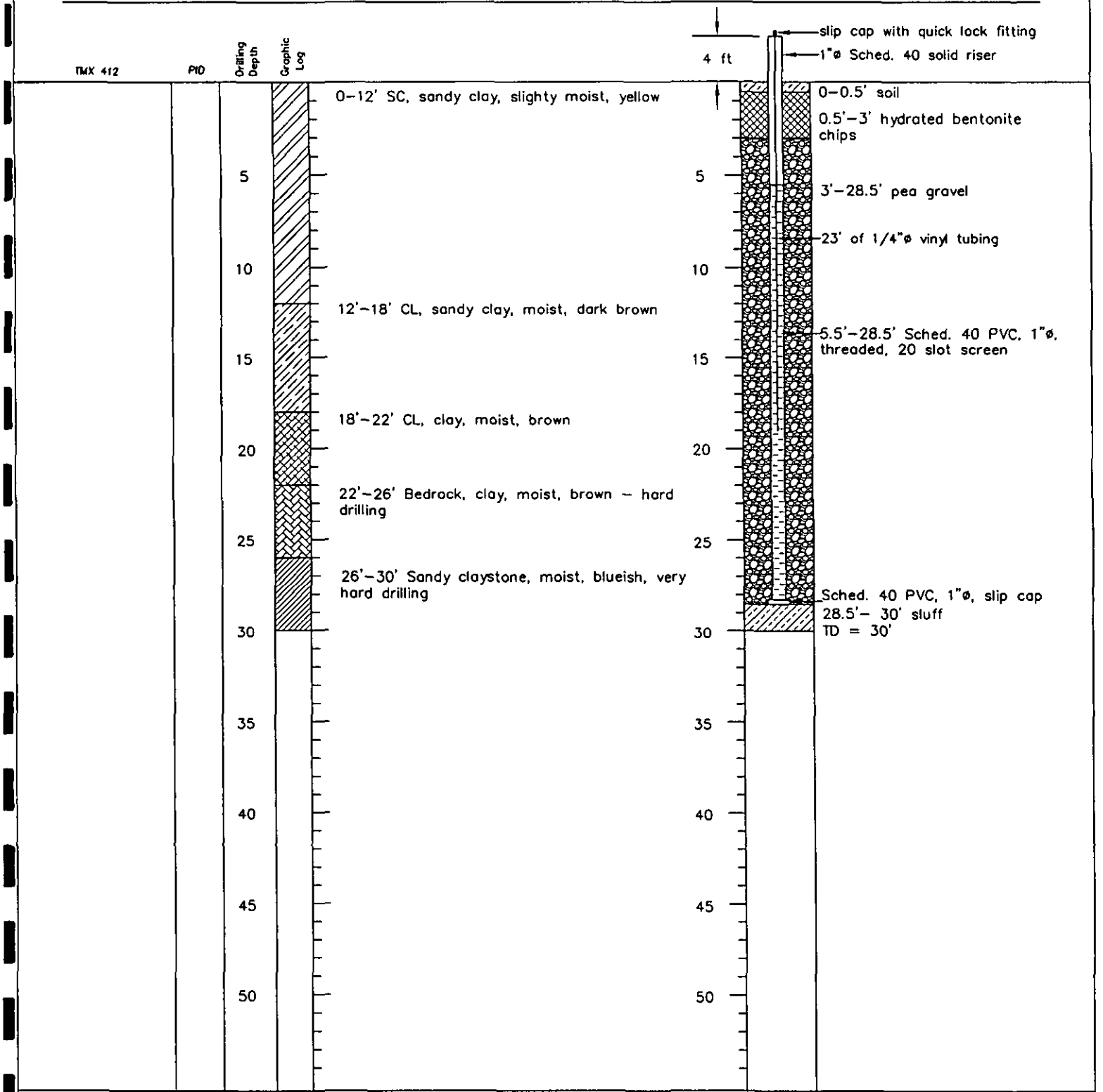
Project Address: 0310-01

Date: 01/13/2004

Boring No.: GMP-4

Logged By: B.V.

Sheet: 1 of 1



Drilling Method: Solid Stem Auger

Hole Diameter: 4" outside diameter

Rig Type: CME-75

Test Boring Elevation:

Location Coordinates: SE of south range

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