Spring 5-21-2021

SILVER BOW CREEK/BUTTE AREA NPL SITE BUTTE PRIORITY SOILS OPERABLE UNIT

Pioneer Technical Services, Inc.

Atlantic Richfield Company

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May 26, 2021

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RE: Butte Priority Soils Operable Unit (BPSOU) 2021 Final Unreclaimed Sites Quality Assurance Project Plan (QAPP) Revision 1

Agency Representatives:

I am writing to you on behalf of Atlantic Richfield Company to submit revisions to the Butte Priority Soils Operable Unit (BPSOU) 2021 Final Unreclaimed Sites Quality Assurance Project Plan (QAPP). Final Agency approval to the Plan was provided in September 2018 and Final cover sheets were provided in October 2018. Current revisions to the plan being submitted for Agency approval consist of formatting, project personnel changes, distribution list updates, goal clarifications, and Standard Operating Procedure updates as summarized below.

Changed in Revision 1:

Distribution Lists: Updated to current distribution list.

Updated text to reference BPSOU CD and Field Sampling Plans (FSPs) rather than sampling and analysis plans (this affected Section 2).

Section 2.1: Updated Project Organization and Responsibilities:

- Updated Atlantic Richfield Liability Manager to Mike Mc Anulty
- Updated Atlantic Richfield Quality Assurance Manager to David Gratson
- Updated title for Josh Bryson and added Eric Hassler as Operations Manager
- Added Brandon Warner as Field Team Supervisor

Section 2.2 and Section 2.3: Updated text to reference the BPSOU CD and specify metals-impacted sediment.

Section 2.4: Updated Step 2: Identify the Goals of the Study to include: Are contaminants, if present on site, the result of historic mining operations or related activities? Minor word changes in Step 4 and Step 7 for clarification.

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Section 2.6.7: Added metals-impacted to clarify type of sediments.

Added Section 3.1 Site Evaluation Objectives (which changed the numbering in the entire section).

Section 3.3.2 Sedimentation Analysis (previously Section 3.2.2): Added metals-impacted to clarify type of sediments.

Section 6: Added reference to BPSOU CD.

Appendix A: Figures/Charts

- Updated A.1, A.2, A.3

Appendix B: SOP Updates

- SOP-SA-04 – revised 11/12/2020
- SOP-DE-02 – revised 09/08/2020

Appendix C: Updated forms.

A summary of the updates is included in Appendix D. Technical elements of the QAPP are expected to remain applicable for sampling efforts to be conducted in 2021, and no additional changes were made.

Included with this letter as an attachment are pages that changed from Revision 0 to Revision 1 of the QAPP. The full Revision 1 report may be downloaded at the following link, under Appendix D.

LINK: https://pioneertechnicalservices.sharepoint.com/:f:/s/submitted/EgOIFKW-NnNEuLFBhE_XtasBduDJdCiMo5HQcwx1-5BnrQ

If you have any questions or comments, please call me at (907) 355-3914.

Sincerely,

Mike McAnulty

Mike Mc Anulty
Liability Manager
Remediation Management Services Company
An affiliate of **Atlantic Richfield Company**

Attachment: 2021 Final Unreclaimed Sites QAPP Revision 1 pages that changed from Revision 0

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SILVER BOW CREEK/BUTTE AREA NPL SITE
BUTTE PRIORITY SOILS OPERABLE UNIT

2021

Final

Unreclaimed Sites
Quality Assurance Project Plan (QAPP)

Atlantic Richfield Company

Revision 1. May 2021

SILVER BOW CREEK/BUTTE AREA NPL SITE
BUTTE PRIORITY SOILS OPERABLE UNIT

2021

Final

Unreclaimed Sites
Quality Assurance Project Plan (QAPP)

Prepared for:

Atlantic Richfield Company
317 Anaconda Road
Butte, Montana 59701

Prepared by:

Pioneer Technical Services, Inc.
1101 S. Montana Street
Butte, Montana 59701

Revision 1. May 2021

APPROVAL PAGE

Quality Assurance Project Plan for
Butte Priority Soils Operable Unit
Unreclaimed Sites

Approved: _____ Date: 9-13-18
Nikia Greene, Remedial Project Manager
U.S. Environmental Protection Agency

Approved: _____ Date: 9-5-18
Daryl Reed, State Project Officer
Montana Department of Environmental Quality

Approved: _____ FOR: Date: 9-5-18
Terry Moore, Quality Assurance Manager
Atlantic Richfield Company

Approved: _____ Date: 9-4-18
Josh Bryson, Operations Project Manager
Atlantic Richfield Company

Approved: _____ Date: 4 Sept 2018
Julia Crain, Quality Assurance Manager
Butte-Silver Bow County

Approved: _____ Date: 9/4/18
Eric Hassler, Superfund Operations Manager
Butte-Silver Bow County

Revision 1. 2021
Plan is effective on date of last signature above.

DOCUMENT REVISION SUMMARY

Revision No.	Author	Description	Date
Rev 0	Pioneer Technical Services, Inc.	Cover Sheet – Final	October 2018
Rev 1	Pioneer Technical Services, Inc.	Annual Update	May 2021

DISTRIBUTION LIST

Silver Bow Creek/Butte Area NPL Site Butte Priority Soils Operable Unit Soils
Sampling Quality Assurance Project Plan (QAPP)
Butte, Silver Bow County, Montana

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LIST OF APPENDICES

LIST OF ACRONYMS

Acronym	Definition	Acronym	Definition
BPSOU	Butte Priority Soils Operable Unit	**mm**	millimeter
BSB	Butte-Silver Bow	**NPL**	National Priority List
CD	Consent Decree	**NRDP**	Natural Resource Damage Program
CLP	Contract Laboratory Program	**MS**	Matrix spike
COC	contaminant of concern	**PARCC**	precision, accuracy, representativeness, comparability, and completeness
CoC	chain of custody	**PDF**	Portable Document Format
CPM	Contractor Project Manager	**PPE**	personal protection equipment
DEQ	(Montana) Department of Environmental Quality	**PRR**	Poore, Roth and Robinson
DOJ	Department of Justice	**QA**	Quality assurance
DQA	Data Quality Assessment	**QAM**	Quality Assurance Manager
DQO	Data Quality Objective	**QAO**	Quality Assurance Officer
DSR	Data Summary Report	**QAPP**	Quality Assurance Project Plan
FSP	Field Sampling Plan	**QC**	Quality control
EDD	electronic data deliverable	**RCRA**	Resource Conservation and Recovery Act
EPA	U.S. Environmental Protection Agency	**RL**	reporting limit
GPS	Global Positioning System	**ROD**	Record of Decision
HAZWOPER	Hazardous Waste Operations and Emergency Response	**RPD**	Relative percent difference
HSSE	Health Safety Security and Environment	**RSD**	Relative standard deviation
ICP-AES	Inductively Coupled Plasma Atomic Emission Spectroscopy	**SOP**	Standard operating procedure
IM	Integrity Management	**SRM**	Standard reference material
LCS	laboratory control sample	**SSHASP**	Site-Specific Health and Safety Plan
LCSD	Laboratory control sample duplicate	**USGS**	U.S. Geological Survey
MBMG	Montana Bureau of Mines and Geology	**XRF**	X-ray fluorescence
mg/kg	milligrams per kilogram		

1.0 INTRODUCTION AND PURPOSE

Unreclaimed sites exist within the Butte Priority Soils Operable Unit (BPSOU) that could pose a threat to human health or surface water quality due to the presence of historic mine waste. Although many source areas have been previously reclaimed, areas still exist in which soils have not yet been evaluated; such sites may provide a pathway for human exposure or impact surface water quality via storm water runoff. These unreclaimed sites will be evaluated in accordance with Appendix D, Attachment C, Section 8.0 of the BPSOU Consent Decree (CD) (EPA, 2020).

This Quality Assurance Project Plan (QAPP) describes the activities necessary to conduct soil sampling and characterization activities on unreclaimed sites. It also describes the quality assurance/quality control (QA/QC) policies and procedures to be used during collection and analysis. This QAPP is intended to standardize the sampling process to provide accurate and defensible testing results necessary to make a final site declaration. A Field Sampling Plan (FSP) will be produced to outline the site-specific activities to be performed at each unique site. Supplemental information mentioned throughout the document is included in the appendices below:

Appendix A Figures/Charts
Appendix B Standard Operating Procedures
Appendix C Forms
Appendix D Summary of Revisions and Bibliography of Data Summary Reports

A map in Appendix A shows the BPSOU area. Individual site figures will be provided for site-specific FSPs. Data unique to each site will be provided in a data summary report (DSR), in addition to historic data. Reference to implemented FSPs and completed DSRs will be updated on an annual basis, as provided in Appendix D. A bibliography that includes historic and new site data will be added annually to this document in Appendix D as site sampling is completed. A separate report will be prepared for each site that will include the declaration as to whether reclamation is required (as described further in Section 2.0).

This QAPP was prepared in a manner consistent with the EPA *Requirements for Quality Assurance Project Plans (EPA QA/R-5)* (EPA, 2001) and the BPSOU *Quality Management Plan* (Atlantic Richfield, 2016) and includes the following:

- Project management and objectives.
- Measurement and data acquisition.
- Assessment and oversight.
- Data review.

The sections below provide the basic plan elements and describe the appropriate content required for planning soil sampling and analysis activities at unreclaimed sites within the BPSOU. This QAPP expands or references information from other site-wide documents to comply with the EPA Requirements for QAPPs (EPA, 2001) and to present project-specific requirements.

2.0 PROJECT MANAGEMENT

This section addresses project administrative functions, project concerns, and goals and approaches to be followed during characterization sampling activities on the specific site.

2.1 Project Organization and Responsibilities

An example chart showing the overall organization of the project team is provided in Appendix A. Responsibilities of key individuals comprising a project team are described below.

Liability Manager – Mike Mc Anulty (Atlantic Richfield Company)

The Liability Manager monitors the performance of the contractor(s), consults with the Contractor Project Manager (CPM) and Quality Assurance Officer (QAO) on deficiencies, and helps finalize resolution actions.

Program Director – Eric Hassler (Butte-Silver Bow [BSB])

The Program Director monitors the performance of the contractor(s), consults with the CPM and QAO on deficiencies, and helps finalize resolution actions.

Quality Assurance Manager (QAM) – David Gratson (Atlantic Richfield Company) or Julia Crain (BSB)

The QAM interfaces with the Operations Manager on company policies regarding quality and has the authority and responsibility to approve specific QA documents including this QAPP.

Field Team Supervisor – Brandon Warner (BSB)

The Field Team Supervisor coordinates and oversees BSB-led field evaluation teams and may also oversee specialty contractors. The Field Team Supervisor ensures that the QAPP for each project area has been reviewed by all members of the BSB-led field team and that the QAPP is properly followed during field activities.

Contractor

Atlantic Richfield and/or BSB may assign a Contractor to be responsible for completing individual site investigations.

Contractor Project Manager (CPM)

The CPM is responsible for scheduling all sampling work to be completed and ensuring that the work is performed in accordance with the requirements contained herein. The CPM is also responsible for consulting with the specific project QA personnel regarding any deficiencies and finalizing resolution actions. The CPM for each project will be listed in the supporting documents for each project area under this QAPP.

Field Team Leader

The Field Team Leader ensures that the QAPP for each project area has been reviewed by all members of the field team and that the QAPP is properly followed during field activities. The Field Team Leader will conduct daily safety meetings, assist in field activities, and document activities in the logbook.

The Field Team Leader is responsible for equipment, problem solving and decision making in the field, and for addressing technical aspects of the project. The Field Team Leader will provide "on-the-ground" overviews of project implementation by observing site activities to ensure compliance with technical project requirements, Health Safety Security and Environment (HSSE) requirements, and the Site-Specific Health and Safety Plan (SSHASP). Finally, the Field Team Leader is responsible for identifying potential Integrity Management (IM) issues, as appropriate, and preparing required project documentation.

Contractor Quality Assurance Officer (QAO)

The Contractor QAO is responsible for verifying effective implementation of QAPP requirements and procedures. This includes reviewing field and laboratory data and evaluating data quality. The Contractor QAO for each project will be listed in the supporting documents created for each project area under this QAPP and will be independent from the unit generating the data.

Safety and Health Manager

Where applicable the Safety and Health Manager is responsible for developing the SSHASP and reviewing it with all members of the field team. The Safety and Health Manager will lead applicable Task Risk Assessments and conduct the initial safety meeting prior to starting fieldwork. The Safety and Health Manager will ensure that work crews comply with all site safety and health requirements and will revise the SSHASP, if necessary.

Laboratory

The laboratory selected to analyze the samples will be an approved laboratory within the EPA Contract Laboratory Program (CLP) (a national network of EPA personnel, commercial laboratories, and support contractors whose fundamental mission is to provide data of known and documented quality). The CLP Laboratory will have QA personnel familiar with the approved QAPP. The CLP Laboratory will be responsible for reviewing final analytical reports, scheduling analyses, and supervising in-house custody procedures. Note: Hereafter, the word laboratory (or Laboratory) denotes a CLP Laboratory.

2.2 Problem Definition and Background

As stated previously, unreclaimed sites exist within the BPSOU that could pose a threat to human health or surface water quality due to the presence of historic mine waste. Although many source areas have been previously reclaimed, areas still exist in which soils have not yet been evaluated; such sites may provide a pathway for human exposure or impact surface water quality via storm water runoff. The list of known unreclaimed sites is identified in Appendix D, Attachment C, Section 8.0 of the BPSOU CD (EPA, 2020). Additional unreclaimed sites may be

identified as remedial actions are implemented within BPSOU. If so, the newly identified sites will be evaluated in accordance with this QAPP.

This QAPP will function as a general QA document for all soil sampling activities at unreclaimed sites within the BPSOU. Individual figures and supporting documents will be included in the site-specific FSPs.

