Spring 3-29-2024

Repository and Proposed Haul Route – Silver Bow Creek Conservation Area Quality Assurance Project Plan

Jacobs Engineering Group

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March 29, 2024

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RE: Repository and Proposed Haul Route - Silver Bow Creek Conservation Area Quality Assurance Project Plan

Agency Representatives:

I am writing you on behalf of Atlantic Richfield Company (Atlantic Richfield) to submit the *Repository and Proposed Haul Route - Silver Bow Creek Conservation Area (SBCCA) Quality Assurance Project Plan (QAPP)* for your review. This QAPP provides the procedures and protocols necessary to collect soil samples from potential repository locations and the alignment of a potential slurry transport system. The data obtained in accordance with this QAPP will be used to support detailed evaluations of the ongoing Repository Siting Study.

The QAPP may be downloaded at the following link: Repository and Proposed Haul Road - Silver Bow Creek Conservation Area (SBCCA) Quality Assurance Project Plan (QAPP)

Fieldwork is anticipated to begin on May 6, 2024. To meet this schedule, Atlantic Richfield is requesting that Agencies complete their review of the QAPP and provide any comments to Atlantic Richfield by April 16, 2024.

If you have any questions or comments, please call me at (406) 723-1834.

Atlantic Richfield Company

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Sincerely,

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Repository and Proposed Haul Route – Silver Bow Creek Conservation Area Quality Assurance Project Plan

Document No.: 240214120125_f156ae99
Version: Rev 1

Atlantic Richfield Company (ARC)

Silver Bow Creek Conservation Area, Butte, Montana
March 29, 2024

Jacobs

Repository and Proposed Haul Route – Silver Bow Creek Conservation Area Quality Assurance Project Plan

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Version	Date	Description	Author	Checked	Reviewed	Approved

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ARC = Atlantic Richfield Company

BSB = Butte-Silver Bow

CDM = CDM Smith

DEQ = Montana Department of Environmental Quality

EPA = U.S. Environmental Protection Agency

RET = Remediation Engineering Technology

RMAP = Residential Metals Abatement Program

QAO = Quality Assurance Officer

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BNSF = BNSF Railway Company

DOJ = Department of Justice

Kelley Drye = Kelly Drye & Warren LLP

MBMG = Montana Bureau of Mines and Geology

Montana Tech = Montana Technical University

MR = Montana Resources Inc.

NRDP = Montana Department of Justice Natural Resource Damage Program

RARUS = RARUS Railway (Butte, Anaconda and Pacific Railway Company)

UP = Union Pacific

WET = Water & Environmental Technologies

Contents

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Figures

Acronyms and Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
ARC	Atlantic Richfield Company
ASTM	ASTM International
bgs	below ground surface
BNSF	BNSF Railway Company
BMP	best management practice
BSB	Butte-Silver Bow
CDM	CDM Smith
CoC	chain of custody
CPM	Contractor Project Manager
DEQ	Montana Department of Environmental Quality
DOJ	U.S. Department of Justice
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
ID	identification
IDW	investigation-derived waste
Kelley Drye	Kelly Drye & Warren LLP
MBMG	Montana Bureau of Mines and Geology
MSHA	Mine Safety and Health Administration
Montana Tech	Montana Technical University
MR	Montana Resources Inc
MSW	municipal solid waste
NCAF	Nonconformity and Corrective Action Form
NPL	National Priority List
NRDP	Montana Department of Justice Natural Resource Damage Program
OSHA	U.S. Occupational Safety and Health Administration
PDF	portable document format

PDI	Predesign Investigation
PID	photoionization detector
PM	Project Manager
PVC	polyvinyl chloride
QA	quality assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	quality control
RA	Remedial Action
RD	Remedial Design
RET	Remediation Engineering Technology
RMAP	Residential Metals Abatement Program
RQD	rock quality designation
SBC	Silver Bow Creek
SBCCA	Silver Bow Creek Conservation Area
SD	Settling Defendant
SME	subject matter expert
SOP	standard operating procedure
SOW	Statement of Work
SPT	standard penetration test
SQL	Structured Query Language
SSHASP	Site-Specific Health and Safety Plan
TCR	total core recovery
WET	Water & Environmental Technologies
yd^3	cubic yard(s)
Yellow Jacket	Yellow Jacket Drilling Services

1 Introduction

This Quality Assurance Project Plan (QAPP) provides the procedures and protocols necessary to conduct an investigation as a part of the necessary geotechnical data collection to support the design of potential repository locations, potential haul routes, and the possible alignment of a slurry transport system necessary to complete Remedial Actions within the Silver Bow Creek Conservation Area (SBCCA). The predesign investigation (PDI) will include a geotechnical investigation to obtain the necessary data and summarize subsurface conditions for the design of the potential repositories and slurry system.

Up to 1.1 million cubic yards (yd^3) of tailings, waste, mining-impacted soil, and contaminated soil will be excavated as part of the ongoing SBCCA remediation program implementation. The excavated material will be transported offsite and placed in various mine waste repositories and possibly the Berkeley Pit. The Repository Siting Study is still ongoing, so the location and means of transporting waste material is still uncertain.

The Berkeley Pit is a potential and preferred repository alternative for the metals-impacted soils originating from the remedial sites, and a soil water slurry pipeline could be used for transportation and placement of the excavated material into the pit. If the Berkeley Pit is not suitable for use, additional geotechnical investigation will be required to evaluate additional upland repository locations, including the Butte Mine Waste Repository and Kelley Mine Area subareas A and B, for the consolidation of remediation wastes. Kelley Repository locations C and E, and a new repository location on a Montana Resources Inc. (MR) property adjacent to Shields Avenue, are being considered for placement of debris and other materials not suitable for slurry transport or placement within the Berkeley Pit.

Hydrocarbon-impacted soils will be transported by truck to the Butte Mine Waste Repository for treatment within a land farm. Segregated municipal solid waste (MSW) will be transported to a local, permitted MSW landfill.

The current geotechnical investigation scope is based on the following:

- Metals-impacted soils will be placed within the Berkeley Pit. The soils will be transported from the SBCCA sites to the Berkeley Pit by a slurry system pipeline. The slurry system pipeline will extend to a barge for placement of the material within the designated area of the pit.
- Hydrocarbon-impacted soils will be placed within the Butte Mine Waste Repository following land farm treatment.
- Municipal debris and trash will be disposed of at Butte-Silver Bow's municipal waste landfill.
- Kelley Mine Areas C and E will be used to place oversized debris and other wastes not suitable for placement within the Berkeley Pit.
- The new Shields Avenue Repository location is considered feasible for placement of organic material and oversized mine waste.

The geotechnical investigation will be limited to addressing the data needs to support the slurry system pipeline, as well as the design of the Kelley Mine Areas C and E, and Shields Avenue repositories. If the Berkeley Pit is not suitable for use, additional geotechnical investigation will be required to evaluate additional upland repository locations, including the Butte Mine Waste Repository and Kelley Mine Area subareas A and B, for the consolidation of remediation wastes.

This QAPP includes data quality objectives (DQOs) specific to proposed design and construction of the potential repository locations, slurry system alignment, and haul route. The DQOs cover the geotechnical investigation activities planned to support advancement of the design effort. The DQOs are mainly references to the applicable ASTM International (ASTM) and American Association of State Highway and Transportation Officials (AASHTO) standards.

