Summer 6-15-2022

Draft Final 2021 Unreclaimed Sites Sampling UR-35 Site Evaluation Summary Report

Pioneer Technical Services, Inc.

Atlantic Richfield Company

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June 15, 2022

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RE: Butte Priority Soils Operable Unit (BPSOU) 2021 Unreclaimed Sites Sampling UR-35 Site Evaluation Summary Report

Agency Representatives:

I am writing to you on behalf of Atlantic Richfield Company to submit the 2021 Unreclaimed Sites Sampling UR-35 Site Evaluation Summary Report, which summarizes sampling and site evaluation activities. The evaluation summary includes the data summary report (DSR) as Appendix A and the data validation report as an attachment (Attachment A) to the DSR.

The report, appendices, and related files may be downloaded at the following link:

https://pioneertechnicalservices.sharepoint.com/:f:/s/submitted/ErWr4Yj4C8xAgF30cvBbUzEBIO7XobZvJxF2DrJsBaQ5UA.

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

Sincerely,

Mike McAnulty

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An affiliate of **Atlantic Richfield Company**

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

Draft Final

2021 Unreclaimed Sites Sampling UR-35
Site Evaluation Summary Report

Atlantic Richfield Company

2022

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BUTTE PRIORITY SOILS OPERABLE UNIT

Draft Final

2021 Unreclaimed Sites Sampling UR-35
Site Evaluation Summary Report

Prepared for:

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Butte, Montana 59701

Prepared by:

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2022

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ABBREVIATIONS AND ACRONYMS

Acronym	Definition	Acronym	Definition
BHRS	Butte Hill Revegetation Specifications	**QAPP**	Quality Assurance Project Plan
BPSOU	Butte Priority Soils Operable Unit	**QC**	Quality Control
CD	Consent Decree	**RCP**	Reinforced Concrete Pipe
DSR	Data Summary Report	**ROD**	Record of Decision
EPA	Environmental Protection Agency	**SBC**	Silver Bow Creek
FRESOW	Further Remedial Elements Scope of Work	**SD**	Settling Defendants
HDD	Hydro Dynamic Device	**SOP**	Standard Operating Procedures
mg/kg	milligram per kilogram	**UR**	Unreclaimed
QA	Quality Assurance	**XRF**	X-Ray Fluorescence

1.0 INTRODUCTION

This Butte Priority Soils Operable Unit (BPSOU) Unreclaimed (UR) Site Evaluation Summary presents the declarations of the subsurface soil sampling conducted on September 8, 2021, at the UR source area UR-35 within the BPSOU (referred to herein as UR-35 Site or Site).

Unreclaimed solid media sites located within the BPSOU may have potentially been impacted by historical mining. These sites must be evaluated to determine if remedial action is required. Site evaluations are completed to determine if a specific site poses a threat to human health, contributes metals-impacted sediments to existing or planned wet weather control features, or contributes to the degradation of surface water quality as described in the BPSOU Consent Decree (CD), Appendix D, Attachment C Further Remedial Elements Scope of Work (FRESOW) (EPA, 2020).

Source areas within the BPSOU may include upland soil waste, mine waste, and floodplain soil and waste. These source areas have the potential to act as indirect pathways for human exposure, contribute metal inputs to the alluvial and bedrock aquifers, and act as metals sources to surface water (to Blacktail Creek and Silver Bow Creek [SBC]) via storm water runoff.

Means and methods used to characterize UR sites and make remediation recommendations are described in the 2021 Final UR Sites Quality Assurance Project Plan (QAPP) (Atlantic Richfield, 2021) (referred to herein as the QAPP). Results from site sampling/inspection activities will be used to make site declarations and drive remedial action requirements to be completed by the Settling Defendants (SDs). Contaminated solid media identified within the BPSOU will be addressed through a combination of source removal, capping, and/or land reclamation as appropriate to meet the Butte Hill Revegetation Specifications (BHRS) (EPA, 2020). The specific Remedial Action Work Plans will be prepared by SDs and approved by Agencies prior to implementation.

1.1 Objectives

This Site Evaluation Summary Report presents all Site data and declarations from the UR-35 Site investigation, as required in the FRESOW (EPA, 2020). Results from the 2021 investigation are summarized in the Data Summary Report (DSR) in Appendix A, which includes a Data Validation Report. The conclusions and declarations provided in this report were based on the objectives and procedures executed and outlined in the DSR. General Site and sample station photographs are included in Appendix B.

This Evaluation Summary Report includes information within each related report as described below:

Site Evaluation Summary:

- A summary of all Site data (historical and new).
- A declaration as to whether the Site contains concentrations at or above human health action levels or the Waste Identification Criteria in Table 1 in Appendix 1 of the BPSOU CD (EPA, 2020), whichever is more stringent.

- A declaration as to whether historical mine waste at the Site is contributing to the degradation of surface water quality.
- A declaration as to whether the Site contributes metals-impacted sediment to existing or planned wet weather control features.

DSR (Appendix A):
- Investigation objectives.
- Data quality assessment.
- Project objectives and sampling design review.
- Preliminary data review.
- Conclusions on the quality of the data.
- Sampling and analysis summary.

Data Validation Report (Attachment A of the DSR):
- Quality assurance (QA) and quality control (QC) review of inorganic data.
- Level A/B Assessment.
- Assessment of precision, accuracy, representativeness, comparability, completeness, and sensitivity between X-ray fluorescence (XRF) and laboratory data.
- Overall data summary.

The following sections provide details about the items bulleted above.

The land use at the UR-35 Site is residential per professional judgment by the field team lead, informed by current county zoning and guidance listed in the 2006 Record of Decision (ROD) requirements (Appendix A of the BPSOU CD; EPA, 2020). Human health action levels and storm water criteria for residential space were referenced to prepare this declaration. The action levels are listed in Table 1.

2.0 SITE DESCRIPTION AND BACKGROUND

Site UR-35 is approximately 0.12 acre and is located 300 feet northwest of the intersection of North Main and Woolman streets in uptown Butte (Figure 1). It is an irregularly shaped, bare area, part of which is a gravel turn-around area used by residents. It is essentially an area in the backyard of homes that face North Main Street. Atlantic Richfield, Butte-Silver Bow, and a private third party own portions of the Site. Site UR-35 is vacant; that is, there are no structures within the boundaries of the Site. However, the private third-party parcel has a residence, and there are other residences close to UR-35. Site UR-35 is poorly vegetated with homogenous soil that is yellow in color mixed with gravel. Due to size and representation, only three sample locations were proposed. Storm water runoff from Site UR-35 generally flows to the south. Site UR-35 is in the Buffalo Gulch drainage basin of the BPSOU.

3.0 SITE EVALUATION

The Site was evaluated following the Unreclaimed Area Logic Diagram (Appendix A.3 of the BPSOU CD; EPA, 2020) to determine if reclamation is warranted. The 2021 Site investigation was completed on September 8, 2021. Sampling activities were performed according to specified

standard operating procedures (SOPs) as outlined in the QAPP. The DSR in Appendix A includes a description of the 2021 investigation. Composite samples were collected from each location at the specified depth intervals of 0 to 2 inches, 2 to 6 inches, and 6 to 12 inches. Two historical data sets were available from 1995 and 1996 (CDM, 1997). Photographs of the sampling events are included in Appendix B.

3.1 Data Summary

A total of 3 sample stations in the 2021 sampling event were sampled by collecting 3-point composite samples at 3 depth intervals. Each sample was collected and analyzed by XRF for arsenic, cadmium, copper, lead, zinc, and mercury. Out of the 9 collected soil samples, 4 were submitted to Pace Analytic Services, LLC, for laboratory confirmation (per Section 3.2.4, Table 5 of the QAPP), and 1 sample was submitted for laboratory QA and QC. The DSR in Appendix A details the total XRF samples collected, confirmation laboratory samples submitted, and the QA and QC laboratory samples submitted. Two surficial historical sample locations were collected in 1995 and 1996 (CDM, 1997) for XRF analysis of arsenic, copper, lead, and zinc. Based on the data quality conclusions in the DSR, the data analyzed in the 2021 sampling event were deemed usable.

For samples analyzed by both XRF and laboratory, the laboratory results were used for the evaluation of the Site. For samples analyzed only by XRF, the XRF results were used for the evaluation of the Site.

3.2 Human Health Action Levels

Table 2 lists the historical data, Table 3 lists the new data, and Table 4 describes the exceedances related to the following findings of the 2021 investigation:

- Lead exceeded the Human Health action level (1,200 milligrams per kilogram [mg/kg])) in 8 of the 9 samples ranging from 1,894 mg/kg to 6,090 mg/kg, and both historical samples exceeded ranging from 2,070 mg/kg to 2,740 mg/kg.
- Both historical samples exceeded the arsenic action level (250 mg/kg) reporting values of 301 mg/kg and 443 mg/kg.