2.3 Project/Task Description

Soil sampling will be performed to provide contaminant of concern (COC) concentrations and pH at each site in accordance with this QAPP and site-specific FSPs. These concentrations, as well as other site characteristics, will support making a declaration as to whether site-specific response actions are necessary. The objectives of the QAPP are as follows:

1. Provide consistent results in identifying the specific types and quality of data needed to support decisions regarding each site as a result of the investigation.
2. Describe specific requirements for collecting and analyzing samples.

Below is a summary of project tasks to be completed under this QAPP at each unreclaimed area.

Sampling: Surface soil samples will be collected as described in standard operating procedure (SOP) Surface Soil Sampling General (SOP-S-01) included in Appendix B. The location and number of samples collected will be detailed in the documents specific to each site. The location and number of samples collected will be based on individual site parameters as determined by experienced personnel familiar with the local area.

Analysis: Field samples will consist of 3-point composites. All samples will be analyzed using the Thermo Fisher Scientific Niton Analyzer XL3 X-Ray Fluorescence (XRF) Analyzer (Niton XL3) per Operating XL3 X-Ray Fluorescence Analyzer General SOP (SOP-SFM-02), and for pH per Field Measurement of pH in Soil SOP (SOP-SFM-01) (refer to Appendix B). Confirmation (composite) samples will be analyzed according to laboratory SOP S-MN-I-313 Rev.30 - 6010-200.7 and S-MN-I-359 Rev. 27 in Appendix B). Field personnel will send the confirmation samples to the laboratory at a rate of 1 per 10 samples, with additional samples sent to the laboratory for confirmation if the field results show the COC levels at 35% above and 35% below established action/screening levels to limit decision errors. The 35% criteria may be adjusted based on the statistical analysis of the confirmation sample results.

Quality Control: The QC measures required at each site will be completed as per this QAPP.

Data Management: The Contractor QAO will review and evaluate analytical data for quality (refer to Section 0).

Documentation and Records: The field team will ensure that all samples collected have a corresponding Global Positioning System (GPS) location, XRF measurement, and that each sample is appropriately logged and documented (refer to Section 2.6 and Section 3.0).

Data Summary Report: For each site, the CPM will develop a DSR. The DSR will contain historical data collected from the site (if available), new information about the site, photographs, field notes, and a summary of all results. When finalized, the DSR listing information will be included in Appendix D of this QAPP.

Site Declaration: For each site, the CPM will complete a site declaration as to whether the site is at or above human health action levels or Waste Identification Criteria in Table 1 in Appendix 1 of the BPSOU CD (EPA, 2020), whichever is more stringent, whether the site is contributing metals-impacted sediment to existing or planned wet weather control features, and whether historic mine waste at the site is contributing to the degradation of surface water quality.

2.4 Data Quality Objectives and Criteria

The EPA Data Quality Objective (DQO) process (EPA, 2006a) is used to establish performance or acceptance criteria that serve as the basis for designing a plan to collect data of sufficient quality and quantity to support the goals of a study. Each step of the DQO process defines criteria that will be used to establish the final data collection designs. This QAPP followed the EPA process to develop criteria for each site. The process consists of seven steps as follows:

Step 1: State the Problem.
Step 2: Identify the Goals of the Study.
Step 3: Identify Information Inputs.
Step 4: Define the Boundaries of the Study.
Step 5: Develop the Analytical Approach.
Step 6: Specify Performance and Acceptance Criteria.
Step 7: Develop the Plan for Obtaining Data.

These DQOs (detailed below) will be used to guide the data collection and analysis activities.

Step 1: State the Problem.

The purpose of this step is to describe the problem to be studied so that the focus of the investigation will not be ambiguous.

Unreclaimed sites are identified as areas that could negatively impact human health and/or materially degrade water quality in downgradient waterways. Site evaluations will determine which, if any, COCs are present within the soil, if concentrations are above action/screening levels listed in Table 1 and Table 2 (on page 7) and support future remedial action efforts within the BPSOU area.

Step 2: Identify the Goals of the Study.

This step identifies the principal question the study will attempt to resolve and what actions may result.

Specific to each unreclaimed site, the key question would be:

- Are contaminants, if present on site, the result of historic mining operations or related activities?
- Are the residual concentrations of arsenic, lead, or mercury present and above the human health action levels shown on Table 1 (on page 7)?
- Are the residual concentrations of cadmium, copper, zinc, arsenic, lead, or mercury present and above the storm water screening criteria shown on Table 2 (on page 8)?

Resulting alternative actions addressing the principal question regarding COC levels include the following:

- Perform additional remedy in the area if COC concentrations exceed action levels.
- Perform additional site-specific analyses if COCs exceed storm water screening criteria.
- If acceptable levels of COCs are met, take no action. (See Unreclaimed Area Decision Logic diagram in Appendix A.)

Step 3: Identify Information Inputs.

The purpose of this step is to identify the informational variables that will be required to resolve the decision statements and determine which variables require environmental measurements.

For each individual site, the following information is required to satisfy or resolve the decision statements:

- Existing data from the individual project area or a similar area to provide preliminary information on variability in sample measurements across the site. This will be important when designing the sampling strategy.
- Arsenic, cadmium, copper, lead, mercury, and zinc results from soil samples that are representative of metals concentrations within the individual project sites.
- BPSOU EPA-developed risk-based action levels for arsenic, mercury, and lead that will dictate the action level, according to land zoning; and will lead to a resolution of the decision statement.
- BPSOU EPA-developed risk-based screening levels for cadmium, copper, and zinc that will dictate the screening level and inform possible remediation efforts.

Step 4: Define the Study Boundaries.

The purpose of this step is to define the spatial and temporal boundaries of the problem.

For each identified unreclaimed area, the site and sample locations will be delineated on a drawing and submitted with supporting documents to the Agencies for review and comment. Samples will be collected at each site to determine if the COC concentrations are above action/screening levels (Table 1 and Table 2 on page 7). Each site is within the BPSOU

boundaries and, generally, the sites are connected by the main drainages at the base of the contributing areas. The work will focus on each individual site and on how any possible contamination will affect the connected drainage.

Potential constraints that could delay fieldwork include adverse weather conditions or the inability to obtain property access. Major project delays resulting from these constraints will be recorded in the field logbooks and reported to the agencies. Individual site sampling efforts are expected to take one to two days to complete. Sampling will be performed as weather conditions permit but most of the effort will be completed from June through October until all collective sites have been characterized.

Step 5: Develop the Analytical Approach.

The purpose of this step is to define the parameters of interest, specify action levels, and integrate any previous DQO inputs into a single statement.

For the BPSOU area, the EPA developed specific risk-based screening levels for human health COCs (arsenic, mercury. and lead) based on land-use exposure scenarios. Current BSB zoning will inform individual site action levels. The screening levels for cadmium, copper, and zinc will inform possible future remediation efforts. Field samples will be tested for pH at a minimal rate of 1 per 200-foot x 200-foot area. The action/screening levels are in Table 1 and Table 2 following.

Table 1. BPSOU Soil Action Levels for Human Health

Analyte	Solid Media	Action Levels
Lead[1]	Non-Residential/ Residential	2,300 mg/kg/1,200 mg/kg
Arsenic[1]	Recreational/Commercial/Residential	1,000 mg/kg/500 mg/kg/250 mg/kg
Mercury[2]	Residential	10 mg/kg

1. From EPA Record of Decision (ROD) BPSOU, Table 12-1 (EPA, 2006b).
2. From Field Screening Criteria and Procedures Phase 7 and 8 Remedial Action, Streamside Tailings Operable Unit removal action levels (Pioneer, 2011).
mg/kg: milligrams per kilogram

Table 2. BPSOU Soil Screening Criteria for Storm Water COCs

Analyte	Action/Screening Levels
Cadmium [1,2]	20 mg/kg
Copper [1,2]	1,000 mg/kg
Zinc [1,2]	1,000 mg/kg
Lead[1,2]	1,000 mg/kg
Arsenic[1,2]	200 mg/kg
Mercury[1,2]	10 mg/kg

1. From Field Screening Criteria and Procedures Phase 7 and 8 Remedial Action, Streamside Tailings Operable Unit removal action levels (Pioneer, 2011).
2. Screening levels to determine possible remediation efforts.

mg/kg: milligrams per kilogram.

Elevated levels of arsenic, cadmium, copper, mercury, lead, and zinc may have negative impacts on human health and surface water quality. If 3 of the 6 contaminant screening level criteria listed in Table 2, are exceeded or if 1 of the contaminant criteria exceeds 5,000 milligrams per kilogram (mg/kg), the site will be further analyzed to determine the materiality of the load to the degradation of surface water.

If results from any of the project site samples are above human health action levels, the site will be addressed in future remediation efforts. If screening criteria are exceeded for surface water analytes, additional analysis will be performed to determine the materiality of the load to the degradation of surface water.

The usability of all analytical data will be evaluated and validated consistent with the procedures described within this document.

Step 6: Specify Performance and Acceptance Criteria

The purpose of this step is to specify the decision maker's tolerable limits on decision errors, which are used to establish performance goals for the data collection design.

There are limitations in evaluating data over a given area and the inherent variability of the matrix being sampled. Measurement error occurs from the inherent variability in the collection, preparation, and analysis of an environmental sample. Individual site FSPs will specify the process to obtain the necessary data to determine the residual COCs within the site while minimizing the matrix, collection, preparation, and analysis variability. Sampling design and measurement errors will be minimized by following the procedures outlined in this QAPP and the SOPs in Appendix B. All FSPs will specify that an adequate quantity of information will be collected to define the residual COCs within the site, and that the data should have confidence and precision factors in fair agreement with previously collected data and QC criteria.

Step 7: Develop the Plan for Obtaining Data.

The purpose of this step is to identify a resource-effective data collection design to generate data that satisfies the DQOs.

The FSP detailed in Section 3.0 is designed to ensure that data will be of sufficient quality and quantity to determine COCs concentrations at each unreclaimed site and help determine if additional remedial action is required. Any site-specific instructions or conditions will be detailed in the supporting documents for each site. The plan will ensure that data from other (related and current) investigations will be comparable due to compatible approaches. Within the sampling design, representatives from the Agencies are encouraged to participate in the field activities and provide input on specific sample locations.

Evaluation of unreclaimed sites will include the following tasks and follow the specific measurement performance criteria listed in Section 2.4.1. This will allow the data gathered to be used in future remediation efforts.

- Complete a site condition inspection and geotechnical analysis of subsidence areas, if necessary.
- Determine any rill depths and adjust sampling depths as needed if rill depths exceed stated sampling depths.
- Conduct the soil sampling activities.
- Capture pertinent data with daily logs and photographs.
- Develop draft and final data summary documents.

2.4.1 Measurement Performance Criteria for Data

Specific data validation processes ensure that analytical results are within acceptable limits. All the information and data gathered according to this QAPP for each unreclaimed site will be checked to ensure they are usable for their intended purposes. The data will be classified as screening data with definitive confirmation and are anticipated to meet data quality requirements for the soil sampling process. An evaluation of analytical control limits and of the precision, accuracy, representativeness, comparability, and completeness (PARCC) parameters will be performed. If significant issues with the data are found, data results will be discussed with the EPA and Montana Department of Environmental Quality (DEQ) project managers. The EPA, in consultation with DEQ, will then decide if the total study error could factor into or cause an incorrect decision. Using this approach, the probability of making an incorrect decision (i.e., either a false negative or positive) based on the information collected is considered small.

The definitions of the PARCC parameters are provided below along with the acceptance criteria for data collected.

Precision
Data precision is assessed by determining the agreement between replicate measurements of the same sample and/or measurements of duplicate samples. The overall random error component of

precision is a function of sampling. The analytical precision is determined by the analyses of field duplicates and by replicate analyses of the same sample. An analytical duplicate is the preferred measure of analytical method precision. When analytes are present in samples at concentrations below or near the quantitation limit, precision may be evaluated using duplicate analyses of laboratory-prepared samples such as laboratory control sample (LCS) duplicates (LCSD) and laboratory matrix spike (MS) duplicate samples. Precision can be measured as relative percent difference (RPD) or as relative standard deviation (RSD, also known as a coefficient of variation). See Precision Calculations in Appendix A.

For this QAPP, precision will be determined by the analyses of field duplicates, field replicates, laboratory (analytical) duplicates, confirmation samples, and the evaluation of the RPD or RSD for these various paired measurements. The RPD goals for measures of laboratory (analytical) precision are provided in example SOPs in Appendix B. Information related to specific sites will be included in the individual site FSP or remedial action work plan. The RPD field precision goal for soil field duplicates will be 35% for sample pairs with both sample results being greater than 5 times the reporting limit (RL). For soil field duplicate pairs with 1 or both sample results being less than 5 times the RL, a difference of less than or equal to 2 times the RL (difference ≤ 2xRL) will be used as the precision goal.

Accuracy/Bias

Accuracy of sample analysis is controlled primarily by the laboratory and is reported as bias. Accuracy is the degree of difference between the measured or calculated value and the true value. It is a measure of the bias or systematic error of the entire data collection process. Potential sources of systematic errors include the following:

- Sample collection methods.
- Physical or chemical instability of the samples.
- Interference effects during sample analysis.
- Calibration of the measurement system.
- Contamination.

Field and laboratory field blanks will be analyzed to assess artifacts introduced during sampling, transport, and/or analyses that may affect the accuracy of the data. The XRF field check sample data will be completed and included in the summary reports. Laboratory accuracy will be determined by LCS results. Proposed minimum detection limits and reporting limits for the specific analytes are listed in Table 3. Accuracy in the field is assessed through the adherence to all sample handling, preservation, and holding times.