1.1 Purpose of the Site Investigation

The purpose of the PDI is to collect geotechnical subsurface information necessary for the design of potential waste repositories, the potential haul route, and the slurry system. The available historical geotechnical information at the site is limited and not sufficient to support complete design. Given the nature of this mining site, site, and subsurface, it is important that recent site-specific subsurface information be obtained for the geotechnical assessment and design of the potential repositories, including slope stability, bearing capacity, and settlement evaluations, as well as an assessment of subgrade conditions along the proposed haul route and slurry system alignment.

The investigation will help assess the subsurface soil, bedrock, and groundwater conditions at the proposed site and establish geotechnical design parameters. The geotechnical investigation are required to examine the subsurface conditions in the proposed repository areas. The information will be used for the geotechnical design of proposed repositories and will examine construction and design requirements. The objectives of the hydrogeological investigation are to supplement existing hydrogeological information, characterize hydrogeological conditions in the project area, and assess groundwater conditions.

To support the site investigation, this document includes the following information:

- Section 2.0 describes the DQOs.
- Section 3.0 describes the sampling process and design.
- Section 4.0 summarizes the assessment and oversight requirements.
- Section 5.0 describes the health and safety requirements.
- Section 6.0 summarizes the data validation process and usability of the resultant data.

1.2 Objectives of the Investigation

The main objective of the PDI is to collect data regarding the physical, strength, and deformation properties of the soil and bedrock within the site to inform the repository and slurry system designs. Work activities will include the advancement of 14 borings with standard penetration tests (SPTs). A more detailed summary of the proposed geotechnical investigation scope can be found in the PDI workplan.

Haul Road –The geotechnical drilling will be performed by Yellow Jacket Drilling Services (Yellow Jacket). SPTs will be performed in all borings. SPT soil samples, along with undisturbed Shelby tube soil samples, sonic soil samples, and rock cores, will be collected from the site. In addition, vane shear testing will be performed at specific borehole locations. A physical site reconnaissance and review of the project area will be conducted to ascertain the location of existing underground and overhead services and evaluate the accessibility, required equipment, and existing site constraints. In addition to the field investigation, a laboratory testing program is planned and will be performed on collected soil and rock samples.

2 Data Quality Objectives

This section describes the DQOs that are part of the proposed geotechnical investigation program:

1. State the Problem: Upon assessing the location and available subsurface information in the areas of the potential repositories, the slurry system pipeline, and related infrastructure, there is insufficient information to adequately evaluate the subsurface conditions for the design of these. Determine the geotechnical data needs to support the design and construction of the work.
2. Identify Study Goals: Obtain subsurface information and develop geotechnical design parameters for the design and construction of the proposed work.
3. Identify Informational Inputs: SPT and vane shear testing, bedrock coring samples, and laboratory tests measured and collected to develop visual, physical, strength, and deformation properties for the analysis and design of the potential repositories and slurry system, and to establish construction recommendations.
4. Define Boundary Studies: The approximate area limits of the proposed repositories and slurry system pipeline, along with the proposed geotechnical boring location are shown on Figures 1 through 4.
5. Develop Analytical Approach: Install geotechnical borings at the proposed locations and to the depths described and take samples and measurements described in this QAPP. Geotechnical data will be evaluated against engineering requirements to evaluate the design and construction of the repositories and slurry system.
6. Specify Performance or Acceptance Criteria: Verify that the collected data will adequately support the repositories and slurry system pipeline design.
7. Develop Plan for Obtaining Data: Staff experienced in this type of work will work on the subsurface investigation program. Qualified drillers from Yellow Jacket will perform the drilling work, SPT, vane shear testing, and bedrock coring in accordance with applicable standards. Qualified Jacobs geotechnical engineers and a geologist will oversee the field work, log the borings, and collect geotechnical samples for laboratory testing. A Jacobs subject matter expert (SME) will review the boring logs and geotechnical testing results.
8. Carry Out Analysis and Design: Use the collected data to support geotechnical analyses (such as slope stability, bearing capacity, and settlement) for the design of the haul route, repositories, and slurry transport aspects of the remedy, to be performed under a separate scope.

The proposed geotechnical investigation program will be performed in accordance with the following AASHTO and ASTM standards applicable to the DQOs for the site investigation and lab testing that will support the design of the repository and slurry system pipeline. The field investigation will be performed by qualified drillers and be supervised by qualified geologists/geotechnical engineers. The laboratory testing program will be performed by accredited laboratories following these AASHTO and ASTM standards.

1. *Field Investigation:*
   a. *ASTM D1586, Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils*
   b. *ASTM D1587, Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes*

   c. *ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)*
   d. *ASTM D2573, Standard Test Method for Vane Shear Test in Saturated Fine-Grained Soils*
   e. *ASTM D4220, Standard Practices for Preserving and Transporting Soil Samples*
   f. *ASTM D4633, Standard Test Method for Energy Measurement for Dynamic Penetrometers*
   g. *ASTM D6914, Standard Practice for Sonic Drilling for Site Characterization and the Installation of Subsurface Monitoring Devices*

2. *Laboratory Testing*
   a. *AASHTO T288 Standard Method of Test for Determining Minimum Laboratory Soil Resistivity*
   b. *AASHTO T291, Standard Method of Test for Determining Water-Soluble Chloride Ion Content in Soil*
   c. *ASTM C1580, Standard Test Method for Water Soluble Sulfate in Soil*
   d. *ASTM D2216, Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass*
   e. *ASTM D2435, Standard Test Methods for One-Dimensional Consolidation Properties of Soils Using Incremental Loading*
   f. *ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)*
   g. *ASTM D2850, Standard Test Method for Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils*
   h. *ASTM D2974, Standard Test Methods for Determining the Water (Moisture) Content, Ash Content, and Organic Material of Peat and Other Organic Soils*
   i. *ASTM D3080, Standard Test Method for Direct Shear Test of Soils Under Consolidated Drained Conditions*
   j. *ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils*
   k. *ASTM D4220, Standard Practices for Preserving and Transporting Soil Samples*
   l. *ASTM D4767, Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils*
   m. *ASTM D4972, Standard Test Methods for pH of Soils*
   n. *ASTM D512, Standard Test Methods for Chloride Ion In Water*
   o. *ASTM D516, Standard Test Method for Sulfate Ion in Water*
   p. *ASTM D6913/D7928, Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis*
   q. *ASTM D7012, Standard Test Method for Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures*

r. *ASTM D7928, Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis*

s. *ASTM G57, Standard Test Method for Measurement of Soil Resistivity Using the Wenner Four-Electrode Method*

3 Data Collection Process and Study Design

The site investigation will include obtaining geotechnical data to support the design of the repositories and haul route. This section provides the procedures and protocols necessary to complete these tasks.

3.1 Preparation for Fieldwork

The following tasks will be completed before conducting field activities:

- Health and safety training
- Access Plan
- Best management practices (BMPs)

3.1.1 Health and Safety Training

All field personnel responsible for sample collection activities will be required to have a valid certification for the 40-hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Site and Emergency Response Training. In addition, all field personnel will obtain the Mine Safety and Health Administration (MSHA) New Miner safety training certification, as well as the Montana Resources (MR) site-specific mine site training. Jacobs field staff will also be required to have internal Safety Liaison training. This training will be completed before mobilization to perform the field work. Current certification records will be maintained by Jacobs.

All field personnel will review this QAPP, PDI Work Plan, and internal project instructions before field activities to verify sample collection and handling methods are completed according to the QAPP requirements. Field personnel will be trained on how to properly use field equipment and complete activities according to field data collection standard operating procedures (SOPs) in the PDI Work Plan submitted under separate cover.