3.3 Screening Criteria for Storm Water

Table 2 lists the historical data, Table 3 lists the new data, and Table 4 describes the exceedances related to the following findings of the 2021 investigation:

- Sample BPSOU-UR35OP01-090821-2 exceeded the cadmium, lead, mercury[1], and zinc screening criteria for storm water. Zinc exceeded the waste criteria (greater than 5,000 mg/kg).

[1] Mercury results are non-detected results as described in Section 2.2.3 of the DVR. The detection limit was higher than the screening criteria for storm water. Sample classified as waste due to zinc result regardless of the mercury result.

- Sample BPSOU-UR35OP01-090821-3 and BPSOU-UR35SS03-090821-2 exceeded the cadmium, lead, and zinc screening criteria for storm water. Lead and zinc exceeded the waste criteria.
- Sample BPSOU-UR35SS02-090821-3 exceeded the arsenic, copper, lead, mercury[1], and zinc screening criteria for storm water. Zinc exceeded the waste criteria.
- Sample BPSOU-UR35SS03-090821-3 exceeded the cadmium, copper, lead, mercury[1], and zinc screening criteria for storm water. Zinc exceeded the waste criteria.
- Historical sample FSUA-20 and FSUA-122 exceeded the arsenic, lead, and zinc screening criteria for storm water.

Five samples collected in 2021 and both historical samples exceeded 3 of the 6 contaminant screening level criteria listed in Table 1. Five zinc results and 2 lead results collected in 2021 exceeded the waste criteria of greater than 5,000 mg/kg. The Site was further evaluated to determine the materiality of the load and the possible contribution to the degradation of surface water per the requirements of the QAPP (Section 2.4, Step 5, page 8).

3.4 Sedimentation Analysis

Contribution to degradation of surface water quality or metals-impacted sediment is determined by evaluating the presence of rills, concentrated outflow, and metals-impacted sediment in downstream infrastructure; determining sediment contribution loading upgradient of the Site; and connection to surface water features (Figure 2).

Presence of Rills:
Heavy vehicle travel and run-on/runoff issues are contributing to formation of rills west along West Boardman Street, and substantially south to West Woolman Street. The Site has poor vegetation and consists of gravel and fine sediments. Rills and gullies forming downgradient to Woolman Street are translocating sediment which may contribute to human health and storm water exceedances in existing storm water inlet structures connected to the Buffalo Gulch drainage.

Concentrated Outflow:
There is no existing storm water infrastructure on the Site or adjacent roadways. Southwest of the Site is a storm water inlet (BG-C-1724) at the base of a vegetated gully comprised of residential yards. Storm water and sediment transported through this inlet routes to West Woolman Street via BG-BG-2682, a brick and granite pipe, to inlet BG-I-5579. BG-I-5579 was inspected and deemed partially functional because the "pipe was nearly filled with sediments"[2]. Storm water flowing south along West Boardman Street to West Woolman Street flows to BG-I-5577 and is routed downgradient to BG-I-5579 via an 8-inch concrete pipe BG-RCP-2547. Inspection of BG-I-5577 deemed the inlet structure functional and partially filled with sediments.

[1]. Mercury results are non-detected results as described in Section 2.2.3 of the DVR. The detection limit was higher than the screening criteria for storm water. Sample classified as waste due to zinc result regardless of the mercury result.

[2] Inspection notes were obtained from a Butte Silver Bow Utilities geodatabase. Access to the database can be provided upon request.

Storm water flowing west along West Boardman Street would likely report to either BG-I-5579 described above or BG-I-5571, located on the corner of West Boardman Street and North Alaska Street. The inlet inspection reported the infrastructure has failed and requires major repair; it is unknown if the cause is sediment related.

Evaluate Metals-Impacted Sediment in Downstream Infrastructure:
Metals-impacted sediment is present at Site UR-35. Sediment has been documented through inspections of storm water inlets and outlets along the Buffalo Gulch drainage. In the previous section, the downgradient inlets contained evidence of sediment deposit from the Site. The Buffalo Gulch drainage pipe runs south along South Dakota Street and is captured by the Buffalo Gulch Webster Garfield Hydrodynamic Device (HDD) approximately 150 feet northeast of the intersection of South Dakota Street and West 1st Street. This device separates sediment from storm water by capturing sediment in its center chamber. The device is maintained by pumping sediment out of the center chamber's sump (Table F-8 describes O&M Procedures [BSB, 2017]). Butte-Silver Bow (BSB) removed 42 cubic yards from the HDD and transported it to the Lower Area One drying beds in 2021. From the outlet of the Buffalo Gulch Webster Garfield HDD, water is discharged to outlet structure BG-O-1. The inspection of the 36-inch concrete outlet structure described a "high sediment" deposit. In 2021, BSB removed 20 cubic yards of sediment from the outlet structure and transported the material to the repository. Storm water and sediment are then transported through the 450-foot, open, grass-lined channel starting at BG-O-1, before reaching the discharge outlet (MT-O-1) into SBC. BSB has multiple sediment removal reports along the channel from 2018 to 2021 Inspection and O&M Data report geodatabase[3].

Evaluate Contributing Sediment Loading Above the Site:
There does not appear to be any sediment loading contributed by sites upslope of the UR-35 Site. The large parcel to the north (upslope) is Steward Parking Lot. Runoff from that parcel drains primarily northwest of UR-35 into a sediment catch system (BG-C-1722) between Sutter Street and the BA&P Hill Trail. That system is connected to the Buffalo Gulch drainage.

Direct Linkage to Surface Water Features:
The UR-35 Site has a partial connection pathway to SBC through the Buffalo Gulch drainage (Figure 2).

4.0 DECLARATION CONCLUSION

From the historical samples (Table 2) and 2021 soil samples (Table 3), 8 samples collected in 2021 exceeded the lead human health action levels and 2 historical samples exceeded the arsenic and lead human health action levels. Five samples collected in 2021 and both historical samples exceeded 3 of the 6 contaminant screening level criteria listed in Table 1. Five zinc results and 2 lead results collected in 2021 exceeded the waste criteria of greater than 5,000 mg/kg. The sedimentation analysis (Section 3.4) indicates the following:

- Documentation of active rills and soil loss from the Site.

[3]Information was obtained from the Butte Silver Bow O&M Data report geodatabase. The database is maintained internally by Butte-Silver Bow.

- Evidence of current metals-impacted sediment within the UR Site boundary translocating off Site.
- Existing downstream infrastructure, Buffalo Gulch Webster Garfield HDD, captures potentially impacted sediment and is designed to retain the sediment migration from Buffalo Gulch drainage mitigating potential surface water degradation from metals-impacted sediment.

The Site has a partially complete pathway to SBC through the Buffalo Gulch drainage; evidence of metals-impacted sediment from Site UR-35 shows it may be contributing to surface water degradation at the SBC and Blacktail confluence. Sediment is captured by the Superfund storm water HDD; however, there is potential for metals-impacted storm water to reach SBC if the structure is not maintained properly. Based on the criteria identified in the QAPP and established qualifying data, corrective actions are recommended to address human health exceedances and the effect of metals-impacted sediment migration from the site.