Table 3. Proposed Minimum Detection Limits and Reporting Limits for Specific Analytes

Analyte	Proposed Minimum Detection Limits (mg/kg)	Reporting Limit (mg/kg)
Arsenic[1]	0.200	1.00
Cadmium[1]	0.0095	0.15
Copper[1]	0.0400	0.50
Lead[1]	0.100	0.50
Zinc[1]	0.278	1.00
Mercury[2]	0.00931	0.02

1. EPA Method 6010 (EPA, 2014).
2. EPA Method 7471B (EPA, 2007).
mg/kg: milligrams per kilogram.

Representativeness
Data representativeness is defined as the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or environmental conditions. Representativeness is a qualitative parameter that is most concerned with the proper design of the sampling program. Representativeness will be achieved through judicious selection of sampling locations and methods. This QAPP has been designed to ensure that the sample locations selected are representative of the medium being sampled and that there are a sufficient number of samples to meet the project DQOs and to satisfy the project remedial action design elements. Sample representativeness may also be evaluated using the RPD values for field duplicate results.

Comparability
Data comparability is defined as the measure of the confidence with which one data set can be compared to another. Comparability is a qualitative parameter but must be considered in the design of the sampling plan and selection of analytical methods, QC protocols and data reporting requirements. Comparability will be ensured by analyzing samples obtained in accordance with this QAPP as well as the appropriate SOPs, which are comparable to the sampling methods used during previous investigations at similar sites. All data will be reported in units consistent with standard reporting procedures so that the results of the analyses can be compared with results from previous investigations. Soil will be reported in units of milligrams per kilogram (mg/kg).

Completeness
Completeness refers to the amount of usable data produced during a sampling and analysis program. The procedures established in this QAPP are designed to ensure, to the extent possible, that data will be valid and usable. To achieve this objective, every effort will be made to collect each required sample and to avoid sample loss.

2.5 Special Training/Certification

All field personnel conducting site investigations will be trained to collect samples and will review the requirements of this QAPP in a project meeting held prior to fieldwork. Hazardous Waste Operations and Emergency Response (HAZWOPER) training will be required for field sampling personnel. All field personnel will read the QAPP document prior to the start of

fieldwork and will acknowledge that they have read and understand the document at the time of the project meeting. Field personnel will be trained on how to use field equipment and in decontamination procedures and custody procedures in accordance with field data collection SOPs used for the sampling event (Section 3.2.5). This training will be documented within the appropriate section of each SOP. The CPM and Safety and Health Manager will be responsible for ensuring that training requirements are fulfilled.

Depending on individual company or agency safety policies, a review of the associated SSHASPs will be conducted with all field personnel prior to fieldwork to assess the particular hazards at the specific site and the control measurements that have been put in place to mitigate these hazards. The SSHASP review will cover all other safety aspects of working at the site including personnel responsibilities and contact information, additional site-specific safety requirements and procedures, and the emergency response plan.

Laboratories providing analytical services will have a documented QC program that complies with EPA Requirements for QAPPs (EPA, 2001). The laboratory QA personnel will be responsible for ensuring that all laboratory personnel have been properly trained and are qualified to perform assigned tasks.

2.6 Documentation and Records

This section describes procedures for documentation management and record keeping related to this QAPP and the individual site investigation reports from initial record generation through final data formatting and storage.

2.6.1 Property Access Agreements

Atlantic Richfield or BSB will request that property owners grant access to their properties for all remedial action-related activities including sampling. The CPM will manage access requests, track their status, and maintain copies of completed agreements received from property owners. Completed agreements will be photocopied and scanned with the electronic version stored on a server. Photocopied access agreements will also be copied to the project record files. Fieldwork will not proceed until access agreements have been finalized.

2.6.2 Field Logbook

All field sampling activities and field data collection will be recorded in a bound field logbook dedicated to the project or on field data sheets (XRF results) that are referenced in the logbook. All documents will follow SOP-SA-05 Project Documentation General (Appendix B). The CPM or Field Team Leader will be responsible for recording information including the sample collection date and time, weather conditions, field crew members, site visitors, samples collected, procedures used, field data collected, and deviations from the site FSP. Sufficient information should be recorded to allow the sampling event to be reconstructed without having to rely on the sampler's memory. Individual field team members may be responsible for required documentation based on specific tasks assigned by the CPM or the Field Team Leader.

Completed field data sheets and logbooks will be photocopied and scanned with the electronic version stored in the project file. Photocopied field records will also be copied to the project record files (refer to Section 3.9). No bound field logbooks will be destroyed or thrown away even if they are illegible or contain inaccuracies that require a replacement document.

2.6.3 Field Photographs

Field personnel will also document field-sampling activities using a digital camera. Documentation of all photographs taken during sampling activities will be recorded in the bound field logbook or appropriate field data sheets (refer to field SOPs for the individual site), and will specifically include the following for each photograph taken:

- The photographer's name, date, time, and the general direction faced.
- A brief description of the subject and the fieldwork portrayed in the picture.
- Sequential number of the photograph.

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

2.6.4 Chain of Custody Records

After samples have been collected, they will be maintained under strict chain of custody (CoC) protocols in accordance with SOP-SA-04 Chain of Custody Form for Environmental Samples General (Appendix B). The field sampling personnel will complete a CoC form (Appendix C) for each shipping container of samples to be delivered to the laboratory for analysis. A copy of each as-transmitted CoC form will be scanned and stored in the project file. The CoC records will also be copied to the project record files (refer to Section 3.9). For complete custody protocols refer to Section 3.2.5.

2.6.5 Analytical Laboratory Records

Results received from the laboratory will be documented both in report form and in an electronic format. Laboratory documentation will include copies of the signed CoC forms, laboratory confirmation reports that include information on how samples were batched and the analyses requested, sample data packages that include the laboratory report and the electronic data deliverable (EDD), and any change requests or corrective action requests. Section 5.1.3 lists the laboratory reporting requirements in detail. The deliverable ("data package" or "report") issued by the laboratory will include data necessary to complete level 2 validation of laboratory results in accordance with specifications included in Section 5.2. Original hard copy deliverables and electronic files received from laboratory will be maintained with the project QA/QC records.

2.6.6 Project Data Reports

A summary report for each site will be prepared following data collection, evaluation, and interpretation. The report will include figures displaying sample locations, analytical results, required declarations about the results (Section 2.3), and program records as detailed in Section

2.6.8. The summary report will be submitted to the Agencies for comment and approval. The approved summary report will be included as an appendix to this QAPP.

2.6.7 Site Declaration

A Site Declaration as to whether a specific site is at or above human health action levels, whether the site is contributing significant metals-impacted sediment to existing or planned wet weather control features, and whether the site is materially contributing to the degradation of surface water quality will be submitted to the Agencies for comment and approval. The approved site declaration will be included as an appendix to this QAPP.

2.6.8 Program Quality Records

Program quality records are documents that furnish objective evidence of the quality of items or services, activities affecting quality, or the completeness of data. These records will be organized and managed by the remedial action entity and will include the following, at a minimum:

- This QAPP and any approved revisions or addenda.
- Site-specific figures and supporting documentation.
- SSHASP and any addenda.
- Copies of SOPs for field data collection, with any updates or revisions or addenda to those SOPs.
- Incoming and outgoing project correspondence.
- Copies of completed access agreements for the individual properties sampled.
- Individual property maps including any field drawings and field photographs.
- Field documentation forms.
- Copies of all bound field logbooks.
- Copies of all field data sheets.
- Electronic field forms.
- Electronic copies of completed sample CoC forms.
- Copies of all laboratory agreements and amendments.
- As-received laboratory data packages (hard copy and electronic).
- Documentation of field and/or laboratory audit findings and any corrective actions.
- Draft and final delivered versions of all reports and supporting documents.

Any addendums or revisions to this QAPP, such as annual updates, will be electronically distributed to all parties identified on the distribution list by the Atlantic Richfield Liability Manager. All records will be maintained and archived electronically for future reference.

3.0 DATA ACQUISITION

This section describes the requirements to complete sampling events at a site to ensure the collection methods and handling procedures result in reliable data that can inform possible future efforts at the site.

3.1 Site Evaluation Objectives

The primary objective of preliminary site evaluations is to characterize the site to determine if sampling and testing are required due to historic mining operations. Site evaluations include visual examination of the site area to determine historic mining activity, identify presence of erosion such as gullies and/or rills, and the potential contribution to downstream contaminated sediment accumulations.

3.2 Soil Sampling Objectives

The primary objective of sampling the unreclaimed sites is to comprehensively characterize COC concentrations in the soils. Samples will be collected from multiple, hand dug test holes from possible waste sources as identified by trained professionals and outlined in the specific supporting documents for each individual site. If no potential source areas are identified, general samples will be collected to characterize soil types and usage areas.

For a specific site, the site layout figure and supporting documents will identify the number of potential samples to be collected, show the locations of each sample, and list any specific sample labeling requirements. Sampling will be conducted by professionals familiar with the sampling processes and the local area. If, during field activities, additional samples need to be collected to evaluate a potential source, the reason and sample collection method will be recorded in the field logbook. Field personnel and representatives from the Agencies (if present) will make the decisions regarding collection of additional "opportunistic" samples to characterize site conditions accurately.

If a site becomes inaccessible due to weather conditions, the sampling date will be adjusted as required. If access to the site is not granted (access agreement not signed by private property owner), the site will remain uncharacterized and be removed from further consideration, barring Agency intervention on the behalf of the sampling team.

To mitigate variability within soil samples, field personnel will use field XRF analysis, which provide instantaneous data that allows the field team to adjust the location and number of samples while at the site. Field XRF confirmation samples will be submitted to the laboratory for arsenic, cadmium, copper, lead, mercury, and zinc analysis.

All sampling will be conducted as per SOPs listed in the Table 4 below. All applicable SOPs are provided in Appendix B.

Table 4. List of Applicable SOPs for Sampling

Reference Number	Title and Revision Date	Originating Organization
SOP-S-01	Surface Soil Sampling General 1/4/2018	Pioneer
SOP-SA-01	Soil and Water Sample Packaging General 1/4/2018	Pioneer
SOP-SA-04	Chain of Custody Forms for Environmental Samples General 1/4/2018	Pioneer
SOP-SA-05	Project Documentation General 1/4/2018	Pioneer
SOP-SFM-01	Field Measurement of pH in Soil 1/4/2018	Pioneer
SOP-SFM-02	Operating XL3-X-Ray Fluorescence Analyzer General 1/4/2018	Pioneer
SOP-DE-01	Personal Decontamination Procedures General 1/4/2018	Pioneer
SOP-DE-02	Equipment Decontamination General 1/4/2018	Pioneer
S-MN-I-313	6010-200.7 Rev. 30 4/14/2017	Pace
S-MN-I-359	7471B Rev. 27 3/1/2018	Pace
S-MN-I-460	Preparation of Solid Samples Rev 19 7/17/2017	Pace

3.2.1 General Sampling Procedure

All unreclaimed site areas will be sampled according to the general procedures in this QAPP and the more detailed procedures listed in the specific site layout figure and supporting documents. Prior to soil sampling activities, a site condition inspection and geotechnical analysis of subsidence areas, if necessary, will be completed. Sample locations identified in the site layout figure will be checked to ensure they meet the sampling objectives. Potential source areas will be sampled preferentially. Depending on real time XRF readings, additional samples can be obtained to define the extent of any contaminants found. If no visually identifiable source areas are present, samples will be collected from general locations to characterize soil types and usage areas. A minimum of 5 combination samples (15 subsamples) will be collected at smaller sites (1 acre or less), and a minimum of 3 combination samples will be collected per acre at larger sites (greater than 1 acre). Subsamples will be collected in a 3-point (triangular) pattern. At each point, a subsample of predetermined depth will be collected. As a rule, the diagonal distance between the points will be 10 feet, depending on the area of soil homogeneity. The diagonal distance can be adjusted in the field to account for soil differences.

Three discrete aliquots of equal amounts of soil from each designated subsample location will be composited into 1 sample. Materials such as plant matter, debris, and large rocks will be removed, to a reasonable extent, prior to placing the sample in the sample container. Samples will be collected from the 0 to 12-inch depth at 0-2 inch, 2-6 inch, and 6-12 inch intervals. Samplers will collect samples using the following protocol:

Collect Samples – Test Pit Method

1. Don a new pair of disposable nitrile gloves.
2. Use a new disposable plastic scoop for each sample.
3. Remove vegetation and debris from the surface prior to digging. If a vegetative mat is present, separate it from the soil surface with the plastic scoop. Shake and scrape the

removed vegetative mat over the sample collection bag to dislodge any soil particles. Include all the dislodged soil particles in the composite sample.

4. Excavate the hole to 0-2 inches, 2-6 inches, and 6-12 inches below ground surface and collect a sample from each interval separately (see step 5-10). Excessive vegetation, tree roots, hard rock areas, and other sampling obstacles may cause problems with planned sample locations. If obstacles are encountered during sampling, choose a new subsample location within 10 feet of the original location.
5. Using a tape measure, mark the sample interval.
6. Use the disposable plastic scoop to scrape the wall of the pit to expose a fresh surface for sampling.
7. Collect the samples from the bottom to the top to avoid cross contamination.
8. Collect a sample from the freshly cleaned interval with the plastic scoop by scraping from the base of the interval to the top of the interval removing material evenly from all around the pit in accordance with SOP-S-01, Surface Soil Sampling-General (Appendix B).
    a. Screen the soils with a stainless steel #10 (2-millimeter [mm]) screen into a new disposable foil pan.
    b. Collect and screen at least one-half to a full plastic scoop of soil from each subsample hole.
9. Place the sieved sample into an appropriately labeled resealable plastic bag.
10. If debris is identified in the screen, remove the debris and make a note in the field logbook.
11. Record the debris information along with a count in the field logbook or on the field data sheet.