The drilling subcontractor will have the requisite expertise in the selected drilling method for geotechnical drilling, and the Field Team Leader will be familiar with the selected method to support and oversee the work. Qualified geotechnical engineering field team members will be present during drilling to assist with the successful completion of the geotechnical testing field work.

The Jacobs Safety Liaison will review the internal Site-Specific Health and Safety Plan (SSHASP) with all field personnel before starting fieldwork to assess the site's specific hazards and the control measurements put in place to mitigate these hazards. The SSHASP is required to meet or exceed the requirements of MR's SSHASP. The review of the SSHASP with field personnel will cover other safety aspects related to the site, including:

- Personnel responsibilities and contact information
- Additional safety requirements and procedures
- Anticipated mining activities within or adjacent to drilling work locations
- The emergency response plan

Personnel will perform hazard identification and task risk assessments before performing specific tasks related to the site investigation. One hard copy of the current approved version of the QAPP will be maintained for reference purposes in the field vehicle or field office. All field team personnel will have access to electronic portable document format (PDF) files of all documents pertaining to fieldwork.

3.1.2 Access Plan

The proposed Kelley Repository sites are positioned to the north and northwest of the Berkeley Pit within the property boundary owned by Atlantic Richfield Company (ARC) or Butte-Silver Bow (BSB) County. An access agreement has been established between ARC and BSB County for Jacobs staff and their subcontractors to access the identified borehole locations.

The proposed Shields Avenue Repository site is positioned to the south-southwest of the Berkeley Pit, within the MR property. New haul roads may be constructed to connect the Butte Civic Center to the proposed Kelley Mine Area and Shields Avenue repositories.

An access agreement is being established between ARC and MR for borings to be installed on MR property, including the potential Shields Avenue Repository location near the polishing plant and the South Ramp.

3.1.3 Best Management Practices

Protection of the environment during field activities will be addressed through implementation of short-term construction BMPs. Typical BMPs may include the following:

- Spillguard secondary containment systems (or equivalent) may be used, as necessary, to contain inadvertent spills or leaks.
- Investigation-derived waste (IDW) will be properly segregated and managed. Media will be segregated as follows:
  - Drilling fluid
  - Soil cuttings
  - Miscellaneous solid waste (personal protective clothing)
  - Wastewater (decontamination fluid)

  Each media type will be placed in separate 55-gallons drums provided by the drilling subcontractor. If grossly contaminated media is observed (such as sheens, nonaqueous phase liquid, or odors), this media type will be segregated into a separate drum. Each drum of IDW will be labeled, documented, sampled, tested, and characterized. The drums will be temporarily stored at a storage area designated by ARC until sample characterization is completed. Upon completion of sample characterization, the drums will be disposed of following local, state, and federal regulations.
- Jacobs will secure an area for the placement of a temporary decontamination pad and staging of drilling equipment and supplies. The drilling subcontractor will be responsible for providing a temporary decontamination pad that will contain all overspray, liquids, and solids generated during decontamination procedures. The drilling subcontractor will provide their electricity source (such as a generator) because electricity is not available at the staging area. Upon completion of the work, the staging area will be returned to pre-work conditions, and the decontamination pad will be removed by the subcontractor. Materials used for the decontamination pad that have come into contact with contamination will be cleaned or disposed of as waste.
- All parts of the heavy equipment that will be in direct contact with potentially contaminated media will be decontaminated before leaving the site. During drilling, parts of the drilling equipment that have been in direct contact with soil will be brushed or scraped to remove debris and then washed before moving to the next boring location to avoid cross-contamination. The heavy equipment decontamination procedures will consist of brushing or scraping debris from exposed equipment

surfaces, as required, followed by high-pressure hot water wash and rinse cycles using a steam-cleaning unit.

- Other reusable equipment will be decontaminated before use. The subcontractor will decontaminate the split-spoon samples after each sampling effort. Decontamination may be performed in the same manner as is used for the heavy equipment or by using one of the following solutions:
  - A nonphosphate detergent (Liqui-Nox or equal) or potable water solution wash
  - A potable water rinse
- All boreholes will be backfilled with cement-bentonite grout after testing.
- General good housekeeping practices will be followed (including equipment maintenance).
- Visible dust onsite produced by the investigation activities will be minimized to the extent possible. Jacobs staff will be performing dust monitoring during the investigation program. The geotechnical drilling subcontractor will apply water to minimize or eliminate airborne dust.

The Field Team Leader will be responsible for confirming BMPs are installed and implemented properly at appropriate locations. Additionally, the Field Team Leader will be responsible for initiating corrective actions, as necessary.

3.2 Geotechnical Characterization

The site investigation consists of 14 geotechnical borings with SPTs and bedrock coring in select boreholes. In addition to SPTs, Shelby tube sampling and vane shear testing will be performed at selected locations as deemed appropriate based on identified ground conditions. The investigation includes drilling of borings and soil sampling under the full-time direct supervision of a Jacobs geotechnical engineer, who will prepare a soil boring log recording lithologic descriptions and sample information.

Soil borings are to be advanced by a sonic rig to obtain a continuous sample of the material, and collected samples will be tested based on the geotechnical laboratory testing requirements. The site investigation also includes the installation of up to three monitoring wells in select borehole locations. Monitoring wells will only be installed if static groundwater is encountered in the overburden material.

The number, location, and depth of the boreholes may be modified depending on accessibility and the subsurface conditions encountered in consultation with the Jacobs geotechnical engineer. SPTs will be conducted per relevant and applicable SOPs in the PDI Work Plan and to the BMPs of the drilling subcontractor.

3.2.1 Scope of Work

The proposed scope of work to be completed under the PDI Work Plan consists of the following tasks:

- Perform site reconnaissance, and review the project area to ascertain the location of existing underground and overhead services and evaluate accessibility, safe distance, required equipment, and existing site constraints. Stake the boring locations, and complete utility clearance before beginning the drilling work.
- Conduct geotechnical investigation, sampling, and in situ tests at the proposed borehole locations.
- Install up to four temporary piezometers to monitor groundwater levels in the area of the proposed repositories (two at Kelley Mine Area and two at Shields Avenue).

- Conduct laboratory testing of specific samples collected during the field investigation program.
- Prepare a Geotechnical Investigation Data Summary Report with the results of the subsurface site investigation.

3.2.2 Proposed Borehole Location Staking and Survey

Before ground disturbance, the proposed borehole locations identified on Figures 1 through 4 will be surveyed and staked. These locations will be reviewed for accessibility and safety concerns by ARC or their representatives and modified accordingly. As-built boring locations will be surveyed after completion of the investigation.

3.2.3 Drilling Equipment

Based on field conditions, anticipated boring depths and recommendations from the geotechnical engineer, the drilling method available and selected for the borehole investigation proposed at the site is *ASTM D6914, Standard Practice for Sonic Drilling for Site Characterization and the Installation of Subsurface Monitoring Devices*. In this method, continuous core samples are recovered and provide a representative lithological column. Sonic drilling uses high-frequency vibration to reduce friction and advance the core barrel. Once the sample is contained in the core barrel, the casing is sonically advanced over the core barrel, protecting the borehole against cave in.

3.2.4 General Procedures

Sonic drilling is generally performed by advancing a core barrel using sonic frequencies. After the core barrel is in place, casing is advanced over the core barrel to protect the borehole from collapsing. The core barrel is then retrieved producing a relatively undisturbed sample.