5.0 REFERENCES

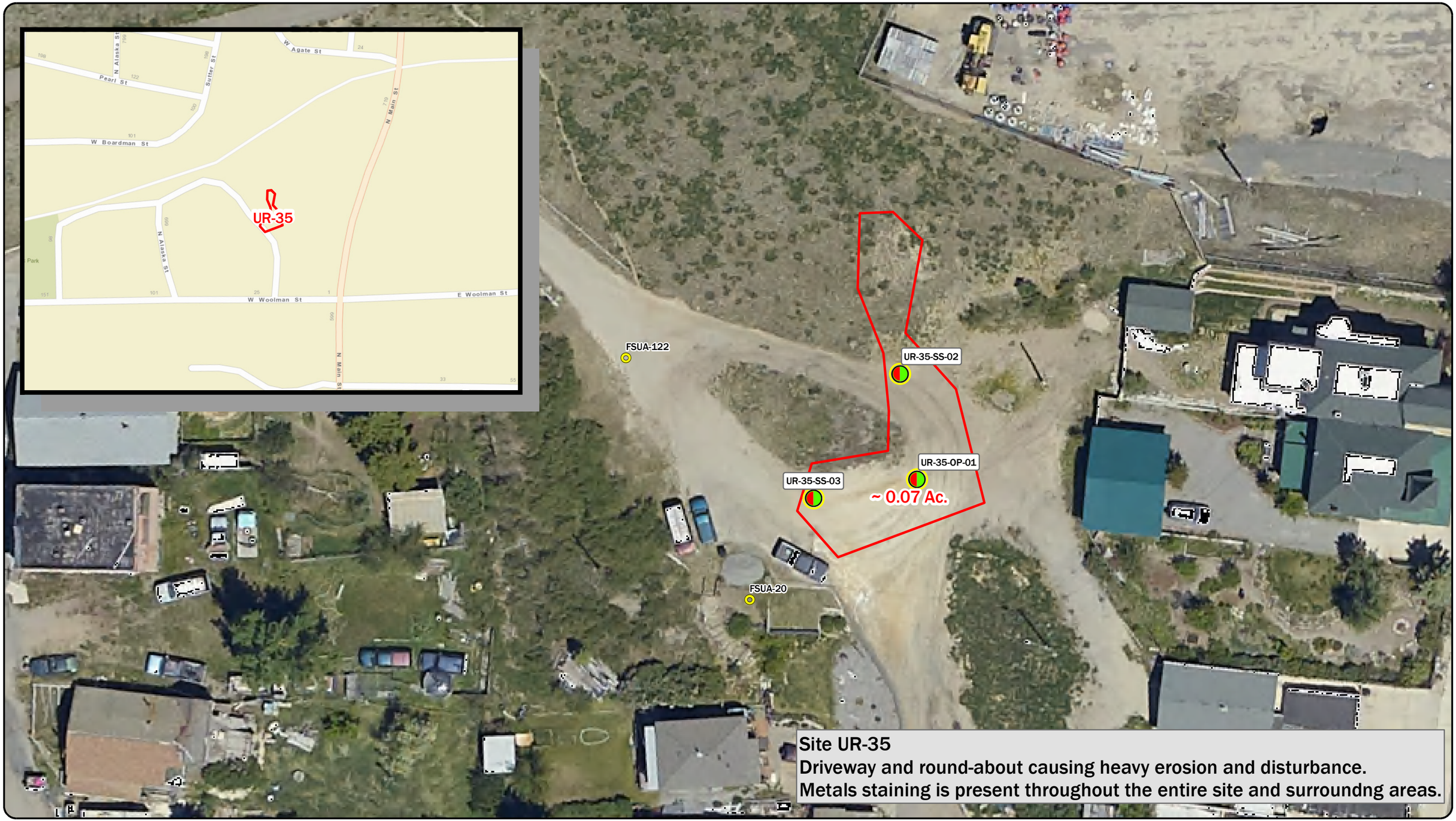
Atlantic Richfield, 2021. Unreclaimed Sites Quality Assurance Project Plan. Atlantic Richfield Company, June 2021.

BSB, 2017. Interim Operation and Maintenance Plan for the Butte-Silver Bow Superfund Storm Water System Within the Butte Priority Soils Operable Unit. April 2017.

CDM, 1997. Final Field Survey of Unreclaimed Areas Summary Report. 1997

EPA, 2020. Consent Decree for the Butte Priority Soils Operable Unit. Partial Remedial Design/Remedial Action and Operation and Maintenance. U.S. Environmental Protection Agency. February 13, 2020. Available at https://www.co.silverbow.mt.us/2161/ButtePriority-Soils-Operable-Unit-Conse. Appendix A of the Consent Decree contains the 2006 Record of Decision.

Figures



HUMAN HEALTH EXCEEDANCE
STORM WATER EXCEEDANCE
WASTE EXCEEDANCE
RESULTS BELOW ACTION LEVEL
HISTORIC SAMPLE STATION
UNRECLAIMED SITE BOUNDARY

N

DISPLAYED AS:
PROJECTION/ZONE: MSP
DATUM: NAD 83
UNITS: INT'L FT
SOURCE: PIONEER/AR/QSI 2020

0 15 30 60
Feet

FIGURE 1

PIONEER TECHNICAL SERVICES, INC.

DATE: 3/1/2022

UR-35
2021 UR SITES
SAMPLING AND
EXCEEDANCES

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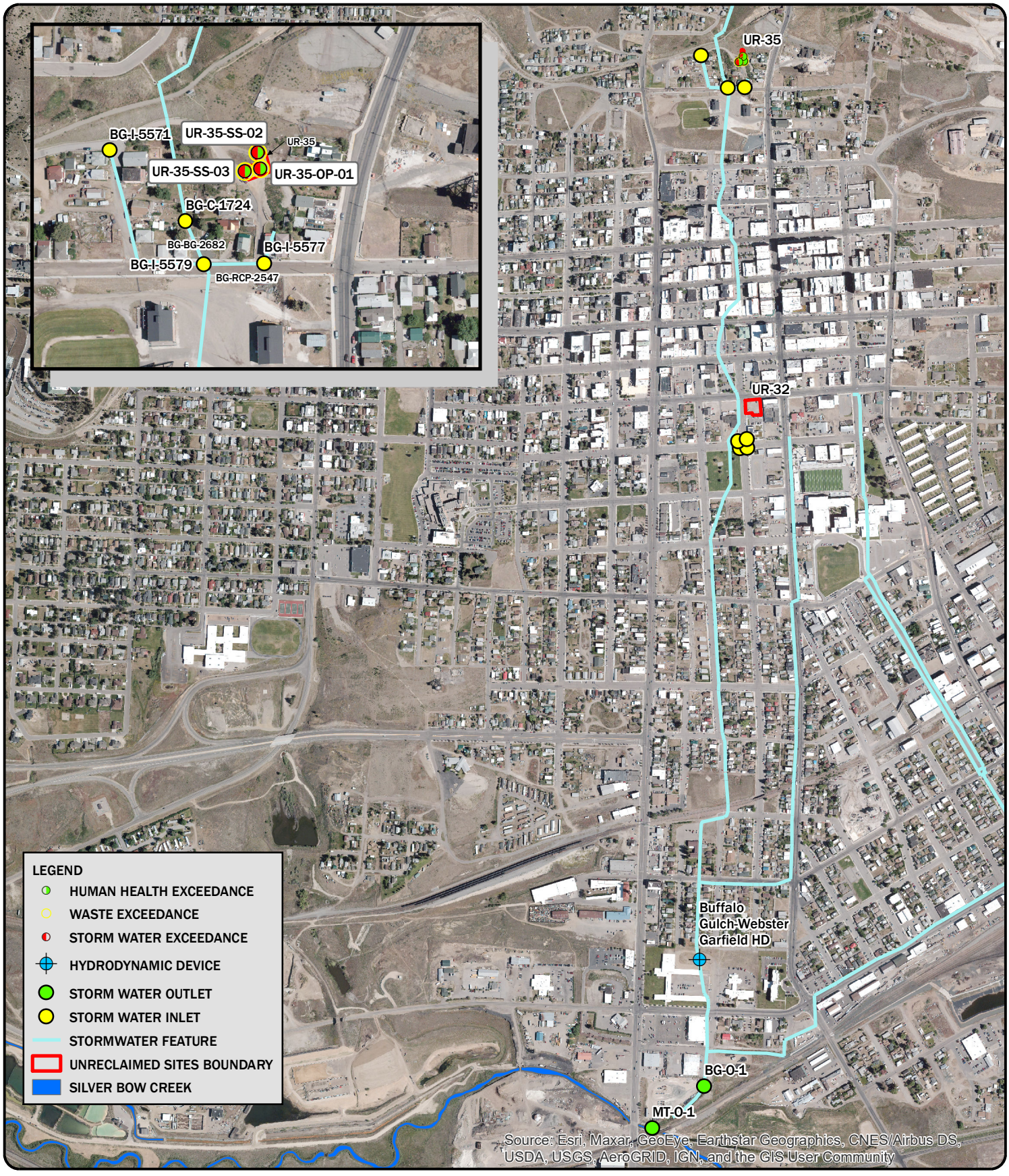

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DISPLAYED AS:
PROJECTION/ZONE: MSP
DATUM: NAD 83
UNITS: INT'L FT
SOURCE: PIONEER/BSB/QSI 2020

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FIGURE 2

PIONEER TECHNICAL SERVICES, INC.

Unreclaimed Sites
UR-35
Storm Water Features

DATE: 3/21/2022

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Tables

Table 1. BPSOU Soil Screening Criteria

Analyte	Solid Media	Action/Screening Levels
Lead[1]	Residential	1,200 mg/kg
Arsenic[1]	Residential	250 mg/kg
Cadmium [2]		20 mg/kg
Copper [2]		1,000 mg/kg
Zinc [2]		1,000 mg/kg
Lead [2]		1,000 mg/kg
Arsenic [2]		200 mg/kg
Mercury [2]		10 mg/kg

1. From EPA Record of Decision (ROD) BPSOU, Table 12-1 (EPA, 2006a).

2. Waste Identification Criteria in Table 1 in Appendix 1 of the BPSOU Consent Decree (EPA, 2020).

mg/kg: milligrams per kilogram

Table 2: Historical Data Summary

COC	Sample FSUA-20	Sample FSUA-122
Arsenic	443	301
Cadmium	N/A	N/A
Copper	908	902
Lead	2,070	2,860
Zinc	3,900	2,740