Collect Samples – Stainless Steel Probe

1. Define the composite sampling interval and test locations.
2. Insert probe to the sampling depth.
3. Remove and composite proper depth profile (i.e., 0-2 inches, 2-4 inches, etc.)
4. Sieve the sample if gravelly as described in step 7a under **Collect Samples – Test Pit Method** (listed previously).
5. Place the sample into an appropriately sized resealable plastic bag
6. Record appropriate data in the field logbook.

Field personnel will analyze samples in the field using a Niton XL3 XRF. This will allow the field team to adjust the location and number of samples to characterize each site accurately. Prior to field XRF analysis, the sampler will follow the general procedures below. Specific details are included in SOP-SFM-02 (Appendix B).

XRF Analysis

1. Thoroughly homogenize the sample in the bag by kneading the soil.
2. If required, place a portion of the homogenized sample into an additional 1-quart resealable plastic bag so that is fits in the analyzer measurement stand.
3. Compact the material so that there is a flat surface on the area to be analyzed and visually inspect this area to ensure that only fines will be present in the XRF aperture.
4. Place the sample bag on the measurement stand and take the measurement.
5. Record the results for the selected metals on the XRF field data sheet (Appendix C).
6. Complete duplicate and replicate XRF analyses on at least 5% of the samples analyzed in the XRF unit.

The sampler will identify each sample and mark the sample bags as follows: operable unit, area, month, day, year, sample interval, and unique number. For example, BPSOU-XX-MMDDYY-0-2-X) where:

- BPSOU denotes Butte Priority Soils Operable Unit.
- XX denotes the specific area.
- MM denotes the month in which the sample was collected (07 for July, 08 for August, etc.).
- DD denotes the day of the month on which the sample was collected (01, 02, etc.).
- YY denotes the year in which the sample was collected (18 for 2018).
- 0-2, 2-6, 6-12 denotes sample interval (0-2 inches, 2-6 inches, 6-12 inches).
- X denotes the sample number (1, 2, 3, 4, etc.).

A sample marked as BPSOU-BO-091218-2-6-2 means the sample was collected in the BPSOU BO area on September 12, 2018, at the 2-6-inch level and it was sample #2.

3.2.2 Sampling Equipment

Resources and field equipment used for the soil sampling will include the following (at a minimum):

- Hard copy of the QAPP.
- Field notebook, pens, camera, batteries, and cell phone.
- Maps of sample locations.
- GPS unit.
- Nitrile gloves.
- Assorted shovels and breaker bars.
- Soil Probe.
- Disposable plastic scoops.
- #10 (2 mm) stainless steel screens.
- Disposable foil pans.
- 1-quart resealable plastic bags.

- Niton XL3 XRF Analyzer.
- Equipment and deionized water for decontamination.
- Sample coolers, ice, and tape.
- Required Level D Personal Protective Equipment (PPE) as detailed in the SSHASP.

Any problems due to equipment failures will be addressed by the Field Team Leader and resolved in a timely and orderly fashion. All actions will be documented in the field logbook.

3.2.3 Decontamination Procedures

Field personnel will decontaminate all non-disposable sampling equipment after use at each sampling location according to SOP-DE-02, Equipment Decontamination General (Appendix B). Disposable equipment and PPE intended for one-time use will not be decontaminated but will be packaged for appropriate disposal as a solid waste in the local landfill. Soil removed from holes during excavation will be returned to the sample holes.

Field personnel will decontaminate reusable sampling equipment within the site boundaries at a centralized location. Sampling equipment will be decontaminated using the procedure below. All equipment will also be decontaminated before leaving the site to prevent off-site transport of contaminants (refer to SOP-DE-02, Equipment Decontamination General).

- Rinse with water.
- Wash with non-phosphate detergent.
- Rinse three times with deionized water.
- Air dry.

For safety, all personnel will undergo decontamination procedures when leaving a contaminated area. Personnel decontamination includes routine practices as well as emergency decontamination. All personnel will follow SOP-DE-01, Personnel Decontamination Procedures General (Appendix B) protocols and take every measure possible to prevent the spread of potentially contaminated materials to clean areas.

3.2.4 Sample Containers and Handling

Soil samples will be collected in a labeled plastic bag, mixed, and analyzed using the field XRF. Individual soil samples will be placed in a cooler as soon as possible after sample collection and XRF analysis. If the laboratory requires different sample containers, the laboratory will provide the container and field personnel will handle the containers in such a way as to prevent accidental contamination. Field personnel will wear a new pair of nitrile gloves when transferring samples from the bag used for XRF analysis to the laboratory sample container.

Samples will be stored in insulated coolers with double-bagged ice as necessary to maintain a temperature of at less than 6 degrees Celsius (ºC) and then transported to the laboratory. Table 5 lists the required sample preservation, containers, and holding times. Sample holding times are established to minimize chemical changes in a sample prior to analysis or extraction. A holding time is defined as the allowable time between sample collection and analysis recommended to

ensure accuracy and representativeness of analysis results, based on the nature of the analytes of interest and chemical stability factors. The holding time for analyses of metals in soils is 180 days.

Table 5. Required Sample Preservation, Containers, and Holding Times

Media	Parameter	Analytical Method	Preservation	Holding Time	Sample Size	Sample Container
Solid	Total Metals*	EPA 6010, 7471B[1]	Ice to 4 °C	180 days	4 ounces	Ziplock bag or 4-ounce glass jar

* Arsenic, cadmium, copper, lead, and zinc.
1. EPA Method 6010D (EPA, 2014) and EPA Method 7471B (EPA, 2007) for mercury.
°C: degrees Celsius.

3.2.5 Sample Custody Protocols

Once the samples are collected, they will be maintained under strict protocols in accordance with SOP-SA-04, Chain of Custody Forms for Environmental Samples General (Appendix B). Field personnel will complete a CoC form (Appendix C) for each shipping container (e.g., cooler, ice chest, or other container) to be delivered to the laboratory. The sampler will be responsible for initiating and filling out the CoC form. The CoC form for a shipping container will list only the samples in that shipping container. Information contained on the form will include the following:

- Project name and identification number.
- Sampler's signature and affiliation.
- Date and time of collection.
- Sample identification number and matrix.
- Analyses requested.
- Remarks or additional notes to laboratory personnel (e.g., do not use for QC).
- Signature of persons relinquishing custody, dates, and times.
- Signature of persons accepting custody, dates, and times.

The sampler will cross out any blank spaces on the CoC form below the last sample number listed. Any documentation, including CoC forms, placed inside the cooler during sample shipment should be placed inside a reclosable plastic bag.

The sampling person whose signature appears on the CoC form is responsible for the custody of the samples from the time of sample collection until custody is transferred to a designated laboratory, a courier, or another project employee for the purpose of transporting the samples to the designated laboratory. The sample is considered to be *in custody* when the sample is:

- in the responsible individual's physical possession;
- in the responsible individual's visual range after having taken possession;
- secured by the responsible individual so that no tampering can occur;

- secured or locked by the responsible individual in an area in which access is restricted to authorized personnel; or
- transferred to authorized personnel.

A completed CoC form will be placed in a sealed zip lock bag and taped to the inside of the cooler lid. Custody seals will be attached to each cooler and samples will be delivered to the laboratory for analysis within the holding times specified for the test requested (Table 5).

The field sampler will file one copy of each CoC form with the project files as a temporary record of sample transfer. The original form will accompany the samples and be returned to the contractor as part of the laboratory QA/QC requirements. The original form will be filed as part of the project's permanent records.

3.2.6 Laboratory Sample Handling and Storage

When the laboratory receives the shipment, laboratory personnel will review the CoC form to verify it is complete and then the designated technician will sign and date it. Any broken custody seals, damaged sample containers, sample labeling discrepancies between container labels and the CoC form, or analytical request discrepancies will be noted on the CoC form. If any of these conditions exist, the laboratory will notify the Field Team Leader and CPM. The Field Team Leader and CPM will resolve discrepancies or non-conformance issues before the samples are analyzed. The laboratory will provide the Field Team Leader and CPM with a copy of the CoC form and the associated sample receipt information. The typical sample receipt information provided includes sample receipt date, sample identifications transcribed from the CoC forms, sample matrix type, and the list of analyses to be performed for each sample. The laboratory will be responsible for following their internal custody procedures from the time of sample receipt until sample disposal.

3.3 Analytical Methods

Surface and near-surface soil samples (0 to 12 inches below ground surface) will be analyzed using both field XRF and analytical laboratory methods described below. The target analytes are listed in Table 1. The samples will also be field checked for pH.

3.3.1 Field Analysis

Field personnel will use a Niton XL3 XRF for the XRF field analysis. A sample stand, which allows the samples to be analyzed in plastic bags, will be used during analysis to ensure consistent exposure times and position of the XRF aperture for each sample. Results for the analytes (listed in Table 1) will be recorded on the field data sheets. Samples will be tested for pH in the field using the Hanna Instruments, HI 99121 Soil pH Meter.

3.3.2 Sedimentation Analysis

The CPM will determine whether the site contributes metals-impacted sediment to waterways or existing infrastructure and rate the site impacts as marginal (little to no sediment impacts),

moderate (some impacts that may need maintenance efforts), or major (remediation necessary). Each site will be rated on the following criteria:

1. Presence of rills. If present, determine the amount of soil lost.
2. Concentrated outflow. Check outflow for soil loss.
3. Sediment in downstream infrastructure. Determine the amount of soil in the infrastructure and the last maintenance operation. If maintained, determine the amounts of material removed.
4. Determination as to whether the infrastructure is part of Superfund or Reclaimed areas. If Superfund, maintenance will be performed under an Operations and Maintenance Plan; if Reclaimed, opportunistic maintenance will be performed per a reclaimed area Monitoring and Maintenance Plan.
5. Condition of downstream infrastructure. Determine if flow rates are impeded by poor condition.
6. Sediment loading contributions. Check for contributing sediment loading above the site in question.
7. Linkage to Silver Bow Creek. Determine if the drainage links to Silver Bow Creek.

Information on each of the above criteria will be documented with photographs.

3.3.3 Laboratory Analysis

Personnel will evaluate field XRF data for each sampling area to determine potential source areas. Representative XRF samples of each source will be composited, and the composite sample analyzed on the field XRF. Confirmation samples will be submitted to the laboratory for analysis. The actual number of sample locations will be evaluated in the field based on environmental conditions of the site and after consultation with the Agencies. Rationale for laboratory sample submission will be based on the results obtained from the original XRF field analysis as well as 10% of all samples collected.

Selected samples will be submitted for laboratory analysis to confirm and expand on field XRF results. Confirmation samples will be analyzed for the analytes listed in Table 1. Samples will be prepared for metals analysis in accordance with the published laboratory procedures. Sample turnaround time is a maximum of two weeks from the submittal date. If Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES) methods are necessary, the laboratory will analyze the samples in accordance with EPA *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, also known as SW-846 Test Method 6010D: Inductively Coupled Plasma-Optical Emission Spectrometry* (ICP-AES), Revision 4 (EPA, 2014).

3.4 Laboratory Audit

The laboratory QA manager will conduct internal laboratory audits to evaluate compliance with the project requirements and this document. The laboratory will be responsible for verifying that QC procedures are followed and that the results of QC analyses are within the specified acceptance criteria, as well as for implementing corrective action if the QC acceptance criteria are not met.

3.5 Sample Disposal

Laboratory samples will be disposed of by the laboratory after all analyses have been completed. Field samples will be archived until confirmations have been completed and approved.

3.6 Quality Assurance/Quality Control

3.6.1 Field QC Samples

Field QC samples are used to identify any biases from transportation, storage, and field handling processes during sample collection and to determine sampling precision. All field QC samples will be delivered with field samples to the laboratory. This section includes brief descriptions of the QC samples to be collected during sampling activities along with frequency, collection, and analytical instructions. The measured values of a standard will be compared to the expected results and if a measured value falls outside this range, then the check sample will be reanalyzed. If the value continues to fall outside the acceptance range, the sampler will note this information on the XRF log. If any of the check sample results indicate that the XRF is not analyzing accurately, the XRF will be cleaned, turned off, and the energy calibration rerun. This information will be noted in the logbook and on the XRF field data sheet. The batch of samples analyzed prior to the unacceptable calibration verification check samples will be reanalyzed.

3.6.1.1 Equipment Rinsate Blanks

Field personnel will analyze equipment rinsate blanks to assess the efficiency of field equipment decontamination procedures in preventing cross contamination of samples. Equipment rinsate blanks will be created by pouring certified distilled or deionized water over or through decontaminated (clean) sampling equipment that has been used to collect investigative samples, and subsequently collecting this (poured) water in prepared sampling containers. Additives or preservatives will be included in the equipment rinsate blanks as required for analysis. The rinsate blank will be shipped with the associated field samples. Field blanks will not be designated for laboratory use in preparation of MS samples or analytical duplicate samples. Field blank samples will be submitted for the same analyses as the associated samples.

3.6.1.2 Field Duplicate

A field duplicate consists of 1 well-mixed and homogenized sample that is split in the field into 2 samples and placed in different sample containers for separate analyses. Each split will have its own sample number. Both split samples will be analyzed for identical chemical parameters. The

results of the field duplicate will be compared to determine laboratory and sampling precision. Field duplicate samples will be collected at a frequency of 1 per 20 samples or once per sampling event, whichever is more frequent.

3.6.2 Field XRF Quality Control Samples

3.6.2.1 Energy Calibration Check

Field personnel will run a preprogrammed energy calibration check on the equipment at the beginning of each working day. If the individual believes that drift is occurring during analysis, that individual will run the energy calibration check. The energy calibration check determines whether the characteristic X-ray lines are shifting, which would indicate drift within the instrument.