SPT sampling will be performed in accordance with *ASTM D1586, Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils*. For shallower boreholes (proposed depth of 25 feet), the SPT sampling interval will be set at every 2.5 feet within the top 10 feet and every 5 feet thereafter. Additional continuous sampling at 2.5-foot intervals may be required if fill material or soft zones are encountered. In the case of deeper boreholes (proposed depth of 100 feet or more), the SPT sampling interval will be set at every 10 feet, unless there is a change in stratigraphy conditions. Standard shear vane tests (ASTM D2573) will be performed in fine-grained, cohesive soils as determined by the field geotechnical engineer.

Undisturbed Shelby tube samples will be collected in fine-grained cohesive soils in accordance with *ASTM D1587*, *Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes* as necessary during the investigation program. The undisturbed sampling location and number is dependent on the nature, stiffness, and consistency of the cohesive soils encountered. Vane shear tests will also be performed in fine-grained, cohesive soils in accordance with *ASTM D2573, Standard Test Method for Vane Shear Test in Saturated Fine-Grained Soils*. The onsite Jacobs geotechnical engineer will determine the location of the undisturbed samples and vane shear testing.

Geotechnical samples from drill cuttings and from the SPTs will be collected using self-sealing plastic bags. A photoionization detector (PID) reading will be obtained on each of the samples and reported in the field boring logs. Each soil and rock sample will be assigned a unique sample identification (ID) during each sampling event indicating, as a minimum:

- Project name
- Geotechnical engineer and specialist initials

- Boring number
- Sample ID
- Sample depth interval
- Recovery depth
- SPT blow counts (where applicable)
- Date

Upon encountering bedrock, rock coring will be performed on select borings to obtain rock cores to characterize the rock mass. A minimum of 20 feet will be cored into the bedrock. Rock coring runs will be performed in 5-foot intervals. The rock cores will be stored in timber boxes 5 feet long marked clearly with the following information:

- Project name
- Boring number
- Top and bottom elevation
- Total core recovery (TCR) in inches and percentage
- Rock quality designation (RQD) in inches and percentage

Groundwater monitoring well installation is proposed at select boreholes locations if groundwater is encountered before encountering bedrock or other boring refusal. The wells will be constructed of 2-inch-diameter polyvinyl chloride (PVC) casing with a 0.010-inch machine-slotted screen. The wells will be installed by a licensed well technician, and the well will intersect the groundwater table with an appropriate length of solid PVC riser pipe with threaded joint connections extending to grade. Screen lengths of 10 or 20 feet will be selected based upon field observations. The wells will be constructed in compliance with the regulations set by the State of Montana.

3.3 Standard Operating Procedures

This QAPP includes specific standards and SOPs (in the PDI Work Plan submitted under separate cover) that apply to particular field and laboratory testing activities. Depending on circumstances and needs, it may not be possible or appropriate to follow the SOPs exactly in all situations due to site conditions, equipment limitations, and limitations of the standard procedures. When necessary to perform an activity that does not have a specific SOP, or when the SOP cannot be followed, existing SOPs may be used as a general guidance, or similar SOPs (not listed in this report) may be adopted if they meet the project DQOs.

For drilling, the selected methods are ASTM D6914, *Standard Practice for Sonic Drilling for Site Characterization and the Installation of Subsurface Monitoring Devices* and ASTM D1586 for SPT sampling. All modifications to SOPs or adoption of changes to SOPs will be approved by the following individuals:

- Field Team Leader
- Contractor Project Manager (CPM)
- Project Senior Geotechnical Engineer
- Drilling Subcontractor Quality Assurance Officer (QAO)

The modifications will be documented in the field logbook or the final project report, as appropriate.

3.4 Documents and Records

The Jacobs geotechnical engineer or specialist and Field Team Leader will be onsite to observe and record notes during the field geotechnical investigation. Field boring logs will serve as a daily record of events, observations, and measurements during field activities. A detailed field boring log will be kept of the soil and rock stratigraphy of each borehole.

Additional drilling observation information will also be obtained and included in the detailed field boring log, such as:

- Resistance to the drilling
- Rod drop
- Loss of drilling fluid circulation
- Soil sample and rock core descriptions

Other details pertaining to work activities but not relevant to geotechnical data collection will be either written down in the field boring logs or a separate field notebook, depending on the relevancy of the information to be recorded.

3.4.1 Field Documentation

This section describes additional procedures and protocols for documentation of field activities, including record taking using the field logbook and field photography.

3.4.1.1 Field Boring Logs and Monitoring Well Installation Logs

All factual data from the geotechnical investigation will be recorded in the field boring logs. When field boring logs are used, each log sheet will have a unique document control number, be bound, and have consecutively numbered pages. The field boring log will be written in a way similar to the final boring log. It should be assumed that the administrative staff typing the field log into gINT (software for generating the final boring logs) will not make any engineering judgments or interpretations of the log. Therefore, the ultimate goal is to provide a legible field log meeting requirements set forth here that can be input into gINT without interpretation.

The field boring logs will include the following information:

- Boring number
- Approximate location and offset information
- Geographic coordinates and elevation (if available)
- The date and time drilling began and ended each day
- Drilling equipment and method and tools used, including SPT hammer type information and type of rods for SPT sampling
- Sample information, including:
  - Sample numbering
  - Sample type (that is, SPT, Shelby tube)
  - Depth interval
  - SPT results
  - Pocket penetrometer results
  - Lithological stratigraphy description, including:
    - Depth and elevation boundaries
    - Color

    - Consistency or relative density
    - Moisture condition
  - Rock core description, including:
    - Rock coring run number and length interval
    - TCR
    - RQD
    - Fracture frequency per foot
    - Lithological description
    - Strength, number, type, and condition of the discontinuities and its surface
- Observed groundwater levels, including date and time
- Comments, such as:
  - Run times for coring
  - Changes in drilling fluid color
  - Drilling chatter
  - Rod bounce (as in driving on a cobble or boulder)
  - Damaged Shelby tubes field vane or SPT sampler
  - Equipment malfunctions, abnormal occurrences, or materials identified
  - PID readings

Monitoring well installation logs will also be prepared. The logs will include the applicable information listed here, as well as the well construction details and comments related to the well development process.

Entries in field boring logs and well installation logs will be legible and contain accurate documentation of field testing activities. Field records are the basis for written reports, so the language in the records will be objective and factual. Once completed, field borings become accountable documents and are maintained as part of the project files.

3.4.1.2 Field Notebook (“Yellow Books”)

Each logger will keep a field diary as a permanent record of the field daily activities. All entries will be in waterproof ink, and any mistakes will be lined out with a single line and initialed by the person making the correction. Individual field team members may be responsible for required documentation based on specific tasks assigned by the Field Team Leader or CPM.