Storm Water Screening Criteria Exceedance

Human Health Action Level Exceedance

Table 3: New Data Summary

Station	FieldSampleID	Result Type	Arsenic (mg/kg)	Cadmium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Zinc (mg/kg)	1+ >HH std	3+ >SW std	1+ >5000	Exceed SW	Exceed
UR-35-OP-01	BPSOU-UR35OP01-090821-1	XRF	127.43	11.29	250.03	2,722.09	9.52 UJ	3,706.89	TRUE				TRUE
UR-35-OP-01	BPSOU-UR35OP01-090821-2	XRF	113.89	23.11	571.82	4,506.57	11.76 UJ	6,274.07	TRUE	TRUE	TRUE	TRUE	TRUE
UR-35-OP-01	BPSOU-UR35OP01-090821-3	Lab	67.00	20.00	449.00	5,690.00	1.00	6,470.00	TRUE	TRUE	TRUE	TRUE	TRUE
UR-35-SS-02	BPSOU-UR35SS02-090821-1	Lab	57.00 J	7.00	563.00	1100.00 J	0.30 J+	2410.00 J					
UR-35-SS-02	BPSOU-UR35SS02-090821-2	Lab	129.00	13.80	983.00	3,760.00	0.80	4,230.00	TRUE				TRUE
UR-35-SS-02	BPSOU-UR35SS02-090821-3	XRF	207.68	16.82	1,306.65	3,156.28	12.27 UJ	6,538.22	TRUE	TRUE	TRUE	TRUE	TRUE
UR-35-SS-03	BPSOU-UR35SS03-090821-1	XRF	39.20 U	18.13	195.23	1,893.62	8.65 UJ	2,604.40	TRUE				TRUE
UR-35-SS-03	BPSOU-UR35SS03-090821-2	Lab	111.00	24.20	430.00	6,090.00	0.67	10,100.00	TRUE	TRUE	TRUE	TRUE	TRUE
UR-35-SS-03	BPSOU-UR35SS03-090821-3	XRF	102.38	24.80	1,361.11	3,989.22	18.07 UJ	19,346.14	TRUE	TRUE	TRUE	TRUE	TRUE

Storm Water Screening Criteria Exceedance

Human Health Action Level Exceedance

Table 4: Exceedances									
Station	Arsenic (mg/kg)	Cadmium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Zinc (mg/kg)	1+ >HH std	3+ >SW std	1+ >5000
UR-35-OP-01	127.43	11.29	250.03	2,722.09	9.52 UJ	3,706.89	TRUE		
UR-35-OP-01	113.89	23.11	571.82	4,506.57	11.76 UJ	6,274.07	TRUE	TRUE	TRUE
UR-35-OP-01	67.00	20.00	449.00	5,690.00	1.00	6,470.00	TRUE	TRUE	TRUE
UR-35-SS-02	129.00	13.80	983.00	3,760.00	0.80	4,230.00	TRUE		
UR-35-SS-02	207.68	16.82	1,306.65	3,156.28	12.27 UJ	6,538.22	TRUE	TRUE	TRUE
UR-35-SS-03	39.20 U	18.13	195.23	1,893.62	8.65 UJ	2,604.40	TRUE		
UR-35-SS-03	111.00	24.20	430.00	6,090.00	0.67	10,100.00	TRUE	TRUE	TRUE
UR-35-SS-03	102.38	24.80	1,361.11	3,989.22	18.07 UJ	19,346.14	TRUE	TRUE	TRUE
FSUA-20	443.00	N/A	908.00	2,070.00	N/A	3,900.00	TRUE	TRUE	TRUE
FSUA-122	301.00	N/A	902.00	2,860.00	N/A	2,740.00	TRUE	TRUE	TRUE

Storm Water Screening Criteria Exceedance

Human Health Action Level Exceedance

Appendix A
Data Summary Report
(includes Data Validation Report)

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

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June 2022

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LIST OF ATTACHMENTS

ABBREVIATIONS AND ACRONYMS

ACRONYM	DEFINITION	ACRONYM	DEFINITION
Atlantic Richfield	Atlantic Richfield Company	**FSP**	Field Sampling Plan
BPSOU	Butte Priority Soils Operable Unit	**NFG**	National Functional Guidelines
CD	Consent Decree	**Pace**	Pace Analytical Services
CFRSSI	Clark Fork River Superfund Site Investigation	**Pioneer**	Pioneer Technical Services, Inc.
DI	Deionized	**QA**	Quality Assurance
DM/DV	Data Management/Data Validation	**QAPP**	Quality Assurance Project Plan
DQA	Data Quality Assessment	**QC**	Quality Control
DSR	Data Summary Report	**SOP**	Standard Operation Procedures
DVR	Data Validation Report	**UR**	Unreclaimed
EPA	Environmental Protection Agency	**XRF**	X-ray Fluorescence

ABSTRACT

This Butte Priority Soils Operable Unit (BPSOU) Unreclaimed (UR) Sites Data Summary Report (DSR) presents results of the subsurface soil sampling conducted on September 8, 2021, at the UR source area UR-35 within the BPSOU.

For the event, 3 sample stations were sampled by collecting 3-point composite samples at 3 depth intervals. Each sample was analyzed in the field for pH and by X-ray fluorescence (XRF) for arsenic, cadmium, copper, lead, mercury, and zinc; 4 soil samples of the 9 collected were analyzed by the laboratory for arsenic, cadmium, copper, lead, mercury, zinc, and percent moisture. One field duplicate was submitted to the laboratory for the sampling event.

This DSR was prepared by Pioneer Technical Services, Inc. (Pioneer), 1101 S. Montana Street, Butte, Montana 59701 for:

Atlantic Richfield Company
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The information presented in this DSR includes laboratory analytical results from the sampling events.

STATEMENT OF AUTHENTICITY

Consistent with the provisions described in the 2020 U.S. Environmental Protection Agency (EPA) BPSOU Consent Decree (CD) (EPA, 2020a), the data sets referenced in this document are considered to be final data generated or evaluated. Data have been designated as enforcement quality and screening quality as described in the *Clark Fork River Superfund Site Investigations* (CFRSSI) *Quality Assurance Project Plan* (QAPP) (ARCO, 1992a) and *CFRSSI Data Management/Data Validation* (DM/DV) *Plan* (ARCO, 1992b) as supplemented by the *CFRSSI DM/DV Plan Addendum* (AERL, 2000a). Consistent with the aforementioned orders, the signatories below hereby stipulate the authenticity and accuracy of the data and hereby waive any evidentiary or other objection as to the authenticity and accuracy of reference in endangerment assessments, public health evaluations, feasibility studies, and remedial design/remedial action documents.

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EXECUTIVE SUMMARY

This BPSOU UR Sites DSR presents the results of the subsurface soil sampling conducted on September 8, 2021, at the UR source area UR-35 within the BPSOU.

Sampling was conducted under the guidelines of the *BPSOU UR Sites – Final Field Sampling Plan (FSP) #3: UR-06, UR-07, UR-20, UR-22, UR-35, and UR-36* (Atlantic Richfield Company, 2021a) (referred to herein as FSP) and the 2021 *Final UR Sites QAPP* (Atlantic Richfield Company, 2021b) (referred to herein as QAPP). Information and data from the sampling efforts will be used to characterize the potential contamination at the Site and evaluate potential human health and ecological risks.

This DSR includes all field XRF and soil pH data, laboratory analytical data, and data validation packages. This DSR does not include any analysis or interpretation of the data by Atlantic Richfield Company (Atlantic Richfield).

Paste pH and natural soil samples were collected from 3 sample stations (Figure 1). Each sample station was determined based on preliminary Site investigations and Agency approval.

In total, 3 sample stations were sampled by collecting 3-point composite samples at 3 depth intervals. Each sample was analyzed in the field for pH and by XRF for arsenic, cadmium, copper, lead, mercury, and zinc; 4 soil samples of the 9 collected were analyzed by the laboratory for arsenic, cadmium, copper, lead, mercury, zinc, and percent moisture. One field duplicate was submitted to the laboratory for the sampling event. Pioneer submitted soil samples to Pace Analytical Services, LLC (Pace) in Minneapolis, Minnesota.

Analytical results were reported in a standard data package. A data validation system was implemented consistent with the procedures described in the CFRSSI DM/DV Plan (ARCO, 1992b) and subsequent addendum (AERL, 2000a). The format for this DSR is consistent with the format established in the *CFRSSI Pilot Data Report Addendum* (AERL, 2000b).

1.0 INTRODUCTION

This report presents the results of soil sampling and analysis for the UR Sites investigation conducted on September 8, 2021, at the UR source area UR-35 within the Silver Bow Creek/Butte Area National Priorities List Site BPSOU area. Activities were consistent with the provisions described in Appendix D of the BPSOU CD (EPA, 2020a). Historical results from previous investigations are summarized in the FSP. The information contained in this report was gathered according to objectives and procedures documented in the FSP and according to the overall soil sampling, analysis objectives, and requirements outlined in the QAPP.

Information referenced throughout this DSR is included in the appendices below:

- Attachment A Data Validation Report (DVR).
- Attachment B Field Forms and Related Documents.
- Attachment C Laboratory Data Packages.
- Attachment D Electronic Data Deliverable File (included separately).