3.6.2.2 Blank Samples

The silicon dioxide sample, as provided by Niton, is a "clean" quartz or silicon dioxide matrix that contains concentrations of selected analytes near or below the XL3 XRF machine lower limit of detection. These samples are used to monitor for cross contamination. Field personnel will analyze this sample at the beginning of each day, once per every 20 samples, and at the end of each day's analysis. The sample information will be recorded as "SIO2" on the XRF field data sheets. This sample will also be analyzed whenever field personnel suspect contamination of the XRF aperture. Any elements with concentrations above the established lower limit of detection will be evaluated for potential contamination. If it is determined that the concentration is higher than that recorded at the start of the day, the probe window and the silicon dioxide sample will be checked for contamination. If it is determined that contamination is not a problem, and the concentration is significantly above the limit of detection, sample results will be qualified by the XRF operator as 'J' estimated, and the problem recorded on the XRF field data sheet and in the logbook. If the problem persists, the XRF will be returned to Niton for calibration.

3.6.2.3 Calibration Verification Check Samples

Calibration verification check samples help check the accuracy of the XL3 and assess the stability and consistency of the analysis for the analytes of interest. A check sample will be analyzed as one of the initial samples, once per every 20 samples and as the last analysis. Results for the check sample (standard reference material [SRM]) will be recorded on the individual site XRF field data sheets and identified as a check sample. There will be 3 Niton-provided SRM check samples for the project: NIST 2709a- Joaquin Soil, USGS SdAR-M2 (an SRM created by the U.S. Geological Survey [USGS]), and a Resource Conservation and Recovery Act (RCRA) sample. There will also be Niton-provided machine-specific expected results for several elements for the check samples. Pioneer has further refined the range of expected results for each SRM standard for each of the field XRFs in use. The measured values of a standard will be compared to the expected results and if a measured value falls outside this range, then the check sample will be reanalyzed. If the value continues to fall outside the acceptance range, this information will be noted on the XRF log. If any of the check sample results indicate that the XRF is not analyzing accurately, the XRF will be cleaned, turned off, and the energy calibration rerun. This

information will be noted in the logbook and on the XRF field data sheet. The batch of samples analyzed prior to the unacceptable calibration verification check samples will be reanalyzed.

3.6.2.4 Duplicate Samples

The XRF duplicate samples will be analyzed to assess reproducibility of field procedures and soil heterogeneity. To run a duplicate sample on the Niton XL3, field personnel will remove the sample bag from the analytical stand, knead it once or twice, and replace it in the stand to be analyzed a second time. Duplicate samples will be recorded on the XRF field data form with a D designator in the sample identification number. One duplicate sample will be analyzed at the rate of 1 per 20 samples.

3.6.2.5 Replicate Samples

Field personnel will analyze a replicate sample at the rate of 1 per 20 XRF samples. To run a replicate sample on the Niton XL3, once the primary sample analysis has been completed, requires restarting the XRF to analyze the same sample a second time with the same soil in the XRF aperture. Replicate samples help in assessing the stability and consistency of the XRF analysis. Replicate sample results will be recorded on the XRF field data form and designated with an R in the sample identification number.

3.6.2.6 Confirmatory Samples

The comparability of the field XRF analysis with laboratory samples will be determined by submitting field XRF-analyzed samples for analysis to the laboratory. The confirmatory analyses can be used to verify the quality of the field XRF data. All samples submitted to the laboratory will be analyzed using the field XRF prior to submittal. The samples analyzed by field XRF will be submitted to the laboratory for metals testing (Table 1) and the results will be used to verify field XRF results and to develop a statistical relationship to the laboratory XRF results.

3.6.3 Laboratory Quality Control Samples

Laboratory QC samples are introduced into the measurement process to evaluate laboratory performance and sample measurement bias. Laboratory QC samples may be prepared from environmental samples or generated from standard materials in the laboratory per the internal laboratory SOPs.

3.6.3.1 Laboratory Blanks

Method blanks will be used to monitor laboratory processes and performance. A method blank is a volume of deionized water or a specified weight of inert material for solid samples that is carried through the entire sample preparation and analyses procedures. The method blank volume or weight will be approximately equal to the sample volumes or sample weights being processed. Method blanks are used to monitor interference caused by constituents in solvents and reagents and on glassware and other sampling equipment. Blank results outside of specified

control limits will be re-run and/or flagged by the laboratory per the QC requirements of the analytical method.

3.6.3.2 Laboratory Control Samples

An LCS, or a blank spike, is an aqueous or solid control sample of known composition that is analyzed using the same sample preparation, reagents, and analytical methods employed for the project samples. The LCS is obtained from an outside source or is prepared in the laboratory by spiking reagent water or a clean solid matrix from a stock solution that is different from that used for the calibration standards. The LCS is the primary indicator of process control used to demonstrate whether the sample preparation and analytical steps are in control, apart from sample matrix effects. If the LCS recovery falls outside the specified control limits, the samples will be re-run and/or flagged by the laboratory per the QC requirements of the analytical method.

Calibration verification should be performed every 20 analyses and at the end of the last analytical run of each day, by analyzing a laboratory control sample and comparing the results to the established values. Control limits are plus or minus 35% of the reference value and the statistical criteria listed in Section 2.4.1. Failure will trigger corrective action and reanalysis of samples since the last in-control LCS measurement.

3.6.3.3 Analytical Duplicates

Analytical duplicates are samples that are split in the laboratory at some step in the measurement process and then carried through the remaining steps of the process. Duplicate analyses provide information on the precision of the operations involved. As the analytical duplicates are a pair of subsamples from a field sample taken through the entire preparation and analyses procedure, any difference between the results indicates the precision of the entire method in the given matrix. Analyses of analytical duplicates and MS duplicates monitor the precision of the analytical process. The frequency of analyses, precision goals, and corrective action information pertaining to analytical duplicates are included in example SOPs included in Appendix B. Information related to specific sites will be included in the individual site documents. If the analytical duplicate precision falls outside the specified control limits, the samples will be re-run and/or flagged by the laboratory per the QC requirements of the analytical method.

3.6.3.4 Matrix Spikes

Laboratory MS samples are used to evaluate potential sample matrix effects on the accurate quantitation of an analyte using the prescribed analytical method. The MS and MS duplicates are prepared by adding an analyte to a subsample of a field sample before sample preparation and analyses. A percent recovery is calculated from the concentrations of the analyte in the spiked and unspiked samples. If the percent recovery for the MS sample and the MS duplicate falls outside the control limits, the results are flagged by the laboratory that they are outside acceptance criteria along with the parent sample.

3.6.3.5 pH Calibration Check

The pH calibration check is performed immediately after calibration of the pH probe and should be within 0.10 pH units. If the acceptance criterion is not met, field personnel will terminate analysis, correct the problem, recalibrate the unit, and attempt a new pH calibration check.

3.7 Instrument Testing, Inspection, and Maintenance

3.7.1 Field Equipment

The Field Team Leader or designee will examine field equipment to certify that it is in proper operating order prior to its first use and at intermittent intervals during the day. Equipment, instruments, tools, and other items requiring preventative maintenance will be serviced in accordance with the manufacturer's specified recommendations. Any routine maintenance recommended by the equipment manufacturer will also be performed and documented in field logbooks or appropriate data sheets. Equipment will be inspected and the calibration checked, if applicable, before it is used. Should equipment deficiencies be found, including calibration failures, the equipment will be immediately removed from service and repaired. Specialized repair parts will be purchased from the manufacturer. Once equipment failure has been resolved and testing/calibration demonstrates proper equipment function, the particular piece of equipment will be returned to service. The Field Team Leader, or designee, will be responsible for field equipment checks and maintaining the Equipment Log.

3.7.2 Laboratory Equipment

Instruments used by the laboratory will be maintained in accordance with each laboratory's QA plan and analytical method requirements. All analytical measurement instruments and equipment used by the laboratory will be controlled by a formal calibration and preventive maintenance program. Required equipment for XRF analysis of soil samples is a drying oven, sieves, a grinder, and an x-ray fluorescence analyzer.

The laboratory will keep maintenance records and make them available for review, if requested, during laboratory audits. Laboratory preventive maintenance will include routine equipment inspection and calibration at the beginning of each day or each analytical batch, per the laboratory internal SOPs and method requirements.

3.8 Inspection/Acceptance for Supplies and Consumables

All supplies and consumables received for the project (e.g., sampling equipment, XRF blanks and SRMs, etc.) will be checked for damage and other deficiencies that would affect their performance. The types of equipment that will be needed to complete sampling activities are described in the relevant SOPs. The Field Team Leader or designee will inspect field supplies.

Per laboratory QA procedures, laboratory personnel will be responsible for inspecting laboratory supplies.

3.9 Data Management Procedures

The Contractor will maintain all project records, either electronic or hard copy, to include the following:

- Individual site maps (hard copy or scanned field drawings and electronic files).
- Project documents, with any approved modifications.
- Field documentation.
- Chain of custody forms.
- Laboratory documentation (results received from the laboratory will be documented both in report form and in an electronic format).
- Data summary reports (for each site sampling event).

Contractor will maintain the project field and laboratory records at a location in Butte, Montana. The CPM will be responsible for managing the project documents. The original field and laboratory documents will be filed chronologically and scanned into a Portable Document Format (PDF) file for future reference. The electronic versions of these records will be maintained on a central server system that is backed up daily.

4.0 ASSESSMENTS AND RESPONSE ACTIONS

Assessment and oversight of data collection and reporting activities are designed to verify that sampling and analyses are performed in accordance with the procedures established in this QAPP. The audits of field and laboratory activities include two independent parts: internal and external audits. Internal audits will be performed by the QAO and/or Atlantic Richfield QAM as necessary. External audits will be performed by the Agencies as necessary.

4.1 Corrective Actions

Assessment of sampling data will be performed during fieldwork on a daily basis. Any equipment malfunctions and data outliers will be reviewed by field technicians and reported to the CPM. All activities will be documented within the project logs. Equipment malfunctions will be remedied by following manufacturers' recommendations. Corrective actions during fieldwork will include replacing/repairing defective equipment and resampling to verify or negate original results. All field personnel and the CPM will have the authority to stop work until any issues are remedied.

Laboratory assessments and corrective actions will follow established procedures and published performance criteria common to accredited facilities and will be documented and reported by the laboratory to the CPM. If a performance criteria issue is unresolved by established laboratory procedures, the CPM, in consultation with the Agencies, will resolve the issue by reanalyzing or resampling. Any actions outside the scope of this QAPP will be reviewed and approved by the Agencies prior to work being completed.

6.0 REFERENCES

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Appendix A
Figures/Charts

Appendix A.1 BPSOU Area Map

Appendix A.2 Organizational Chart

Appendix A.3 Unreclaimed Area Decision Logic

Appendix A.4 Precision Calculations

LEGEND

BPSOU BOUNDARY

N

DISPLAYED AS:
PROJECTION/ZONE: MSP
DATUM: NAD 83
UNITS: INTN'L FT
SOURCE: PIONEER/ESRI

0 1,500 3,000 6,000
Feet

FIGURE 1

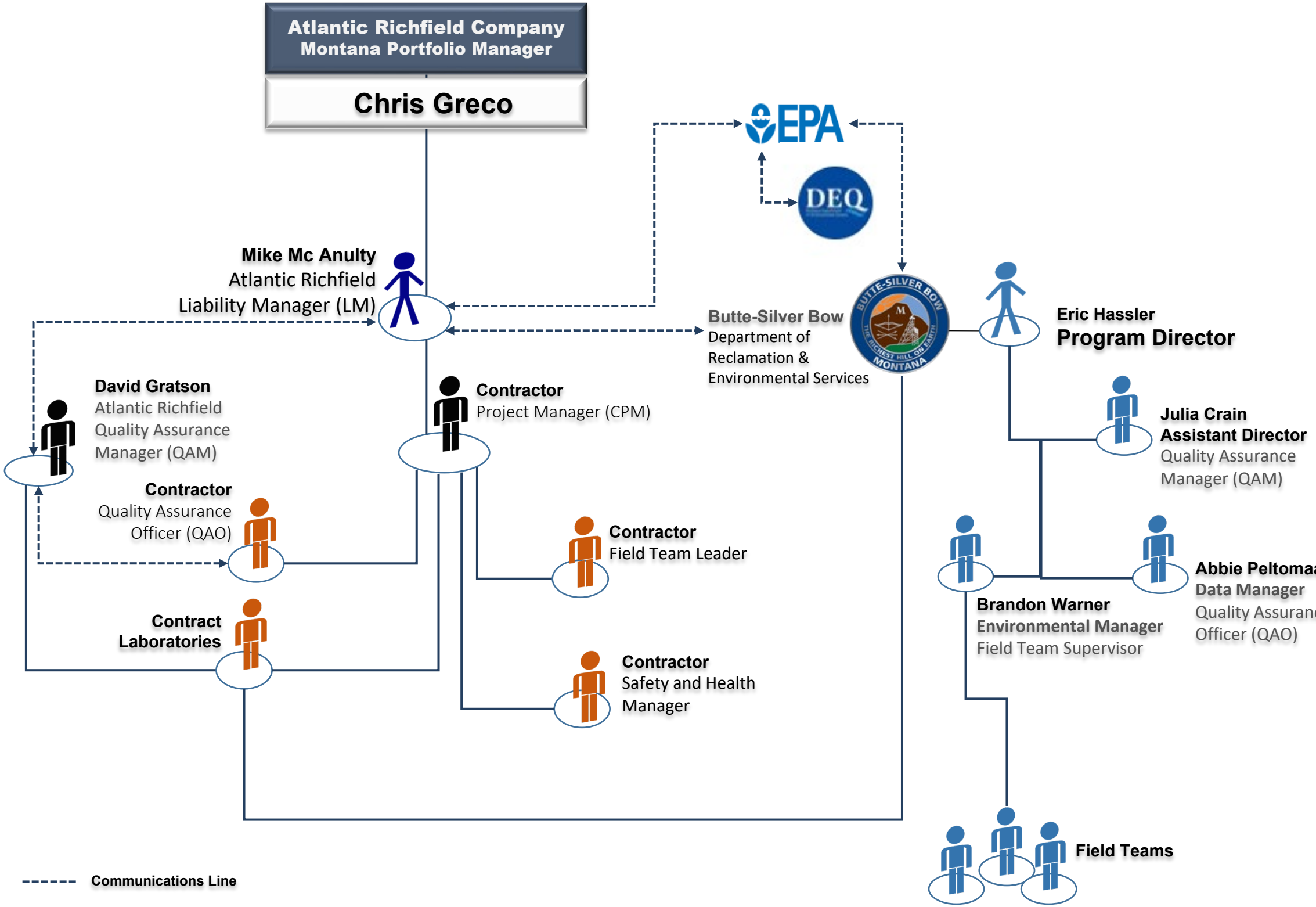
BPSOU AREA

PIONEER TECHNICAL SERVICES, INC.