Significant observations, measurements, relevant data, and results will be clearly documented in the data log or the field logbook. At a minimum, the following will be recorded:

- A description of the field task
- Time and date fieldwork started and ended each day
- Location and description of the work area, including sketches, if possible, map references, and references to photographs collected
- Names and titles of field personnel
- Name, address, and phone number of field contacts or site visitors (including agency representatives and auditors)
- Meteorological conditions at the beginning of fieldwork and ensuing changes in the weather conditions

- Documentation of health and safety-related activities (tailgate meetings)
- Details of the fieldwork general activities
- All field measurements and observations made, including drawings and figures if appropriate
- Field analysis results
- Delays, downtime, and standby time periods, including issues encountered and potential impact on schedule
- Personnel and equipment decontamination procedures
- Deviations from the QAPP or applicable field SOPs (including the PDI Work Plan)
- Summary of work completed for the day, including:
  - List of borings completed for the day
  - Soil drilling and sampling total linear footage drilled for the day
  - Rock coring linear footage drilled for the day
  - Summary of quantity for other relevant pay items

3.4.1.3 Field Photographs

Photographs will be taken of field activities. When practical, photographs should include a scale in the picture, as well as a white board with relevant information (including time, date, and location). Additional photographs documenting site conditions will be taken, as necessary. All photographs taken during sampling activities will be recorded in the bound field notebook or appropriate field data sheets (refer to field SOPs in the PDI Work Plan), and will specifically include the following for each photograph taken:

- Time, date, and location
- Photograph or video number from the camera or video recorder
- The identity of the person taking the photograph or video
- Direction that the photograph was taken, and description of the subject photographed

Soil samples and rock core photographs will be properly identified. Rock cores will be laid out inside the core boxes in book-fashion, reading left to right from the top left. Clearly legible depths should be marked on spacers at the beginning and end of each core run. Foam spacers should be used and marked to indicate the position and depths of core loss or cavities (when there is no recovery). The actual depth of the core should be represented in the core boxes, regardless of the amount of rock recovered.

Core breaks made to fit the boxes and other mechanical breaks should be marked on the core, with the marks shown on either side of the break: >|< (the vertical line indicates the break).

The core boxes (timber boxes) will be labeled with relevant information. Placement of the rock cores should reflect the actual depths drilled (cored). For example, length of no recovery zones must be clearly visible in the photograph. A photo of the entire core box will be taken, with two additional closeups of each half (left and right). Additional closeup photographs will be taken as needed to document special feature (such as shear and infill zones).

The digital files will be placed with the electronic project files, with copies of supporting documentation from the bound field logbooks.

3.4.2 Sample Handling, Documentation, and Shipping

Once in the field, the Field Team Leader is responsible for proper sampling, labeling, preserving, and transfer of samples to the courier for transport to the laboratory. Completed chain-of-custody (CoC) forms will be generated for all samples. The Field Team Leader is responsible for properly filling out the CoC forms with the following information:

- Project name
- Project Manager (PM) name and telephone number
- Unique sample ID
- Date and time of sample collection
- Sample designation as composite or grab
- Number of containers
- Analyses required
- Name of person collecting samples
- Custody transfer signatures and dates and times of sample transfer from the field to transporters and to the laboratories
- Laboratory name, address, and contact information
- Special instructions

At the end of each sampling day, the person collecting samples will be responsible for checking all sample labels to make sure they are accurate and correspond with the CoC form. The samples will be stored at a protected and designated location up to the time of shipment to the laboratory for the applicable testing. The sample storage area will be selected to protect and maintain the collected samples moisture, at room temperature and away from disturbance. It is anticipated that samples will be shipped for laboratory testing at the end of each working week. The shipping method and procedure will minimize disturbance to collected samples, including moisture, will preserve the sample's integrity, and avoid sample vibration.

Upon receipt of the samples, the laboratory will check the original CoC form, request analysis documents, and compare them with the labeled contents of each sample container for corrections and traceability. The laboratory will sign the CoC form and record the date and time received. The laboratory will send a Sample Confirmation Receipt to the PM and Project Chemist, documenting the sample IDs, parameters, and expected due date. The PM or their designee will review the Sample Confirmation Receipt for accuracy of the sample IDs and requested parameters.

3.5 Instrument and Equipment Testing, Inspection, Maintenance, and Calibration

To verify continual quality performance of the instruments and equipment, testing, inspection, and maintenance will be performed and recorded as described in this section. All field and laboratory equipment will be operated, maintained, calibrated, and standardized in accordance with applicable AASHTO and ASTM procedures, and the laboratory recommended procedures.

3.5.1 Field Equipment

Field equipment will be examined to verify that it is in proper operating order before its first use. Equipment, instruments, tools, gauges, and other items requiring preventive maintenance will be serviced and calibrated in accordance with the manufacturer's specified recommendations, as necessary. Field equipment will be cleaned (decontaminated) and safely stored between each use. Any routine maintenance recommended by the equipment manufacturer will also be performed and documented in field notebooks.

Calibration certificates for SPT hammer energy transfer ratio and vane shear test torque meter equipment will be obtained before mobilization, and the certificates will be required to be completed within 1 year before the start of the drilling work.

Calibration of handheld field equipment, such as PID and dust monitoring equipment, will be completed in the field at the beginning of each day and recorded in the field notebooks. Equipment deficiencies or malfunctions during fieldwork will be recorded as appropriate in the field notebooks. The SOPs for the field equipment are listed in the PDI Work Plan submitted under separate cover.

3.5.2 Decontamination Procedures

An area will be selected and secured for the placement of a temporary decontamination pad and staging of drilling equipment and supplies. A temporary decontamination pad that will contain all overspray, liquids, and solids generated during decontamination procedures will be provided by the geotechnical drilling subcontractor. The subcontractor will also provide their electricity source (that is, generator) to allow performing decontamination duties.

Upon completion of the work, the staging area will be returned to pre-work conditions, and the decontamination pad will be removed by the subcontractor. Materials used for the decontamination pad that have come in contact with contamination will be cleaned or disposed of as waste.

All parts of the heavy equipment that will be in direct contact with potentially contaminated media will be decontaminated before beginning work and leaving the site. The sonic core and other equipment that encounter soil will be decontaminated between boreholes. Any part of the drilling equipment that has been in direct contact with soil will be brushed or scraped to remove debris, washed, and fully decontaminated before moving to the next boring location to avoid cross-contamination. The heavy equipment decontamination procedures will consist of brushing or scraping debris from exposed equipment surfaces, as required, followed by at least three separate high-pressure hot water wash and rinse cycles using a steam-cleaning unit.

Other reusable equipment will be decontaminated before use. The subcontractor will decontaminate the split-spoon samples after each sampling effort. Decontamination will be performed in the same manner as the heavy equipment or by using a nonphosphate detergent (Liqui-Nox or equal) and potable water solution wash and a potable water rinse.

3.6 Laboratory Testing

All laboratory testing will be performed by Terracon Consultants Inc. (laboratory testing subcontractor). Terracon has all the necessary accreditations to perform the anticipated laboratory testing program following AASHTO and ASTM standards. All the laboratory testing will be performed by qualified staff and following the applicable standards.

3.7 Inspection and Acceptance of Supplies and Consumables

All supplies and consumables received for the project (such as sampling equipment, calibration standards) will be checked to verify their condition is satisfactory and free of defects that would affect performance. The types of equipment needed to complete sampling activities are described in the relevant field SOPs (in the PDI Work Plan). Inspections of field supplies will be performed by the Field Team Leader or field team members.

3.8 Data Management Procedures

This section describes how the data for the project will be managed, including field and laboratory data.

The QAPP quality records will be maintained by ARC. These records, in either electronic or hard copy form, may include the following:

- Project work plans with approved modifications, updates, and addenda
- Project QAPP with approved modifications, updates, addenda, and corrective or preventive actions
- Field documentation, including field boring logs, field notebooks, data sheets, and photographs, in accordance with the PDI Work Plan
- Laboratory documentation, including laboratory test results, data sheets, and photographs

Hard copy field records will be maintained in the project's central data file, where original field documents are filed chronologically for future reference. These records will also be scanned to produce electronic copies. The electronic versions of these records will be maintained on a central Microsoft Structured Query Language (SQL) server system that is backed up regularly. The data will be stored on the SQL server, and a Microsoft Access database will be set up to access the data, which can then be exported to Microsoft Excel, if necessary, for further graphing and interpretive analysis. Using a Microsoft-based software configuration is widely accepted with support from Microsoft and allows for data sharing with most hardware configurations.