This investigation's field notebook and datasheets are located at the Atlantic Richfield Contractor (Pioneer) office in Butte, Montana.

All characterization activities and procedures in 2021 followed the QAPP. Sample stations were determined based on preliminary Site investigations and Agency approval. The QAPP describes the quality assurance (QA) and quality control (QC) policies and procedures used during sample collection and analysis. Samples were obtained from the sample stations listed below and in Table 1 following the FSP.

Station Field Identification	Sample Identification
UR-35-SS-01	Sample not collected, refer to Deviations, Section 4.0.
UR-35-SS-02	BPSOU-UR35SS02-090821-X
UR-35-SS-03	BPSOU-UR35SS03-090821-X
UR-35-OP-01	BPSOU-UR35OP01-090821-X

*X indicates sample depth interval.

Samples collected were analyzed by XRF. A subset of the samples was sent to Pace in Minneapolis, Minnesota, for laboratory analyses as listed in Section 3.1.4, Table 5 of the QAPP. The data verification and validation for the XRF and laboratory results are included in Attachment A. All data included in this report are provided as final.

Personnel from Pioneer completed the soil sampling activities. The soil data collected had to undergo rigorous sampling and analysis procedures and meet QA/QC protocols and documentation requirements to be designated as enforcement quality. All data underwent a Stage 2A verification and validation according to EPA *National Functional Guidelines* (NFG) *for Inorganic Superfund Data Review* (EPA, 2020b) and EPA *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (EPA, 2009). All data presented herein have undergone data

validation according to the CFRSSI DM/DV Plan Addendum (AERL, 2000a). Section 3.0 and Attachment A provide information about data quality and validation.

This DSR contains the following information:

- Investigation objectives (Section 1.1).
- Site description and background (Sections 1.2 and 1.3).
- Data quality assessment (Section 2.0).
- Project objectives and sampling design review (Section 2.1).
- Preliminary data review (Section 2.2).
- Conclusions on the quality of the data (Section 2.3).
- Sampling and analysis summary (Section 3.0).
- Deviations (Section 4.0).

The Standard Operating Procedures (SOPs) followed were developed by Pioneer according to the *CFRSSI SOPs* (ARCO, 1992c) and are included in the QAPP. The SOPs were followed for sampling, data collection, and field/office protocols.

1.1 Investigation Objectives

The QAPP listed the following two objectives:

- The Site will be sampled at three depth intervals: (1) 0 to 2 inches, (2) 2 to 6 inches, and (3) 6 to 12 inches at the Site-specific approved sample stations.
- Opportunistic samples may be obtained in the field at the discretion of field sampling personnel or Agency oversight representative(s). The field team leader will be responsible for determining the appropriate sampling protocol as dictated by the location of the opportunistic sample(s).

The results of the investigation will supplement existing data contained within the Atlantic Richfield Geocortex historical database cited in the FSP. This data will be used to make a Site declaration specifying any areas that do not meet the human health or storm water criteria per Table 1 and Table 2 in the QAPP.

1.2 Investigation Site Description

The UR sites within the BPSOU could pose a threat to human health or surface water quality due to the presence of historical mine waste. Although many source areas have been previously reclaimed, areas still exist in which soil has not yet been evaluated, and such sites may provide a pathway for human exposure or impact surface water quality via storm water runoff. The UR-35 Site was assessed per the QAPP.

This DSR describes the activities conducted for soil sampling and characterization at the UR-35 Site. Supplemental information provided in the FSP describes the 2021 investigation. Sample stations were determined based on preliminary Site investigations and Agency approval to quantify

the potential of human health impacts and/or storm water impacts at depth intervals of 6 to 12 inches, 2 to 6 inches, and 0 to 2 inches.

The following figure summarizes the 2021 sampling effort:

- Figure 1 displays proposed and sampled stations for the 2021 sampling event.

1.3 Background

Site UR-35 is approximately 0.12 acre and is located 300 feet northwest of the intersection of North Main and Woolman streets in uptown Butte (Figure 1). It is an irregularly shaped bare area, part of which is a gravel turn-around area used by residents. It is essentially an area in the backyard of homes that face North Main Street. Atlantic Richfield, Butte-Silver Bow, and a private third party own Site UR-35. Site UR-35 is vacant; that is, there are no structures within the boundaries of the Site. However, the private third-party parcel has a residence, and there are other residences close to Site UR-35. Site UR-35 is poorly vegetated with homogenous soil that is yellow in color and mixed with gravel. Due to size and representation, only 3 sample locations were proposed. Storm water runoff from Site UR-35 generally flows to the south. Site UR-35 is in the Buffalo Gulch drainage basin of BPSOU.

2.0 DATA QUALITY OBJECTIVES AND ASSESSMENT

The objective of the Data Quality Assessment (DQA) process (EPA, 2000) is to determine whether the project-specific objectives have been satisfied and if the analytical results are acceptable for project decision making. The DQA process consists of five steps that relate the quality of the results to the intended use of the data:

Step 1: Review sampling design (Section 2.1).
Step 2: Conduct preliminary data review (Section 2.2).
Step 3: Select statistical test(s) as appropriate to evaluate data quality (not applicable).
Step 4: Verify assumptions (not applicable).
Step 5: Draw conclusions about the quality of the data (Section 2.3).

2.1 Project Objectives and Sampling Design Review

Project-specific objectives were defined in the FSP to cover the sampling design requirements outlined in the QAPP.

2.2 Preliminary Data Review

A preliminary data review was conducted to determine if any problems or anomalies were present in the sample collection and analysis procedures. This was completed by evaluating data quality indicators (Section 2.2.1) followed by data verification and validation (Attachment A).

2.2.1 Data Quality Indicators

The DQA process evaluates the results against data quality indicators of precision, accuracy, representativeness, comparability, completeness, and sensitivity. An evaluation of each data quality indicator is included in the DVR (Attachment A).

2.3 Data Quality Conclusions

The laboratory samples were collected using standard sampling methods and relevant Pioneer SOPs. The sampling design, SOPs, and laboratory analytical methods were based on EPA and other industry-standard practices. Laboratory analytical methods are provided in Table 5 of the QAPP. Sample collection was completed by professionals properly trained in following SOPs and using the equipment. Proper chain of custody and sample handling activities were observed during sample collection, delivery to the laboratory, and analysis. The analytical laboratories performed the sample analyses using industry-standard methods. The validation checklists are included in the DVR (Attachment A); all data met the Level A and Level B criteria.

Data generated from the collected samples were examined to ensure that project objectives were met. The data quality objectives for the investigation are listed in the QAPP, Section 2.4. A data QA/QC review was completed for the sampling event.

For the 2021 Site sampling event, a total of 9 natural soil samples were collected. All samples were analyzed by XRF, and 4 samples were sent to Pace for laboratory analysis. This resulted in a total of 54 natural data points generated by the XRF analyses and 28 natural data points generated by the laboratory analysis. Of the points, 11 (20%) XRF natural data points were designated screening quality, and 43 (80%) XRF natural data points were designated as enforcement quality. For the laboratory natural data points, 4 (14%) were designated screening quality, and 24 (86%) laboratory natural data points were designated as enforcement quality. No data were rejected. The DVR (Attachment A) includes a summary of the analysis. Please note that 9 of the 11 (81.8%) screening quality XRF data points were qualifications made to the mercury results (Section 2.2.3 of the DVR). Based on the data quality conclusions in the DSR, the data analyzed in the 2021 sampling event were deemed usable.

3.0 SAMPLING AND ANALYSIS SUMMARY

This section summarizes completed tasks that addressed the monitoring objectives described in the QAPP, including sampling methods, field analysis methods, and analytical results for the UR soil sampling.

3.1 Soil Sample Collection

Samples were collected following procedures detailed in the QAPPs referenced in Section 1.0, except where modifications of the sampling design or procedures were required. Any modifications are listed in Section 4.0. Sample station locations were selected in cooperation and agreement with Agency oversight personnel.

The general sampling approach consisted of hand-dug pits. The UR Site sampling proceeded as follows.

Sample stations were determined based on preliminary Site investigations and the Agency-approved FSP. Field personnel and representatives from the Agencies (when present) made decisions regarding collection of additional "opportunistic" samples to characterize the Site conditions and characteristics accurately. A minimum of 5 combination samples (15 subsamples) were collected at smaller sites (1 acre or less), and a minimum of 3 combination samples were collected per acre at larger sites (greater than 1 acre). Subsamples were collected in a 3-point (triangular) pattern. At each point, a subsample of predetermined depth was collected. As a rule, the diagonal distance between the points was 10 feet, depending on the area of soil homogeneity. The diagonal distance could be adjusted in the field to account for soil differences and the presence of obstacles. Three discrete aliquots of equal amounts of soil from each designated subsample location were composited into 1 sample. Materials such as plant matter, debris, and large rocks were removed, to a reasonable extent, prior to placing the sample in the sample container for laboratory analysis. A portion of the natural sample was placed into a #10 (2 millimeter) disposable sieve screen prior to running the XRF analysis and a portion was used for pH analysis. After XRF analysis was complete, the sample was archived in the Pioneer office in Butte, Montana. Samples were collected from the 0 to 12inch depth at 0- to 2-inch, 2- to 6-inch, and 6- to 12-inch intervals.