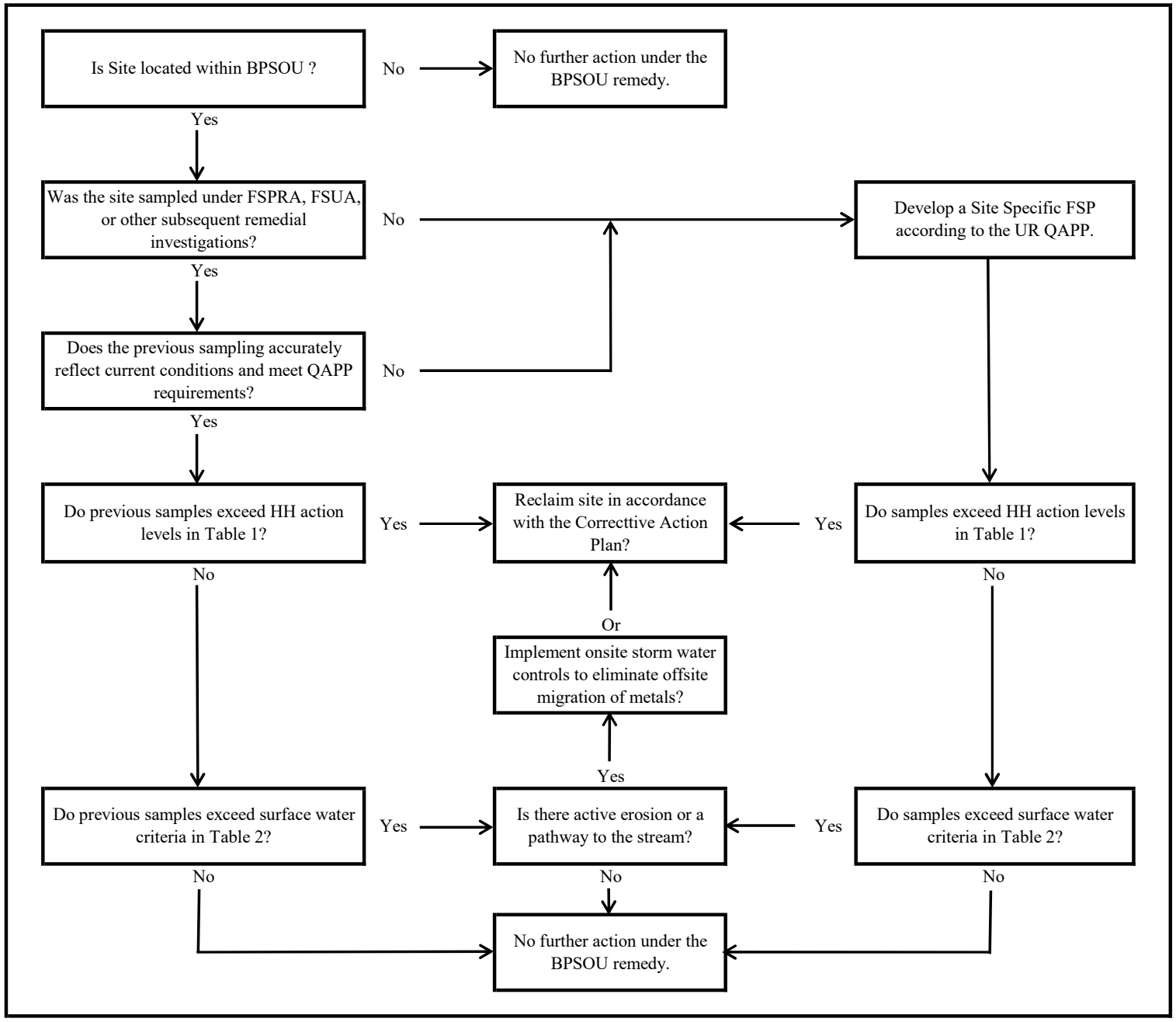
DATE: 1/6/2021

Path: Z:\Shared\Active Projects\ARCO\BPSOU_Misc\GIS\BPSOU_Bndry.mxd

Appendix A2. Program Organizational Chart



Appendix A.3:
Unreclaimed Area Decision Logic



Appendix B
Standard Operating Procedures

Decontamination Methods for Direct Sample Contact Equipment

Appendix B.1 SOP-S-01 Surface Soil Sampling General

Appendix B.2 SOP-SA-01 Soil and Water Sample Packaging General

Appendix B.3 SOP-SA-04 Chain of Custody Forms for Environmental Samples General

Appendix B.4 SOP-SA-05 Project Documentation General

Appendix B.5 SOP-SFM-01 Field Measurement of pH in Soil

Appendix B.6 SOP-SFM-02 Operating XL3-X-Ray Fluorescence Analyzer General

Appendix B.7 SOP-DE-01 Personal Decontamination Procedures General

Appendix B.8 SOP-DE-02 Equipment Decontamination General

Appendix B.9 S-MN-I-313 6010-200.7 Inductively Coupled Plasma Atomic Emission Spectroscopy

Appendix B.10 S-MN-I-359 Mercury in Liquid and Solid/Semi-Solid Waste

Appendix B.11 S-MN-I-460 Preparation of Solid Samples for Analysis by ICP and ICP-MS

PURPOSE	This Standard Operating Procedure (SOP) establishes the requirements for documenting and maintaining environmental sample chain of custody from point of origin to receipt of sample at the analytical laboratory. This procedure will apply to all types of air, soil, water, sediment, biological, and/or core samples collected in environmental investigations by Pioneer Technical Services, Inc. (Pioneer). It is applicable from the time of sample acquisition until custody of the sample is transferred to an analytical laboratory.
SCOPE	Pioneer prepared this practice for the workforce and this SOP applies to all work performed by and on behalf of Pioneer. All members of the Pioneer workforce who conduct the work shall be trained and competent (as defined by OSHA) in the risk-assessed procedure described below before performing the work.
DEFINITIONS	**Chain of custody** is an unbroken trail of accountability that ensures the physical security of samples, data, and records. Custody refers to the physical responsibility for sample integrity, handling, and/or transportation. Custody responsibilities are effectively met, if the samples are: • In the responsible individual's physical possession; • In the responsible individual's visual range after having taken possession; • Secured by the responsible individual so that no tampering can occur (usually for shipping); or • Secured or locked by the responsible individual in an area in which access is restricted to authorized personnel only.

WORK INSTRUCTIONS

The following instructions provide guidance to perform the task in a safe, accurate, and reliable manner. If these instructions present information that is inaccurate or unsafe, personnel must notify the Project Manager, Safety Manager, and the SOP Technical Author to initiate appropriate revisions. Personnel will perform all work under this SOP in a manner that is consistent with procedures and policies described in the appropriate Operation, Maintenance, and Monitoring (O&M) Plan (where applicable), appropriate Site-Specific Health and Safety Plans (SSHASP), and Pioneer Corporate Health and Safety Plan (HASP).

TASK	INSTRUCTIONS
Project Manager's Responsibilities	The Project Manager is responsible for overall management of environmental sampling activities, designating sampling responsibilities to qualified personnel, and reviewing any changes to the sampling plan.
Field Team Leader's Responsibilities	The Project Manager may act as the Field Team Leader or may choose to appoint a Field Team Leader. The Field Team Leader is responsible for general supervision of field sampling activities and ensuring proper storage/transportation of samples from the field to the analytical laboratory. The Field Team Leader is also responsible for maintaining sample custody as defined above until the sample has been properly relinquished as documented on the chain of custody form.

	The Field Team Leader will review chain of custody forms for accuracy and completeness to preserve sample integrity from collection to receipt by an analytical laboratory. The review of chain of custody forms may be delegated to qualified personnel.
Field Sampler's Responsibilities	The Field Sampler is responsible for sample acquisition in compliance with technical procedures, initiating the chain of custody, and checking sample integrity and documentation prior to transfer. Field samplers are also responsible for initial transfer of samples consisting of physical transfer of samples directly to the internal laboratory or transferred to a shipping carrier, (e.g., United Parcel Service or Federal Express) for delivery.
Laboratory Technician's Responsibilities	The receiving Laboratory Technician is responsible for inspecting transferred samples to ensure proper labeling and satisfactory sample condition. Unacceptable samples will be identified and segregated. The Laboratory Project Manager will be notified. The Laboratory Technician will review the chain of custody for completeness and file as part of the project's permanent record.
Fill out Chain of Custody Forms	The Field Team Leader or designated Field Sampler will initiate the chain of custody form for the initial transfer of samples. A chain of custody form will be completed and accompany every sample set. Only those samples included in the shipping container (cooler or box) should be listed on the chain of custody form included in the container. All chain of custody forms must be completed and include the following information: • Project code. • Project name. • Sampler's signature. • Sample identification. • Date sampled. • Time sampled. • Analysis requested. • Remarks column should contain information about a sample that the laboratory might need. Examples of remarks that should be included: ▪ If samples could have very high or low expected concentrations (outside of normal instrument calibration range). ▪ DO NOT USE FOR QA/QC (quality assurance/quality control) should be indicated for field blanks, bottle blanks, or equipment rinsate blanks. ▪ If a sample should be held for later analysis (i.e., if sample being analyzed requires results from another sample to determine analysis status).

	▪ The sample should be archived after initial analysis by the laboratory for potential additional analysis in the future. ▪ Requires filtering (if not completed in the field). ▪ Requires preservation (if not completed in the field). ▪ Any other sample specific information that will aid the laboratory in completing the appropriate analysis. • Relinquishing signature, data, and time. • Receiving signature, date, and time. Laboratory-provided chain of custody forms should be used if provided, and all required fields should be filled out. Pioneer also has generic chain of custody forms that can be used if no laboratory forms are available. Make sure that the above required information is on the form and include the laboratory name and address to which the samples are being shipped. The Field Sampler relinquishing custody and the responsible individual accepting custody will sign, date, and note the time of transfer on the chain of custody form. Note: if the transporter is not an employee of Pioneer, the Field Sampler may identify the carrier and reference the bill of lading number in lieu of the transporter's signature. One copy of the chain of custody form will be filed as a temporary record of sample transfer by the Field Sampler. The original form will accompany the sample set and will be returned to Pioneer as part of the contracted laboratory QA/QC requirements. The original form and the transporter's receipt will be filed as part of the project's permanent records. The Project Manager (or designee) will track the chain of custody to ensure timely receipt of samples by an analytical laboratory. Shipping information, including date shipped, laboratory shipped to, transporter's identity (i.e., Federal Express), and tracking number should be recorded in the field logbook. If more than one sample shipment occurs during a project, the associated samples per shipment should be referenced (sample numbers or samples collected on these dates).
Sample Handling.	All samples will be collected and handled in accordance with SOP-SA-01 Soil and Water Sample Packaging and Shipping and SOP-SA-02 Sample Preservation and Containerization for Aqueous Samples, or methods described in the Sampling and Analysis Plan (SAP) or Work Plan (WP). Samples will be transported in insulated coolers with ice as necessary to maintain a temperature of 4 degrees Celsius (°C) plus or minus 2 °C until receipt by the analytical laboratory. Alternate shipping containers can be used if the analytical method, SAP, or WP does not have temperature requirements for the samples.

HEALTH SAFETY SECURITY ENVIRONMENT (HSSE) CONSIDERATIONS

This section to be completed with concurrence from the Safety and Health Manager.

SOURCE	*HAZARDS*	*WHERE*	*HOW, WHEN, RESULT*	*CONTROLS*
CHEMICAL	Potential contact with contaminated water/soil samples.	Outside of bottles.	Inadvertent exposure to contaminated water/soil samples could lead to adverse health effects.	Personnel will practice proper personal hygiene – wash hands prior to eating/drinking and when leaving the site. Personnel will wear nitrile gloves and safety glasses when handling sample containers.
	Preservatives (HCL, HNO_3, H_2SO_4, Zinc, Acetate, and NaOH).	Outside of bottles.	Inadvertent exposure to preservatives could lead to adverse health effects.	Safety Data Sheets for each preservative chemical are available to all Personnel on the Pioneer company web site. Personnel will wear nitrile gloves and safety glasses when handling the bottles. Refer to the Chemical Flushing Guidelines available inside vehicle's first aid kit for first-aid procedures in case of contact with preservatives.
NOISE	Not applicable.			
ELECTRICAL	Not applicable.			
BODY MECHANICS	Improper lifting.	Sites.	Back injuries and muscle/back strains could result when using improper techniques to lift and carry packaged samples and coolers.	Personnel will use proper lifting techniques – get a good grip, keep the load close to the body, lift with legs and not with back, and avoid lifting loads above shoulder's height. Two workers will lift/carry packaged samples and coolers, if needed.

HEALTH SAFETY SECURITY ENVIRONMENT (HSSE) CONSIDERATIONS

This section to be completed with concurrence from the Safety and Health Manager.