All field and laboratory testing data and supporting documentation will be subject to appropriate review to confirm the accuracy and completeness of original data records before uploading into the project database. Field and laboratory data that have been reviewed and approved in a hard copy format will be entered into an electronic system to be uploaded to the project database. Following these review steps, field testing electronic data files will be imported to the project database.

Standardized data import formats and procedures will be used to upload field testing data into the electronic database. Standardized parameter names, numerical formats, and units of measure will be applied to the original information to facilitate comparability across data sets and within the database. Using these standardized formats will allow for quick and easy querying to retrieve data. Data can be retrieved by exporting into an Excel file and, because the data will be formatted with parameter names, made into a pivot table for data interpretation.

4 Assessment and Oversight

Assessment and oversight of data collection and reporting activities are designed to verify that testing is performed in accordance with the procedures established in this QAPP. Qualified staff will be selected for overseeing the investigation.

4.1 Field Activities Oversight

Oversight personnel will have the ability to view field testing and determine the appropriateness of the recorded data to verify that the appropriate data are recorded. Deviations from this QAPP will be brought to the attention of oversight personnel. If the deviation is first determined by oversight personnel, ARC or field representatives will be immediately notified. Reasons for such deviations will be recorded in the field logbook, along with corrective actions to be implemented, if required. If oversight personnel request a deviation from the QAPP, the deviation and the reasons for the deviation will be noted and then signed by the agency personnel.

4.2 Corrective Action Procedures

Corrective action is the process of identifying, recommending, approving, and implementing measures to counter unacceptable procedures or performance that does not meet quality standards, which can affect data quality. Corrective action can occur during field activities, laboratory analyses, and data assessment.

Nonconforming equipment, items, activities, and conditions, and unusual incidents that could affect data quality and attainment of the project's DQOs will be identified, controlled, and reported in a timely manner. A nonconformance is defined as a malfunction, failure, deficiency, or deviation that renders the quality of an item unacceptable or indeterminate in meeting the project's DQOs.

Corrective actions implemented by field personnel will follow appropriate field SOPs (listed in the PDI Work Plan), as necessary. Corrective actions to address nonconformance conditions will be taken in consultation with the CPM and reported on a Nonconformity and Corrective Action Form (NCAF) form included in Appendix A, as necessary. If corrective action requests are not in complete accordance with approved project planning documents, EPA will be consulted, and concurrence will be obtained before the change is implemented.

Completion of corrective actions should be evidenced by data that meet the project's performance criteria for field testing. If the data do not meet the performance criteria, and a data collection error or faulty procedure cannot be found, the results will be reviewed by the CPM and Field Team Leader in consultation with the contractor QAO to assess whether retesting is required.

All corrective actions taken will be documented and reported to the Field Team Leader and CPM. If corrective action requests are not in complete accordance with approved project planning documents, EPA will be consulted, and concurrence will be obtained before changes are implemented. Corrective action records will be included with the QAPP records.

4.3 Corrective Action During Data Assessment

During data assessment, Jacobs field personnel will be responsible for quality assurance (QA) in consultation with office personnel to determine the need for corrective action. Potential types of corrective action may include retesting by the field team. The appropriate and feasible corrective actions will depend on the ability to mobilize the field team and whether the data to be collected are necessary to meet the required QA objectives. If corrective action requests are not in complete accordance with approved project planning documents, EPA will be consulted, and concurrence will be obtained before the change is implemented. Corrective actions of this type will be documented by the Jacobs field personnel on an NCAF and will be included in subsequent reports.

4.4 Quality Assurance Reports to Management

After the investigation and laboratory testing are complete, the results will be presented in the Geotechnical Investigation Data Summary Report, summarizing the testing activities and factual data. The report will include the following:

- Summary of the investigations performed
- Summary of investigation results
- Summary of collected factual data (that is, survey, groundwater levels, tables, and graphics)
- Laboratory testing data reports
- Photographs documenting the work conducted
- Recommendations for additional phases, if necessary

All data will be incorporated into the report, and the report will be submitted in draft final form to ARC, EPA, and Montana Department of Environmental Quality (DEQ) for review.

5 Health and Safety

All work completed by Jacobs and its subcontractor during the investigation will be performed in accordance with the procedures described in the SSHASP. The SSHASP may be updated to include unique hazards that materialize during field activities for the investigation, including identifying necessary task risk assessments to perform before field work. All work completed within the permitted mine area must be completed in accordance with MR's SSHASP, site-specific training, and applicable MSHA regulations and requirements.

Jacobs will supervise site activities for compliance with health and safety and technical requirements of the project. The drilling subcontractor is required to submit their Health and Safety Plan for the proposed project, along with the safety records of the company and of all subcontractors for review. Jacobs and the drilling subcontractor must coordinate the work and access requirements with the plant site and contractors working on the same site. The drilling subcontractor must submit a work plan and site access request a minimum of 10 business days before starting work.

6 Data Validation and Usability

This section addresses the final project checks conducted after the data collection phase of the project is completed to confirm that the data obtained meet the project objectives and to estimate the effect of deviations on data usability to achieve the stated DQOs (Section 2.0). Data collected in the field will be sufficient to make appropriate estimations of geotechnical characteristics necessary for the repository and haul route designs.

Data reported by the drilling subcontractor will be reviewed by the CPM and QAO to verify the data meet sufficient quality standards to answer the estimation statement. Documentation in the field boring logs and field notebooks will be verified against the reported test data results to verify there are no discrepancies between reported testing and requirements described in this QAPP and recorded in the field by the geotechnical engineer. Types of information collected in the boring logs and field notebooks that will be checked by the CPM or QAO include:

- Date
- Field team or Field Team Leader
- Physical description of sample location
- Sampling method and sample ID numbers
- Date and time of collection
- Field measurements
- Field observations, including drawings and figures, if appropriate
- Field notebooks in secure location
- Complete field forms, as required

Basic data verification checks performed by the CPM or QAO will include an evaluation of the following, as applicable for each analytical method:

- Completeness of data package
- Instrument calibration, as required
- Internal standards

7 Project Organization

This section provides descriptions of the responsibility and authority of the main organizations and personnel involved.

7.1 Organizations

This section lists the organizations and their roles and responsibilities.

7.1.1 Environmental Protection Agency

In the Silver Bow Creek (SBC)/Butte Area National Priority List (NPL) area, EPA is the lead agency for Remedial Design (RD) and Remedial Action (RA) efforts by Settling Defendants (SDs) (ARC and BSB). Communications with ARC, DEQ, and BSB will be led by EPA, and then EPA will review and authorize this QAPP and PDI Work Plan.

7.1.2 Montana Department of Environmental Quality

DEQ is the state agency for review of RD and RA efforts by SDs in the SBC/Butte Area NPL area. DEQ will review and provide comments to EPA on the associated QAPP and PDI Work Plan.

7.1.3 Atlantic Richfield Company

ARC manages, funds, and performs the project RD and RA construction. ARC will administer the contract and monitor the overall progress of RD and RA activities conducted under the project and will be the primary authority regarding interpretation of the project contract requirements.