3.1.1 Sample Analysis

3.1.1.1 pH

The general UR site pH analysis proceeded as follows per SOP-SFM-01 in Attachment B of the QAPP:

Composite paste pH samples were collected using disposable trowel scoops, plastic cups, and deionized (DI) water. Roughly 1 inch of fine material was scooped from the #10 sieved material into the bottom of the cup. The DI water was added to the sample, and the cup was swirled until a paste was made. The Hanna Instruments HI 99121 meter was used to measure the paste pH sample. The meter was decontaminated with DI water after each use. The collected soil was returned to the area where the sample was collected, and the tools were discarded.

3.1.1.2 XRF

The general XRF analysis proceeded as follows per SOP-SFM-02 in Attachment B of the QAPP:

Field personnel thoroughly homogenized the natural sample in the bag by kneading the soil, split roughly 1 disposable trowel scoop from the natural sample, and placed the split sample into a #10 sieve inside a gallon resealable plastic bag (i.e., Ziploc™). If required, the sieved sample was transferred into an additional 1-quart resealable plastic bag so that it fit in the analyzer measurement stand. The material was compacted so that there was a flat surface on the area to be analyzed and visually inspected to ensure that only fines were present. The sample bag was placed on the XRF stand and analyzed. The results were recorded for the selected metals on the XRF field

datasheet. Field personnel completed duplicate and replicate XRF analyses on at least 5% of the samples analyzed in the XRF unit.

Soil samples for arsenic, cadmium, copper, mercury, lead, zinc, percent moisture, and associated QA/QC samples were packaged and shipped to Pace for analysis. Field forms are in Attachment B, analytical reports are in Attachment C, data deliverable files are in Attachment D, and soil results (including QA/QC samples), applicable laboratory flags, data validation qualifiers, and reason codes are included in the tables in the DVR in Attachment A.

3.1.1.3 Laboratory Samples

The general laboratory sampling proceeded as follows per SOP-S-01 and SOP-SA-01 in Attachment B of the QAPP:

Composite soil samples were collected in a labeled plastic bag and homogenized after each subsample was collected. After the sample was collected from the 3-point composite, a portion of the sample was removed and placed in a #10 sieve within a separate resealable plastic bag (XRF analysis described in Section 3.1.1.2 above). Field personnel then sent every 1 per 10 samples, with additional samples sent to the laboratory for confirmation if the field results were within the Contaminant of Concern (COC) action/screening levels (Table 1 and Table 2 within the QAPP) at 35% above and 35% below. Laboratory samples were analyzed for arsenic, cadmium, copper, lead, zinc, and percent moisture.

4.0 DEVIATIONS

During the sampling event, there was one deviation to the FSP:

- Sample Station UR-35-SS-01 was not sampled due to third party ownership. Access was not granted before the sampling event. Areas of visually impacted sediment were sampled. The location of UR-35-SS-01 was in a vegetated area with no indication of impacted sediments on the surface.

5.0 REFERENCES

AERL, 2000a. Clark Fork River Superfund Site Investigations Data Management/Data Validation Plan Addendum. June 2000.

AERL, 2000b. Clark Fork River Superfund Site Pilot Data Report Addendum. July 2000.

ARCO, 1992a. Clark Fork River Superfund Site Investigations Quality Assurance Project Plan. Prepared by PTI Environmental Services. May 1992.

ARCO, 1992b. Clark Fork River Superfund Site Investigations Data Management/Data Validation Plan. May 1992. PTI Environmental Services, Contract C 117-06-64, April 1992.

ARCO, 1992c. Clark Fork River Superfund Site Investigations Standard Operating Procedures. September 1992.

Atlantic Richfield Company, 2021a. BPSOU Unreclaimed Sites Draft Final Field Sampling Plan Package #3. August 2021.

Atlantic Richfield Company, 2021b. Final Unreclaimed Sites Quality Assurance Project Plan. June 2021.

EPA, 2000. Guidance for Data Quality Assessment: Practical Methods for Data Analysis. EPA QA/G-9. U.S. Environmental Protection Agency. July 2000.

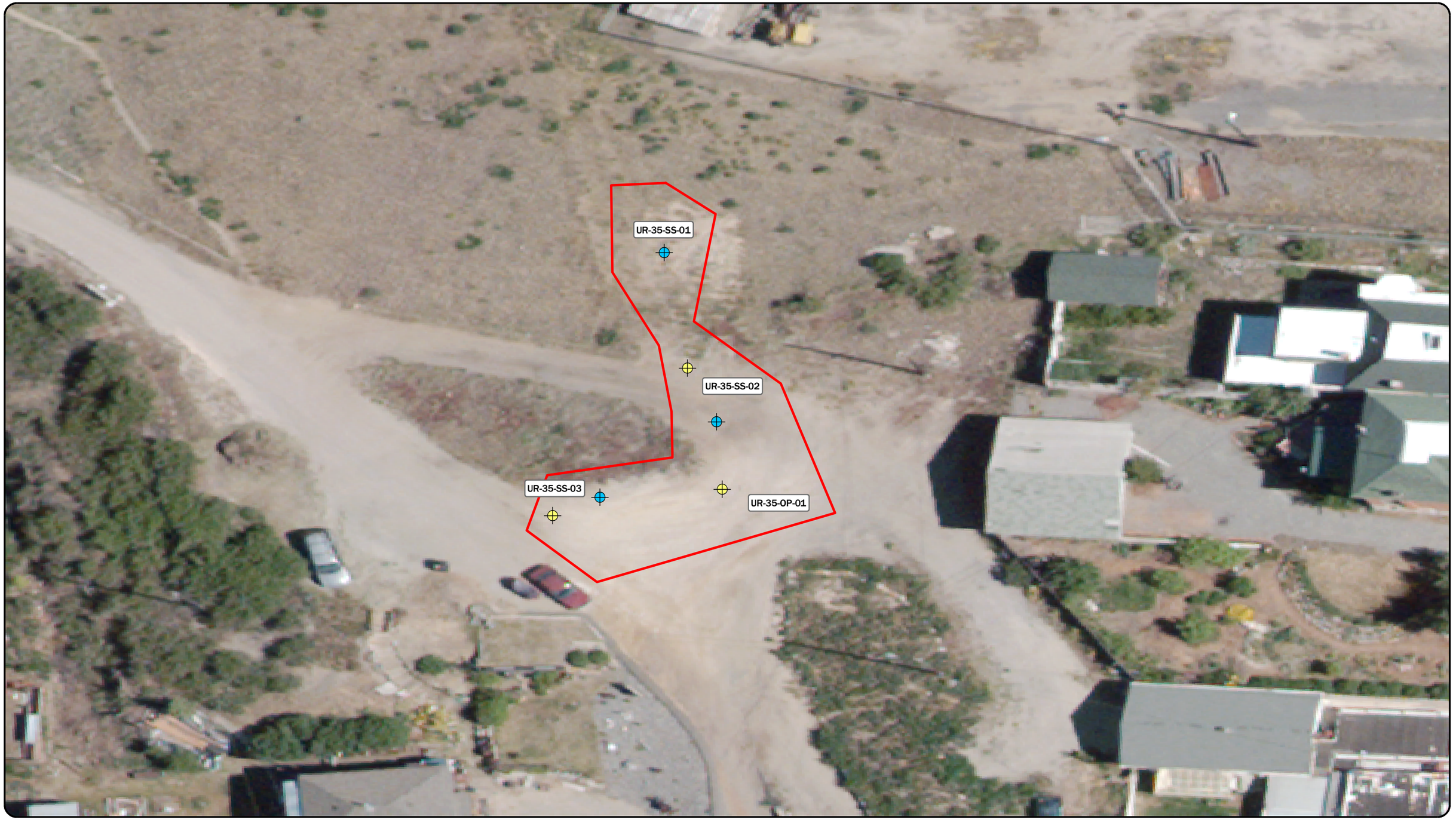
EPA, 2009. Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use. U.S. Environmental Protection Agency. January 2009.

EPA, 2020a. Consent Decree for the Butte Priority Soils Operable Unit. Partial Remedial Design/Remedial Action and Operation and Maintenance. U.S. Environmental Protection Agency. February 13, 2020. (Appendix A of the CD contains the EPA 2006 Record of Decision, 2011 Explanation of Significant Differences to the 2006 Record of Decision, and the 2020 Record of Decision Amendment). Available at https://www.co.silverbow.mt.us/2161/ButtePriority-Soils-Operable-Unit-Conse.

EPA, 2020b. U.S. Environmental Protection Agency National Functional Guidelines for Inorganic Superfund Data Review. November 2020.