SOURCE	*HAZARDS*	*WHERE*	*HOW, WHEN, RESULT*	*CONTROLS*
GRAVITY	Falls from slips and trips.	Uneven terrain, slick/muddy/wet surfaces and steep slopes.	Walking/working on slick/muddy/ wet and uneven terrain could cause slips and trips resulting in falls and injuries.	Personnel will wear work boots with good traction and ankle support. Personnel will be aware of working/walking surfaces and choose a path to avoid hazards. Keep work areas as dry as possible.
WEATHER	Not applicable.			
RADIATION	Not applicable.			
BIOLOGICAL	Not applicable.			
MECHANICAL	Not applicable.			
PRESSURE	Not applicable.			
THERMAL	Not applicable.			
HUMAN FACTORS	Inexperienced and improperly trained personnel.	Sites.	Inexperienced personnel and improper training could cause incidents resulting in adverse health effects and/or property damage.	Personnel will be properly trained in this procedure and other applicable procedures. Personnel will implement stop work procedures, if necessary.
SIMOPS (Simultaneous Operations)	Not applicable.			

ADDITIONAL HSSE CONSIDERATIONS This section to be completed with concurrence from the Safety and Health Manager.	
REQUIRED PPE	**Personal Protection Equipment** (PPE): Safety glasses, high-visibility work shirt or vest, long pants, work boots, and nitrile gloves.
APPLICABLE SDSs	**Safety Data Sheets** (SDSs): HCL, HNO_3, H_2SO_4, Zinc, Acetate, and NaOH. Safety Data Sheets are available to Pioneer employees at the link below: https://pioneertechnicalservices.sharepoint.com/Safety/SafetyDataSheets
REQUIRED PERMITS/ FORMS	Per site/project requirements.
ADDITIONAL TRAINING	Per site/project requirements.

DRAWINGS, DOCUMENTS, AND TOOLS/EQUIPMENT The following documents should be referenced to assist in completing the associated task.	
DRAWINGS	
RELATED SOPs/ PROCEDURES/ WORK PLANS	SOP-SA-01 Soil and Water Sample Packaging and Shipping and SOP-SA-02 Sample Preservation and Containerization for Aqueous Samples.
TOOLS/ EQUIPMENT	Seals and labels, chain of custody forms, chain of custody seals (provided by contracted laboratory), packing and shipping materials, cooler, and ice.
FORMS/ CHECKLIST	Chain of custody forms.

APPROVALS/CONCURRENCE

By signing this document, all parties acknowledge the completeness and applicability of this SOP for its intended purpose. Also, by signing this document, it serves as acknowledgement that I have received training on the procedure and associated competency testing.

SOP TECHNICAL AUTHOR	DATE
Julie Flammang **Julie Flammang**	**11/12/2020**
SAFETY AND HEALTH MANAGER	**DATE**
Tara Schleeman **Tara Schleeman**	**11/12/2020**

PURPOSE	To provide standard instructions for equipment decontamination.
SCOPE	Pioneer Technical Services, Inc. (Pioneer) prepared this practice for the workforce and this Standard Operating Procedure (SOP) applies to all work performed by and on behalf of Pioneer. All members of the Pioneer workforce who conduct the work shall be trained and competent (as defined by OSHA) in the risk-assessed procedure described below before performing the work.
NOTES	All equipment leaving the contaminated area of a site must be decontaminated. Decontamination methods include removal of contaminants through physical, chemical, or a combination of both methods. Decontamination procedures are to be performed at the same level of protection used in the contaminated area of a site. In some cases, decontamination personnel may be sufficiently protected by wearing one level lower protection. The information for site-specific equipment decontamination and personnel protection levels, as detailed in the Sampling and Analysis Plan (SAP), work plan (WP), and Site-Specific Health and Safety Plan (SSHASP), should be followed. The following decontamination procedures are for typical uncontrolled hazardous waste sites. For a specific or unusual contaminant, such as dioxins, see the SSHASP and consult with the Safety and Health Manager. Decontamination procedures should be used in conjunction with methods to prevent contamination of sampling and monitoring equipment. If practical, particularly with organic contaminants, one-time-use equipment should be used and disposed of in accordance with the SAP, WP, and SSHASP. This SOP covers all equipment decontamination EXCEPT for submersible pumps. Decontamination of pumps is detailed in SOP-DE-02A – Equipment Decontamination - Pumps for Well Sampling.

WORK INSTRUCTIONS

The following instructions provide guidance to perform the task in a safe, accurate, and reliable manner. If these instructions present information that is inaccurate or unsafe, personnel must notify the Project Manager, Safety Manager, and the SOP Technical Author to initiate appropriate revisions. Personnel will perform all work under this SOP in a manner that is consistent with procedures and policies described in the appropriate Operation, Maintenance, and Monitoring (O&M) Plan (where applicable), appropriate Site-Specific Health and Safety Plans (SSHASP), and Pioneer Corporate Health and Safety Plan (HASP).

TASK	INSTRUCTIONS
1. Set up decontamination station.	a. Review the SAP or WP and determine if decontamination fluids need to be contained and the need for special decontamination requirements (i.e., chemical rinse). b. If the fluids require containment, set up the decontamination station so that it is located within a small plastic swimming pool or on plastic sheeting with turned up edges to contain water that may slop over during the decontamination process.

	c. If pressurized or gravity flow water is available, attach a hose or piping to reach the decontamination area. If no water is available, bring 5-gallon containers of tap and deionized water (DI) to the decontamination area to clean the equipment. d. Label empty 5-gallon buckets: *gross wash, soap wash, DI rinse, final rinse, and chemical rinse* (if required). e. Lay out clean plastic or foil to place cleaned equipment on to allow for air drying. f. If a chemical rinse is required, fill a spray bottle with the appropriate chemical and label the spray bottle with the chemical's name. g. Pour approximately 2.5 to 3 gallons of tap water into the buckets labeled: *gross wash* and *soap wash*. h. Add a **few drops** (1-3 drops) of Liquinox© soap to the bucket marked *soap wash*. i. Pour 2.5-3 gallons of DI water into the buckets labeled: *DI rinse* and *final rinse.* If a chemical rinse is required, pour DI water into the bucket labeled: *chemical rinse.*
2. Remove gross contamination.	Remove gross contamination using pressurized or gravity flow tap water, if available. If not, manually scrub the equipment using the 5-gallon bucket of water marked *gross wash* and a stiff brush (dedicated to the gross wash step).
3. Wash equipment.	Move the equipment to the 5-gallon bucket marked *soap wash*. Wash equipment with a stiff brush (dedicated to the soap wash step).
4. Triple rinse equipment.	In the bucket marked *DI rinse*, triple rinse the equipment with DI water to remove any soap residue.
5. Second rinse with deionized water.	Using DI water, triple rinse the equipment again in the bucket marked *final rinse* if a chemical rinse is not required.
6. Rinse equipment with chemicals.	In many cases, the tap water and DI water rinses will be sufficient. However, if specified in the SAP, WP, or SSHASP, chemical rinses of the equipment may be required. For inorganic contaminants, a mixture of 10:1 nitric acid in distilled water (10 parts water to 1 part nitric acid) may be specified. A methanol rinse may be required for some organic contaminants, such as hydrocarbons. Spray bottles, clearly marked with the appropriate chemical name, are an acceptable means of rinsing most equipment. **To perform the chemical rinse:** a. Hold the equipment over a collection container (5-gallon bucket or bowl). b. Make sure that all personnel and vehicles are upwind of the spray. c. Spray the piece of equipment inside and out starting at the top and working down to the bottom. d. Dispose of the contained chemicals as described in the SAP, WP or SSHASP. The Safety and Health Manager and/or Project Manager must approve the disposal method used.

7. Rinse equipment with deionized water.	After a required chemical rinse, rinse the equipment again with the DI water in the bucket marked *chemical rinse*. This DI water will need to be retained (i.e., do not dispose of this water on the site), tested, and disposed of according to federal and state requirements for the chemical used. The Safety and Health Manager and/or Project Manager must approve the disposal method used. After the rinse in the *chemical rinse* bucket, triple rinse the equipment again in the bucket marked *final rinse.*
8. Air dry equipment.	Place equipment on plastic sheeting or foil to air dry.
9. Transport/ store equipment.	Wrap equipment in foil or plastic wrap to transport or store.
10. Clean decontamination equipment.	a. Triple rinse equipment from the *gross wash* and *soap wash* (brushes and buckets) with clean tap water, preferably with pressurized water. Soap can be used on particularly dirty equipment. b. Triple rinse all decontamination equipment with DI water, including *DI rinse* and *final rinse* buckets. c. Store decontamination equipment, labeled and in a clean location so they are used only for decontamination purposes.
11. Dispose of decontamination solutions.	Storage of contained decontamination fluids as required by the SAP, QAPP, or WP or of residue from a chemical rinse should have been arranged on site prior to sampling. Once the sampling and associated decontamination is complete, sampling of the stored fluids for hazardous waste criteria will be required. If the fluids are determined to be hazardous (e.g., meet the characteristics of a hazardous waste [ignitability, corrosivity, reactivity, or toxicity] or contain listed wastes from title 40 of the Code of Federal Regulations [CFR] in part 261.4), dispose of them according to federal and state requirements. The Safety and Health Manager and/or Project Manager must approve the disposal method used. Note: when using other than the above-mentioned solutions, check with the Safety and Health Manager and the Project Manager.
12. Measure effectiveness of procedures.	Measure the effectiveness of the decontamination procedures using field equipment rinsate blanks as discussed in the SAP, QAPP, or WP.

HEALTH SAFETY SECURITY ENVIRONMENT (HSSE) CONSIDERATIONS
This section to be completed with concurrence from the Safety and Health Manager.

SOURCE	*HAZARDS*	*WHERE*	*HOW, WHEN, RESULT*	*CONTROLS*
CHEMICAL	Potential contact with contaminated items and resulting water from decontamination procedures.	Sites.	Inadvertent exposure to contaminated items and water resulting from decontamination procedures could lead to adverse health effects.	Personnel will practice proper personal hygiene (wash hands prior to eating/drinking and when leaving the site); follow decontamination procedures as described above; and wear nitrile gloves and safety glasses when handling contaminated items.
	Chemical rinse (e.g., dilute nitric acid, methanol, and hexane).	Sites.	Personnel could be exposed to chemicals via ingestion and skin/eye contact when decontaminating equipment. Exposure could cause irritation of skin/eye and adverse health effects.	Personnel will check and follow safety procedures as outlined in the chemical-specific Safety Data Sheets. Personnel will prevent skin/eye contact with chemicals and they will wear nitrile gloves and eye protection when handling chemicals. Personnel will practice proper personal hygiene (wash hands prior to eating/drinking, after decontaminating equipment, and when leaving the site). All personnel and vehicles will stand upwind when spraying equipment with chemicals. Refer to the Chemical Flushing Guidelines available inside any Pioneer vehicle's first aid kit for first-aid procedures in case of contact with chemicals.
NOISE	Not applicable.			
ELECTRICAL	Not applicable.			

HEALTH SAFETY SECURITY ENVIRONMENT (HSSE) CONSIDERATIONS
This section to be completed with concurrence from the Safety and Health Manager.

SOURCE	*HAZARDS*	*WHERE*	*HOW, WHEN, RESULT*	*CONTROLS*
BODY MECHANICS	Improper lifting.	Sites.	Back injuries and muscle/back strains could result when using improper techniques to lift and carry 5-gallon containers.	Personnel will use proper lifting techniques: get a good grip, keep the load close to the body, lift with legs and not with back, and avoid lifting loads above shoulder's height. Two people will lift awkward/heavy tools and equipment.
GRAVITY	Falls from slips and trips.	Areas designated for decontamin-ation procedures.	Slips and falls could occur while performing decontamination procedures due to slippery surfaces resulting in bruises, scrapes, or broken bones.	Personnel will wear work boots with good traction and ankle support. Personnel will also be aware of working/ walking surfaces and choose a path to avoid hazards, keep work areas as dry as possible, and wear muck boots as necessary.
WEATHER	Cold/heat stress.	Sites.	Exposure to cold climates may result in cold burns, frostbites, and hypothermia. Exposure to high temperatures may result in heat cramps, heat exhaustion, or heat stroke.	Training on signs and symptoms of cold/heat stress is required. Personnel will wear appropriate clothing when working outdoors, remain hydrated, and have sufficient caloric intakes during the day. Personnel will also follow procedures outlined in applicable SSHASP and/or Pioneer corporate HASP.
	Hypothermia/ frostbite.	Sites where air temperature is 35.6 °F (2 °C) or less.	Personnel whose clothing becomes wet during decontamination procedures may be exposed to hypothermia and/or frostbite.	Personnel will change clothing if it becomes wet.

HEALTH SAFETY SECURITY ENVIRONMENT (HSSE) CONSIDERATIONS
This section to be completed with concurrence from the Safety and Health Manager.

SOURCE	*HAZARDS*	*WHERE*	*HOW, WHEN, RESULT*	*CONTROLS*
	Lightning.	Outdoor sites.	Electrocution, injury, death, or equipment damage could be caused by lightning strike.	Personnel will follow the 30/30 rule during lightning storms.
RADIATION	Ultraviolet (UV) radiation.	Outdoors.	Personnel could be exposed to UV radiation during summer months causing sun burns, skin damage, and eye damage.	Personnel will wear safety glasses with tinted lenses, long-sleeve work shirts, and long pants. Personnel should wear sunscreen, if necessary.
BIOLOGICAL	Plants, insects, and animals.	Sites.	Exposure to plants, insects, and/or animals may cause rashes, blisters, redness, and swelling.	Training on the signs and symptoms of exposure to plants, insects, and animals is required. Personnel will avoid contact with plants, insects, and animals. First-aid kits will be available on the site. Personnel with allergies will notify their supervisor.
MECHANICAL	Not applicable.			
PRESSURE	Not applicable.			
THERMAL	Contact with hot surfaces.	Foil and decontamination equipment.	If foil and decontamination equipment are placed directly in the sun, they could get hot. Contact with hot surfaces could result in personal injury.	Personnel will not set decontamination stations directly in the sun.