7.1.4 Butte-Silver Bow

The BSB City-County is the local agency for coordination and review of RD and RA efforts conducted in the SBC/Butte Area NPL area.

7.1.5 Montana Resources

Portions of the drilling scope will be conducted on MR property. Jacobs will coordinate with MR in advance of drilling activities and adhere to the requirements of the access agreement established between ARC and MR.

7.1.6 Jacobs

Jacobs is the ARC Engineer for site investigation activities. Jacobs will be responsible for administering subcontracts for the necessary remaining professional services, including:

- Site subsurface investigations
- Laboratory testing
- Repository design
- Spoils transport

Jacobs developed this QAPP and PDI Work Plan. Jacobs will also deliver the approved QAPP to the parties on the distribution list by email.

7.1.7 Drilling Subcontractor

The selected subcontractor, Yellow Jacket, will be responsible for completing the geotechnical drilling work in compliance with the PDI Work Plan and QAPP. The subcontractor will have primary responsibility for the following:

- Project safety
- Drilling activities
- Daily project documentation
- Reporting
- Drilling quality control (QC) measures associated with implementing the geotechnical drilling work

Jacobs will serve as QA subcontractor on behalf of ARC to oversee drilling activities.

7.1.8 Contract Laboratory

The selected Laboratory Testing Subcontractor Terracon will be responsible for completing the laboratory testing work in compliance with the PDI Work Plan and QAPP.

7.2 Personnel

This section lists the personnel and their roles and responsibilities for the site. During construction activities, EPA, DEQ, ARC, and the subcontractors will be coordinating or attending the following activities as needed:

- Technical meetings
- Preconstruction site walks
- Weekly progress meetings
- Pre-final and final inspections

7.2.1 EPA Project Manager

Ms. Emma Rott and/or Ms. Molly Roby are the EPA Remedial PMs for this work. Both of them are based in EPA Region 8 office in Helena, Montana. They will be the primary contact for EPA and ensure that RDs and RAs comply with the Agency RD and RA Statement of Work (SOW). They will be responsible for review and approval of this QAPP and other project documents. During construction, they will be responsible for providing construction oversight on behalf of EPA.

7.2.2 DEQ Project Manager

Mr. Daryl Reed is the DEQ Project Officer for this work. Mr. Reed is based in the DEQ Remediation Division office located in Helena, Montana. He will be the primary contact for DEQ and verify that RDs and RAs comply with the EPA's RD and RA SOW. Mr. Reed will be responsible for review and approval of this QAPP and other project documents on behalf of DEQ.

7.2.3 Atlantic Richfield Project Manager

The ARC Liability Manager is Mr. Josh Bryson. Mr. Bryson is responsible for overall programmatic planning for technical and administrative components of RD and RA work completed by ARC. Mr. Bryson will be the primary technical point of contact for EPA, DEQ, BSB, and the project engineer and subcontractor.

7.2.4 Field Team Leader

The Field Team Leader for the geotechnical investigation will be Mr. Josh Butler. Mr. Butler will confirm that all members of the field team review and follow this QAPP when implementing field activities. The Field Team Leader will also be responsible for maintaining the QAPP. The Field Team Leader will conduct daily safety meetings, assist in field activities, and document activities in the logbook.

The Field Team Leader will be responsible for equipment coordination, problem solving, and decision-making in the field for technical aspects of the project. Additionally, the Field Team Leader will provide on-the-ground observations of site activities to verify compliance with the following requirements:

- Technical project requirements
- Health, safety, security, and environment requirements
- The SSHASP

Finally, the Field Team Leader will identify potential integrity management issues, as appropriate, and prepare required project documentation.

7.2.5 Project Safety and Health Manager

The Safety and Health Manager, Mr. Bill Berlett from Jacobs, will conduct the initial safety meeting before starting investigation fieldwork. Mr. Berlett will verify that work crews comply with all health and safety requirements and revise the project SSHASP, if necessary.

8 Schedule

Table 1 shows the proposed schedule for deliverables and work activities described in this QAPP. With EPA approval, the PDI Work Plan field efforts are scheduled to begin in April 2024. Effective, open communication will be critical to achieving timely completion of the project. As such, periodic meetings between EPA and ARC will be scheduled to discuss the status of ongoing efforts, upcoming events, and deliverables and to resolve issues that may arise.

Because of the uncertainty associated with the schedule for several tasks that are out of ARC's control (including seasonal constraints, EPA review periods, the need to fill data gaps), the schedule lists important deliverables and design activities relative to major milestones and other conditions.

Table 1. Proposed Schedule

Scope Item	Start	End
QAPP and PDI Work Plan Preparation and Review	1/24/2024	4/1/2024
Geotechnical Investigation – Field Work	5/6/2024	6/21/2024
Geotechnical Investigation Report	5/20/2024	8/20/2024

9 References

Figures

Figure 1. Kelley Mine Area Repositories C and E Proposed Borehole Locations.