Figures

Figure 1. Unreclaimed Sites UR-35 Sample Stations



2021 SAMPLE STATION

PROPOSED SAMPLE STATIONS

UNRECLAIMED SITES BOUNDARY

N

DISPLAYED AS:
PROJECTION/ZONE: MSP
DATUM: NAD 83
UNITS: INT'L FT
SOURCE: PIONEER/QSI 2020

0 12.5 25 50
Feet

FIGURE 1

PIONEER TECHNICAL SERVICES, INC.

Unreclaimed Sites
UR-35
2021 Sample Stations

DATE: 3/21/2022

Path: Z:\Shared\Active Projects\ARCO\BPSOU\LandSupport\SolidMedia\Insufficiently_Unreclaimed\UR_Sampling\Unreclaimed_Samplelocations_UR35.mxd

Tables

Table 1. Coordinates for Sample Stations and Identification

Table 1. Coordinates for Sample Stations and Identification			
Station Field Identification	Sample Identification	Northing	Easting
UR-35-OP-01	BPSOU-UR35OP01-090821-X	659660.796	1197476.428
UR-35-SS-02	BPSOU-UR35SS02-090821-X	659695.778	1197470.785
UR-35-SS-03	BPSOU-UR35SS03-090821-X	659654.546	1197442.14

Attachment A
Data Validation Report (DVR)

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

Draft Final

2021 Unreclaimed Sites Sampling UR-35
Data Validation Report

Atlantic Richfield Company

June 2022

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

Draft Final

2021 Unreclaimed Sites Sampling UR-35
Data Validation Report

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June 2022

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LIST OF ATTACHMENTS

ACRONYMS AND ABBREVIATIONS

Acronym	Definition
%R	Percent Recovery
BPSOU	Butte Priority Soils Operable Unit
CCS	Calibration Check Sample
CFRSSI	Clark Fork River Superfund Site Investigation
COC	Contaminants Of Concern
DM/DV	Data Management/Data Validation
DV	Data Validation
DVR	Data Validation Report
EPA	U.S. Environmental Protection Agency
FSP	Field Sampling Plan
GFAA	Graphite Furnace Atomic Absorption Spectrometry
ICP	Inductively Coupled Plasma
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LDS	Laboratory Duplicate Sample
LMS	Laboratory Matrix Spike
LMSD	Laboratory Matrix Spike Duplicate
LOD	Limit of Detection
MB	Method Blank
MDL	Method Detection Limit
mg/kg	milligram per kilogram
NFG	National Functional Guidelines
Pace	Pace Analytical Services, LLC
Pioneer	Pioneer Technical Services, Inc.
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RL	Reporting Limit
RPD	Relative Percent Difference
SDG	Sample Delivery Group
SiO_2	Silicon Dioxide
SOP	Standard Operating Procedure
SRM	Standard Reference Materials
UR	Unreclaimed
XRF	X-Ray Fluorescence

DOCUMENT MODIFICATION SUMMARY

Revision No.	Author	Version	Description	Date
Rev 0	Sara Ward	Draft	Issued for Internal Review	3/2/2022
Rev 1	Sara Ward	Draft Final	Issued for Agency Review	6/15/2022

1.0 DATA VALIDATION REPORT SUMMARY

This Data Validation Report (DVR) summarizes the X-ray fluorescence (XRF) and laboratory analytical results from samples collected from the Unreclaimed (UR) UR-35 Site (referred to as Site). The samples were collected per the *Butte Priority Soils Operable Unit* (BPSOU) *UR Sites – Final Field Sampling Plan (FSP) #3: UR-06, UR-07, UR-20, UR-22, UR-35, and UR-36* (Atlantic Richfield, 2021a) (referred to herein as the FSP). The 2021 UR-35 sampling event included samples collected under the 2021 Unreclaimed Sites Quality Assurance Project Plan (QAPP) (Atlantic Richfield, 2021b) (referred to herein as the QAPP).

All data have undergone a Stage 2A data validation as defined in the U.S. Environmental Protection Agency (EPA) *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (EPA, 2009). Data validation was conducted in accordance with the QAPP, the *Clark Fork River Superfund Site Investigation* (CFRSSI) *Data Management/Data Validation* (DM/DV) *Plan* (ARCO, 1992a) and *CFRSSI DM/DV Plan Addendum* (AERL, 2000), the *CFRSSI QAPP* (ARCO, 1992b), *EPA National Functional Guidelines* (NFG) *for Inorganic Methods Superfund Data Review* (EPA, 2020), analytical methods, and laboratory standard operating procedures (SOPs). The 2020 EPA National Functional Guidelines for Inorganic Methods Superfund Data Review was followed since it is the most current version. This report details the evaluation of field XRF and laboratory data for the purpose of usability.

This document refers to the tables and attachments below.

- Table A1 contains the natural sample results with laboratory qualifiers; data validation qualifiers; enforcement, screening, and rejected classifications; and data validation reason codes.
- Table A2 contains the field duplicate pair samples with results, laboratory qualifiers, data validation qualifiers, data validation reason codes, and quality control (QC) criteria assessment.
- Table A3 contains sample identification information including the field sample name, sample type, sample location, laboratory sample name, sample date, analytical methods, and analytes.
- Table A4 contains the definitions for the laboratory qualifiers; data validation qualifiers; enforcement, screening, and rejected classification codes; and data validation reason codes.
- Table A5 contains the XRF Silicon Dioxide (SiO_2) Standard and Calibration Check Sample (CCS) results.
- Table A6 contains the XRF duplicate and replicate sample results and QC criteria assessment.
- Attachment 1 contains the data validation checklists. Attachment 1.1 and Attachment 1.2 contain the checklists for XRF analysis and laboratory analysis, respectively.
- Attachment 2 contains the Level A/B Assessment Checklist.
- Attachment 3 contains the QC criteria used in the data validation process.

The instrument output for XRF data, produced by Pioneer Technical Services, Inc. (Pioneer), was used to perform the data validation of the XRF results, and the standard data packages received from Pace Analytical Services, LLC (Pace) were used to perform the data validation of the laboratory results.

All data met the Level A and B criteria. Based on the validation process outlined in the CFRSSI DM/DV Plan (ARCO, 1992a), the quality of the data is ranked as enforcement quality, screening quality, or it is rejected. Enforcement quality data are defined in the CFRSSI DM/DV Plan as data that meet the Level A and B criteria (Attachment 2) and are not qualified as estimated or rejected after the data validation process. For sample results qualified as estimated "J" by the laboratory because the reported result is between the method detection limit (MDL) and analytical reporting limit (RL), values are considered enforcement quality data if no other qualifiers were required during validation. Enforcement quality data may be used for all purposes under the Superfund program including the following: site characterization, health and safety, engineering evaluation/cost analysis, remedial investigation/feasibility studies, evaluation of alternatives, confirmational purposes, risk assessments, and engineering design. As all samples met the Level A and B documentation criteria, the results that were not qualified as estimated (e.g., J, J+, J-, or UJ) or rejected for some exceedance of quality assurance (QA)/QC criteria were considered "enforcement" quality data and were assigned an "E" in Table A1. Screening quality data, as defined in the CFRSSI DM/DV Plan, are those samples that do not meet the Level B criteria and/or were qualified as estimated (e.g., J, J+, J-, or UJ) during the data validation process. Potential uses of screening quality data, depending on their quality, include site characterization, determining the presence or absence of contaminants, developing or refining sampling and analysis techniques, determining relative concentrations, scoping and planning for future studies, engineering studies and engineering design, and monitoring during implementation of the response action. Sample results that were qualified as estimated during the validation process were considered "screening" quality data and assigned an "S" in Table A1.

Data rejected during data validation cannot be used for any Superfund activities. No results were rejected.

The summary of data points in this DVR includes only the natural samples and does not include the field QC samples (the field duplicate). Note that the field QC samples underwent the same data validation procedures as the natural samples, and the results are included on the data validation checklists in Attachment 1. The qualifications made to field QC samples are listed in Table A2; however, the qualifications made to these samples are not included in the summary of qualifications made to natural data points, and the field QC samples are not included in Table A1.

For the 2021 Site sampling event, a total of 9 natural soil samples were collected. All samples were analyzed in the field by XRF, and 4 samples were sent to Pace for laboratory analysis of metals. This resulted in a total of 54 natural data points generated by the XRF analyses and 28 natural data points generated by the laboratory analysis. A summary by analysis type is shown below:

Analysis Type	Natural Samples	Data Points	Enforcement Quality Data Points (% of total)	Screening Quality Data Points (% of total)	Rejected Data Points (% of total)
XRF	9	54	43 (80%)	11 (20%)	0 (0%)
Pace	4	28	24 (86%)	4 (14%)	0 (0%)

Please note that 9 of the 11 (81.8%) screening quality XRF data points were qualifications made to the mercury results due to the lack of a CCS with a known amount of mercury, as discussed in Section 2.2.3.