HEALTH SAFETY SECURITY ENVIRONMENT (HSSE) CONSIDERATIONS This section to be completed with concurrence from the Safety and Health Manager.				
SOURCE	***HAZARDS***	***WHERE***	***HOW, WHEN, RESULT***	***CONTROLS***
HUMAN FACTORS	Inexperienced and improperly trained personnel.	Sites.	Inexperienced personnel and improper training could cause incidents resulting in injuries and/or property damage.	Personnel will be properly trained in this procedure and other applicable procedures. Personnel will implement stop work procedures, if necessary.
SIMOPS (Simultaneous Operations)	Not applicable.			

ADDITIONAL HSSE CONSIDERATIONS This section to be completed with concurrence from the Safety and Health Manager.	
REQUIRED PPE	**Personnel Protection Equipment** (PPE)**:** Safety glasses, high-visibility work shirt or vest, long pants, work boots, and nitrile gloves.
APPLICABLE SDSs	**Safety Data Sheets** (SDSs) for corresponding chemicals used during chemical rinse will be maintained based on the site characterization and contaminants. Safety Data Sheets are available to Pioneer personnel at the link below: https://pioneertechnicalservices.sharepoint.com/Safety/SafetyDataSheets
REQUIRED PERMITS/ FORMS	Per site/project requirements.
ADDITIONAL TRAINING	Per site/project requirements.

DRAWINGS, DOCUMENTS, AND TOOLS/EQUIPMENT The following documents should be referenced to assist in completing the associated task.	
DRAWINGS	
RELATED SOPs/ PROCEDURES/ WORK PLANS	

TOOLS/ EQUIPMENT	Five empty 5-gallon buckets, tap water, stiff brushes, Liquinox soap, four 5-gallon containers of DI (or distilled water if DI water is not available), chemicals for chemical rinse (if required), small plastic swimming pool/plastic sheeting or foil, tarps, and sprayers (if available). If additional items for decontamination are needed, they will be listed on the SAP.
FORMS/ CHECKLIST	

APPROVALS/CONCURRENCE

By signing this document, all parties acknowledge the completeness and applicability of this SOP for its intended purpose. Also, by signing this document, it serves as acknowledgement that I have received training on the procedure and associated competency testing.

SOP TECHNICAL AUTHOR	**DATE**
Julie Flammang **Julie Flammang**	**09/08/2020**
SAFETY AND HEALTH MANAGER	**DATE**
Tara Schleeman **Tara Schleeman**	**09/08/2020**

Appendix C
Forms

Appendix C.1 Chain of Custody

Appendix C.2 XRF Field Data Sheet

Appendix C.3 Level A-B Validation Form

Appendix C.4 Corrective Action Template

Laboratory Management Program (LaMP) Chain of Custody Record

Soil, Sediment and Groundwater Samples

BP Site Node Path: _____ **Req Due Date (mm/dd/yy):** _____ Rush TAT Yes _____ No ____x

BP/RM Facility No: _____ **Lab Work Order Number:** _____

Lab Name:	BP/ARC Facility Address:	
Lab Address:	City, State, ZIP Code:	Consultant/Contractor Project No:
Lab PM:	Lead Regulatory Agency:	Address:
Lab Phone:	California Global ID No.:	Consultant/Contractor PM:
Lab Shipping Accnt:	Enfos Proposal No:	Phone: Email:
Lab Bottle Order No:	Accounting Mode: Provision _____ OOC-BU _____ OOC-RM _____	Send/Submit EDD to:
Other Info:	Stage Activity OMM	Invoice To: BP-RM _____ BP-Other _____

BP/RM PM:	Sample Details	Requested Analyses	Report Type & QC Level
			Limited (Standard) Package ____
PM Phone:		Filt	Limited Plus Package ____
PM Email:		Pres	Full Package ____

Lab No.	Sample Description	Date	Time	Field Matrix	Start Depth	End Depth	Depth Unit	Grab (G) or Composite (C)	Total Number of Containers	Analysis	Comments

Sampler's Name:	Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
Sampler's Company:						
Ship Method: Ship Date:						
Shipment Tracking No:						

Special Instructions:

THIS LINE - LAB USE ONLY: Custody Seals In Place: Yes / No | Temp Blank: Yes / No | Cooler Temp on Receipt: _____°F/C | Trip Blank: Yes / No | MS/MSD Sample Submitted: Yes / No

XRF SAMPLES

XRF - Thermo Fisher Scientific
Nitron XL3 X-Ray Based

Soil Action/Screening Levels (mg/kg)

		Residential		250	71	3,100	1,200			
		Non-Residential					2,300			
		Recreational		1,000	20	1,000		1,000		
		Commercial		500						
XRF Reading	**Sample Name**	**Date collected**	**Date analyze**	**As mg/kg**	**Cd mg/kg**	**Cu mg/kg**	**Pb mg/kg**	**Zn mg/kg**	**Depth**	**Pass/Fail**

Level 2 Data Validation Checklist XRF Sample Analysis

Site:	**Case No:**	**Laboratory:**
Project:	**Sample Matrix:**	**Analyses:**
Sample Date(s):	**Analysis Date(s):**	
Data Validator:	**Validation Date(s):**	

1. Holding Times

Analyte	Laboratory	Matrix	Method	Holding Times	Collection Date(s)	Analysis Date(s)	Holding Time Met (Y/N)	Affected Data Flagged (Y/N)

*Reference for Holding Times –

Were any data flagged because of holding time? Y [ ] N [X]
What sample preparation steps were performed (i.e. drying, sieving etc.)?
Were the samples prepped according to the SAP/QAPP? Y [X] N [ ]

Describe Any Actions Taken:

Comments:

2. Energy Calibration (System Check)

Was the energy calibration performed at the frequency of once per day? Y [ ] N [ ]
Was the energy calibration Resolution below 195? Y [ ] N [ ]
Did the energy calibration run for at least 50 seconds? Y [ ] N [ ]

Describe Any Actions Taken:

Comments:

3. SiO_2 Standards

Was the SiO_2 Standard analyzed at the beginning of analysis? Y [ ] N [ ]
Was the SiO_2 Standard analyzed at the frequency of 1 per 20 natural samples? Y [ ] N [ ]
Were the SiO_2 Standard results within the control limits? Y [ ] N [ ]
Were any data flagged because of the SiO_2 Standard results? Y [ ] N [ ]

Describe Any Actions Taken:

Comments:

4. Calibration Check Samples

Were the appropriate Calibration Check Samples (CCS) analyzed at the beginning of analysis? Y [ ] N [ ]
Were the appropriate CCS analyzed at the frequency of 1 per 20 natural samples? Y [ ] N [ ]
Were CCS results within the control limits? Y [ ] N [ ]
Were any data flagged because of CCS problems? Y [ ] N [ ]

Describe Any Actions Taken:

Comments:

5. Duplicate Sample Results

Were Duplicate Samples analyzed at the frequency of 1 per 20 natural samples?	Y ☐	N ☐
Were Duplicate Sample results within the control window?	Y ☐	N ☐
Were any data flagged because of duplicate sample results?	Y ☐	N ☐

Describe Any Actions Taken:

Comments:

6. Replicate Sample Results

Were Replicate Samples analyzed at the frequency of 1 per 20 natural samples?	Y ☐	N ☐
Were replicate sample results within the control window?	Y ☐	N ☐
Were any data flagged because of replicate sample results?	Y ☐	N ☐

Describe Any Actions Taken:

Comments:

7. Overall Assessment

Are there analytical limitations of the data that users should be aware of?	Y ☐	N ☐

If so, explain:

Comments:

8. Authorization of Data Validation

Data Validator

Name: **Reviewed by:**

Signature: _____ _____

Date: _____ _____

Level A/B Assessment Checklist

1. General Information

Site:
Project:
Client:
Sample Matrix:

2. Screening Result

Data are:

1. Unusable ____
2. Level A ____
3. Level B ____

I. **Level A**

Criteria – The following must be fully documented.	**Yes/No**	**Comments**
1. Sampling date		
2. Sampling team or leader		
3. Physical description of sampling location		
4. Sample depth (soils)		
5. Sample collection technique		
6. Field preparation technique		
7. Sample preservation technique		
8. Sample shipping records		

II**. Level B**

Criteria – The following must be fully documented.	**Yes/No**	**Comments**
1. Field instrumentation methods and standardization complete		
2. Sample container preparation		
3. Collection of field replicates (1/20 minimum)		
4. Proper and decontaminated sampling equipment		
6. Field custody documentation		
7. Shipping custody documentation		
8. Traceable sample designation number		
9. Field notebook(s), custody records in secure repository		
10. Completed field forms		

Level 2 Data Validation Checklist for Sample Analysis

Site: **Case No:** **Laboratory:**
Project: **Sample Matrix:** **Analyses:**
Sample Date(s): **Analysis Date(s):**
Data Validator: **Validation Date(s):**

1. Holding Times

Analyte	Laboratory	Matrix	Method	Holding Times	Collection Date(s):	Analysis Date(s)	Holding Time Met (Y/N)	Affected Data Flagged (Y/N)

Were any data flagged because of holding time? Y ☐ N ☐
Were any data flagged because of preservation problems? Y ☐ N ☐

Describe Any Actions Taken:

Comments:

2. Blanks

Were Method Blanks (MBs) analyzed at the frequency of 1 per analytical batch? Y ☐ N ☐
Were MBs within the control window? Y ☐ N ☐
Were any data flagged because of blank problems? Y ☐ N ☐

Describe Any Actions Taken:

Comments:

3. Laboratory Control Samples

Were Laboratory Control Samples (LCS) analyzed at the frequency of 1 per batch? Y ☐ N ☐
Were LCS results within the control window? Y ☐ N ☐
Were any data flagged because of LCS problems? Y ☐ N ☐

Describe Any Actions Taken:

Comments:

4. Duplicate Sample Results

Were Laboratory Duplicate Samples (LDS) analyzed at the frequency of 1 per batch? Y ☐ N ☐
Were LDS results within the control window? Y ☐ N ☐
Were any data flagged because of LDS problems? Y ☐ N ☐

Describe Any Actions Taken:

Comments:

5. Matrix Spike Sample Results

Were Laboratory Matrix Spike Samples (LMS) analyzed at the frequency of 1 per batch? Y ☐ N ☐
Were LMS results within the control window? Y ☐ N ☐
Were any data flagged because of LMS problems? Y ☐ N ☐

Describe Any Actions Taken:

Comments:

6. Field Blanks

Were field blanks submitted as specified in the QAPP?	Y		N		N/A	
Were field blanks within the control window?	Y		N		N/A	
Were any data qualified because of field blank problems?	Y		N		N/A	

Describe Any Actions Taken:

Comments:

7. Field Duplicates

Were field duplicates submitted as specified in the QAPP?	Y		N		N/A	
Were results for field duplicates within the control window?	Y		N		N/A	
Were any data qualified because of field duplicate problems?	Y		N		N/A	

Describe Any Actions Taken:

Comments:

8. Overall Assessment

Are there analytical limitations of the data that users should be aware of? Y ☐ N ☐

If so, explain:

Comments:

9. Authorization of Data Validation

Data Validator

Name: **Reviewed by:**

Signature: _____ _____

Date: _____ _____

Corrective Action Report/ Corrective Action Plan

Project ID	Project Name	Document ID

Preparer's Signature/Submit Date	Submitted to:

Description of the requirement or specification	
Reason for the Corrective Action	
Location, affected sample, affected equipment, etc. requiring corrective action	
Suggested Corrective Action	(Continue on Back)
Corrective Action Plan	(Continue on Back) ☐ Approval signature/date:_____
	Approval of corrective actions required by EPA? ☐ Yes ☐ No ☐ EPA approval name/date:_____ ☐ Corrective actions completed name/date:_____
Preventative Action Plan	(Continue on Back) ☐ Preventative actions completed name/date:_____

Corrective Action Report/
Corrective Action Plan

Suggested Corrective Action (Continued)	
Corrective Action Plan (Continued)	
Preventative Action Plan (Continued)	

Appendix D
Summary of Revisions and Bibliography of Data Summary Reports

Summary of Revisions
Bibliography of Completed Sites and Executive Summaries

Appendix D.1
Summary of Revisions

Rev. No.	Year	Description
1	2021	Distribution lists: Updated to current distribution list. Updated text to reference BPSOU CD and Field Sampling Plans (FSPs) rather than sampling and analysis plans (this affected Section 2). Section 2.1: Updated Project Organization and Responsibilities • Updated Atlantic Richfield QAM to David Gratson • Updated Atlantic Richfield Liability Manager Title (Mike Mc Anulty Atlantic Richfield Company) • Updated Operations Manager (Eric Hassler) • Added Brandon Warner as BSB Field Team Supervisor Section 2.2 and Section 2.3: Updated text to reference the BPSOU CD and specify metals-impacted sediment. Section 2.4. Updated Step 2: Identify the Goals of the Study to include: Are contaminants, if present on site, the result of historic mining operations or related activities? Minor word changes in Step 4 and Step 7 for clarification. Section 2.6.7: Added metals-impacted to clarify type of sediments. Added Section 3.1 Site Evaluation Objectives, which changed all the section 3 headings after it. Section 3.3.2 Sedimentation Analysis (previously Section 3.2.2): Added metals-impacted to clarify type of sediments. Section 6 References: added the BPSOU CD information. Appendix A: Figures/Charts • Updated A.1 – Updated BPSOU Area Map to revised BPSOU boundary in the Consent Decree • Updated A.2 – Organization Chart • Updated A.3 – Decision Logic Appendix B: SOP Updates • SOP-SA-04 – revised 11/12/2020 • SOP-DE-02 – revised 09/08/2020 Appendix C: Updated forms Appendix D: Added changes to previous revision.