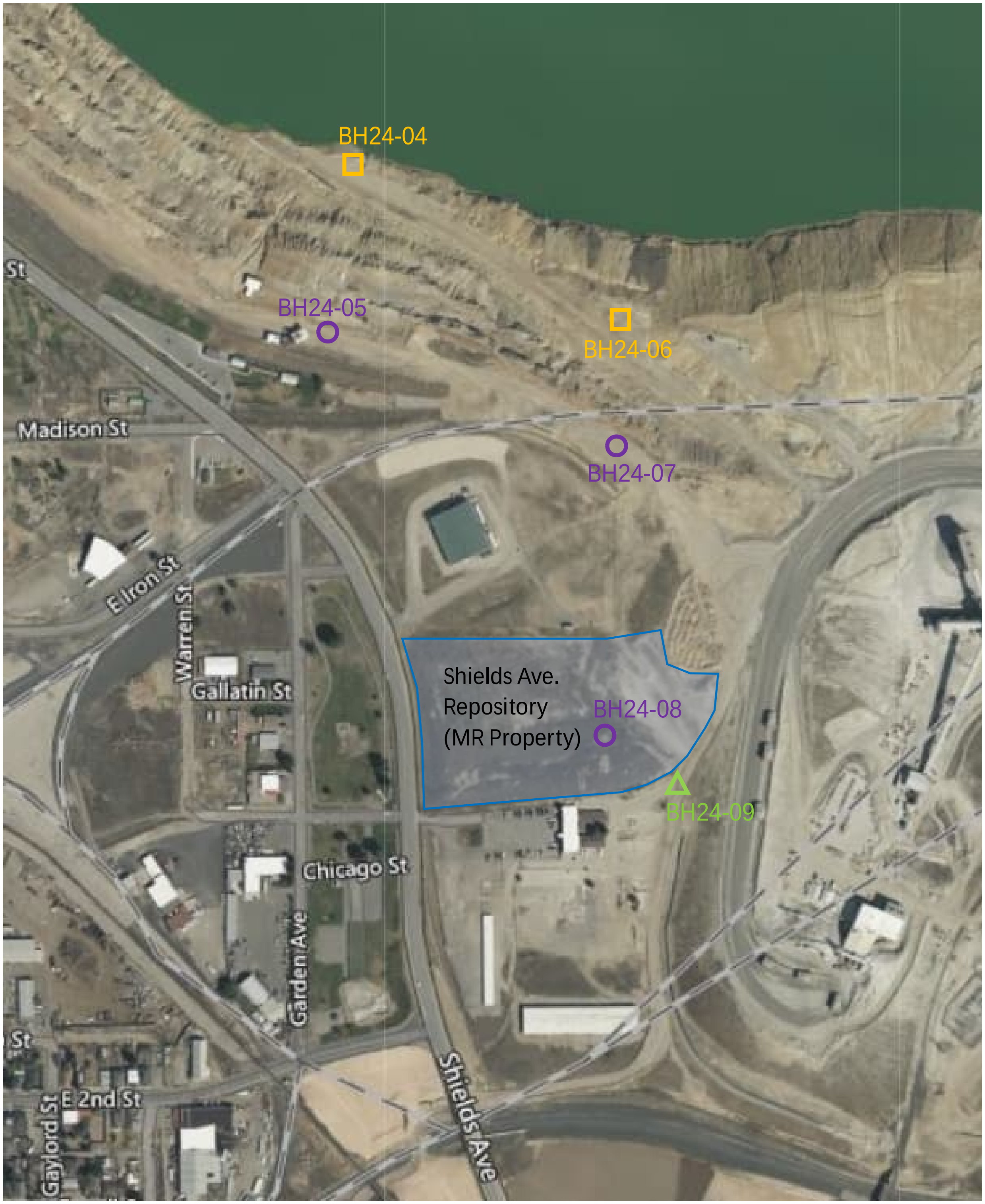

Figure 2. Shields Avenue Repository (circle), South Ramp (square), and Slurry System Piping (triangle) Proposed Borehole Locations.

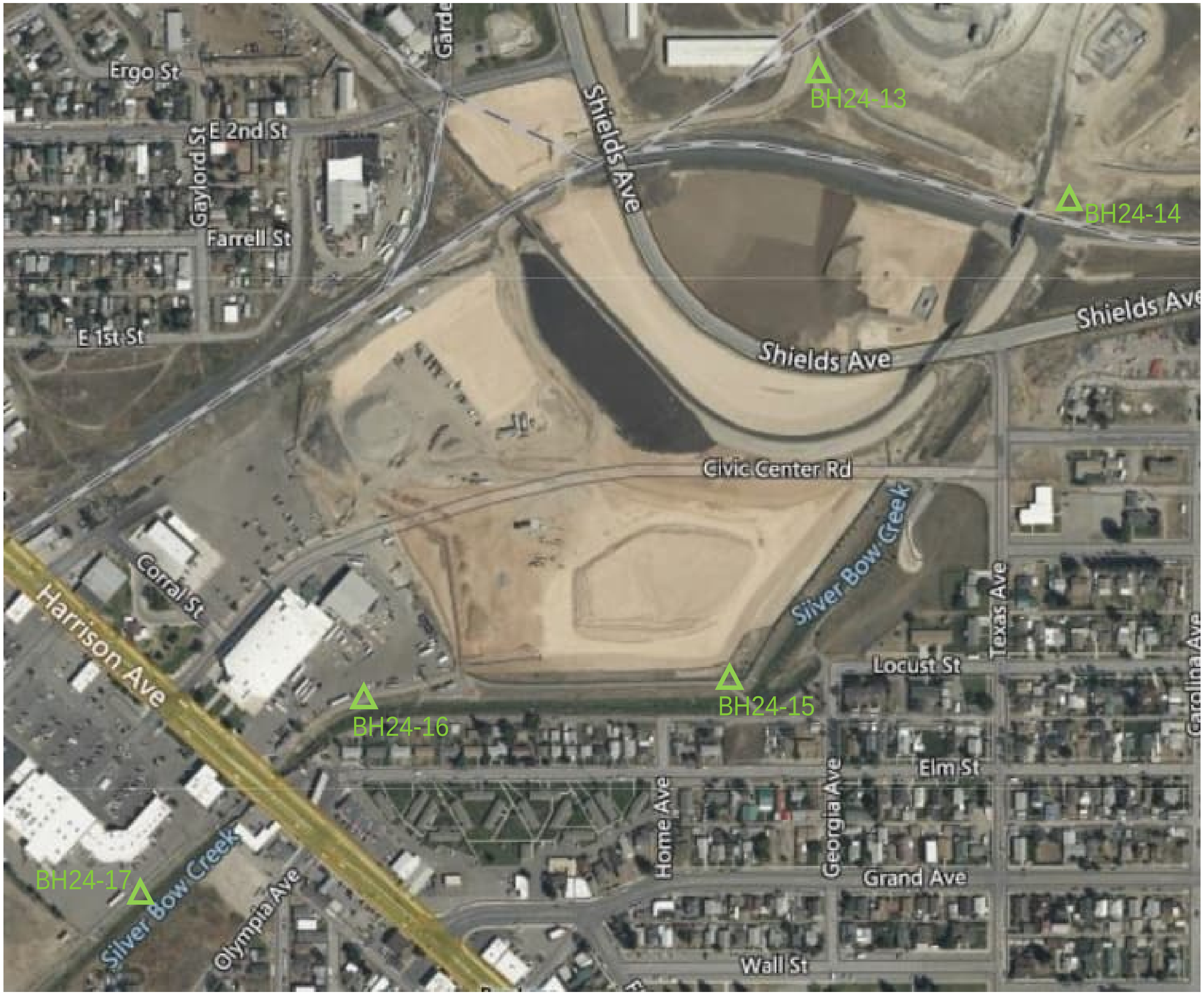

Figure 3. Slurry System Piping Proposed Borehole Locations (triangle).

Appendix A
Corrective Action Report

Jacobs

Nonconformity and Corrective Action Form		Effective Date: 3/22/2021	Rev. No: 1.0
Issuing Process:	Process Owner:	Date Last Reviewed: 3/22/2021	

PART 1 – General Information

Date issue identified:		**Nonconformity Report Number:**	
Prepared By:		**Company/ Title/Position:**	
Project Name:		**Project Number:**	
Client Number:		**Contract Number:**	

PART 2 – Nonconformity Report

Statement of Nonconformity- Describe in specific detail the requirement not being met including objective evidence
Contract Requirement or Project Specification/Drawing
Test/Inspection/Audit/Activity Identifying Nonconformity

PART 3 – Reporting/Notification

Reportable to Client/Stakeholders?	Yes ☐ No ☒
Note Action Taken and Why	

PART 4 – Investigation/Root Cause Determination

Investigative Process Findings:
Additional Observations:

Jacobs

Root Cause Analysis (RCA) Performed?	Yes ☐		No ☐
RCA Date:		**RCA Attendees:**	
Probable Root and Contributing Cause(s): Describe in detail the probable root cause of the issue, ideally using an industry recognized tool for causal analysis			
Implications of Usability of Data:			
Potential Effect:			
Nonconformity Categorization	Major ☐ Minor ☐		

PART 5 – Immediate Correction:

Immediate Correction(s) and Completion Dates: Describe in detail the steps taken to immediately contain/resolve the issue in the short term
Personnel Responsible for Implementation of Immediate Corrective Action(s):

Immediate Corrective Actions have been verified as completed		
Printed Name	**Signature Verifier**	**Date**
Printed Name	**Signature Verifier**	**Date**

PART 6 – Long Term Corrective Actions

Long-Term Corrective Actions and Completion Dates: Describe in detail the steps taken to eliminate the root cause and prevent reoccurrence and to prevent occurrence in similar systems/activities, including any data/metrics to validate the effectiveness of the actions taken

Personnel Responsible for Implementation of Long-Term Corrective Actions:

Long-Term Corrective Actions have been Fnonverified as completed		
Printed Name	**Signature Quality Manager**	**Date**
Printed Name	**Signature Quality Manager**	**Date**