Table A1 shows the laboratory qualifiers, data validation qualifiers, enforcement or screening designators, and the reason code for the qualification for each natural data point.

2.0 QUALITY ASSURANCE/QUALITY CONTROL REVIEW OF INORGANIC DATA

The QC criteria used during the data validation process are listed in Attachment 3.

For XRF data, the QC criteria were derived from the QAPP, the CFRSSI DM/DV Plan (ARCO, 1992a) and DM/DV Plan Addendum (AERL, 2000), the CFRSSI QAPP (ARCO, 1992b), the *Niton XL3 Mining QC Sheet* (ThermoFisher Scientific, 2014), and the Pioneer SOP for operating the XL3 XRF analyzer (SOP-SFM-02) (included in the QAPP).

For laboratory data, the QC criteria were derived from the QAPP, CFRSSI DM/DV Plan Addendum (AERL, 2000), the NFG for Inorganic Superfund Data Review (EPA, 2020), analytical methods, and method-specific laboratory SOPs.

Data validation checklists derived from the CFRSSI DM/DV Addendum (AERL, 2000) were completed for the XRF data and each laboratory report (Attachment 1). Below are the deviations made to the checklists provided in the CFRSSI DM/DV Addendum guidance document:

- The Laboratory Data Validation Checklist for Metals Analysis by Spectrace XRF was revised slightly to more accurately reflect the information provided by the XRF Analyzer (Niton XL3). The checklist is included in Attachment 1.1. The guidelines for XRF QA and QC are listed in Section 3.6 (Quality Assurance/Quality Control) of the QAPP.
- The Laboratory Data Validation Checklist for Metals Analysis by Inductively Coupled Plasma (ICP) or Graphite Furnace Atomic Absorption Spectrometry (GFAA) was revised slightly to more accurately reflect the information provided in the full data packages provided by Pace and the requirements listed in the NFG (EPA, 2020). The checklist is included in Attachment 1.2.
- The Data Validation Checklist for Field Quality Control was not filled out for each data package. Sections on field duplicates were added to each Laboratory Data Validation Checklist worksheet.

The relevant data validation checklists were completed for each sample delivery group (SDG) and included the data validation performed for the methods and analytes listed below:

Data Validation Checklist	Method	Analyte(s)
XRF	XRF	Arsenic, Cadmium, Copper, Lead, Mercury, and Zinc
Laboratory: Pace	EPA 6010D	Arsenic, Cadmium, Copper, Lead, and Zinc
	EPA 7471B	Mercury
	ASTM D2974	Percent Moisture

One Level A/B Assessment was completed for the Site (Attachment 2).

2.1 Field Quality Control Samples

The QAPP requirement for field duplicate collection frequency is 1 field duplicate sample per 20 natural samples or once per sampling event, whichever is more frequent. Disposable sampling equipment was used to collect soil samples; therefore, equipment rinsate blanks were not collected.

Any qualifications required based on the field QC sample results are detailed in the data validation checklists (Attachment 1) and are listed in Table A1 and Table A2.

Please note that although the field QC samples (field duplicate samples) may receive a qualifier during the data validation process, the enforcement and screening quality summaries and the precision and accuracy assessment summaries do not include the field QC sample results. Only the results of the natural samples are included in the data quality assessment summaries.

2.1.1 Field Duplicate

During the sampling event, 1 field duplicate sample was collected for the 4 natural samples submitted to Pace for analysis (25%); therefore, the collection frequency requirement for field duplicates (5%) was met.

The analytical RLs presented in the laboratory reports were used to evaluate the field duplicates. The field duplicate QC criteria assessments are listed in Table A2.

For the 9 natural XRF samples collected at the Site, 1 field duplicate sample (11%) was analyzed; therefore, the collection frequency requirement for field duplicates (5%) was met.

The QC criteria used to assess field duplicate pair results during data validation are listed in Attachment 3. The field duplicate sample pairs and QC criteria assessments are listed in Table A2. If a field duplicate result was outside the control limit, the parent sample and any samples considered sufficiently similar were qualified as specified in Attachment 3. Any qualifications made to natural samples based on the field duplicate sample results are detailed in the data validation checklists (Attachment 1) and are listed in Table A1 and Section 4.1.

2.1.2 Equipment Rinsate Blank

Disposable sampling equipment was used to collect soil samples; therefore, equipment rinsate blanks were not collected.

2.2 XRF Quality Control Samples

This section summarizes the XRF QC samples evaluated during the data validation of the XRF results.

2.2.1 Energy Calibration Check

The energy calibration check determines whether the characteristic X-ray lines are shifting, which would indicate drift within the instrument. The requirement set forth in the QAPP was the performance of the preprogrammed energy calibration check on the equipment at the beginning of each working day. During the sampling event, the energy calibration check was performed at the beginning of each working day.

2.2.2 Silicon Dioxide Standard

The SiO_2 standard, as provided by Niton, is a "clean" quartz or silicon dioxide matrix that contains concentrations of selected analytes near or below the machine's lower limit of detection. Analysis results with the XRF instrument of this SiO_2 standard are used to monitor for cross contamination. The frequency requirement for SiO_2 standard sample analysis set forth in the QAPP is to complete analysis of this sample at the beginning of each day, once per every 20 samples, and at the end of each day's run sequence.

During the sampling event, the frequency requirement for SiO_2 standard samples was met. Results are listed in Table A5.

The SiO_2 standard sample results were within the control limits.

2.2.3 Calibration Check Samples

The CCSs help check the accuracy of the XRF instrument and assess the stability and consistency of the analysis for the analytes of interest. The CCSs used were the Niton-provided Standard Reference Materials (SRMs): NIST 2709a-Joaquin Soil (NIST 2709a) sample and a Resource Conservation and Recovery Act (RCRA) sample.

The frequency requirement for CCS analysis set forth in the QAPP is to complete analysis of at least 1 CCS at the start of each day, one per every 20 samples, and as the last analysis each day. The frequency requirement for CCS analyses was met. Results are listed in Table A5.

- The CCS results were within the control limits. However, there was no CCS that had a known amount of mercury greater than the limit of detection (LOD) for mercury. Therefore, all detected mercury results have been qualified "J" and all non-detected mercury results

have been qualified "UJ." This resulted in 9 mercury results qualified "UJ" due to the lack of an appropriate CCS.

Qualifications due to lack of an appropriate CCS standard are listed in Table A1.

2.2.4 XRF Duplicate and XRF Replicate Samples

The XRF duplicate and XRF replicate samples help check the precision of the XRF sampling method and instrument. The XRF duplicate sample was analyzed by removing the sample bag from the analytical stand, kneading it once or twice, and analyzing a second time. The XRF replicate sample was analyzed immediately following the primary sample analysis by restarting the XRF to analyze the same sample a second time with the same soil in the XRF aperture.

The frequency requirement for XRF duplicate and XRF replicate samples set forth in the QAPP is the analysis of each sample once per every 20 samples (5%).

For the 9 natural XRF samples collected at the Site, 1 duplicate sample (11.1%) and 1 replicate sample (11.1%) were analyzed. Therefore, the frequency requirement for XRF duplicate and XRF replicate samples (5%) was met for the Site.

Table A6 contains the XRF duplicate and XRF replicate sample pair results with the parent sample results and the QC criteria assessment. If the results were outside the control limit, the parent sample and any sample considered sufficiently similar were qualified "J" if the result was detected and "UJ" if the result was not detected.

The XRF duplicate and XRF replicate sample results were within the control limits.

2.3 Laboratory Quality Control Samples

The laboratory QC sample types vary depending on analytical method. The QC criteria used during data validation to evaluate the applicable laboratory QC samples are listed in Attachment 3 and Section 3.6 of the QAPP.

The Stage 2A data validation includes the evaluation of the following laboratory QC items as applicable per analytical method:

- Holding Times.
- Preservation.
- Method Blanks (MB).
- Laboratory Control Sample (LCS) and LCS Duplicates (LCSD).
- Laboratory Duplicate Samples (LDS).
- Laboratory Matrix Spike (LMS), LMS Duplicates (LMSD).

The analytical RLs produced by each laboratory were used to evaluate the laboratory duplicates. The laboratory MDLs were used for the data review and validation of laboratory MB samples.

The appropriate laboratory QC samples were analyzed with each sample group. Any qualifications required based on the laboratory QC sample results are detailed in the data validation checklists (Attachment 1) and are listed in Table A1. Also refer to Section 4.1 and Section 4.2.

3.0 LEVEL A/B ASSESSMENT SUMMARY

Data that meet the Level A and Level B criteria and are not qualified as estimated or rejected are assessed as enforcement quality data and can be used for all Superfund purposes and activities. Data that meet only the Level A criteria and are not rejected can be assessed as screening quality data.

Screening quality data can be used only for certain activities, which include engineering studies and design. Data that do not meet both the Level A and B criteria are designated as unusable. The Level A/B Assessment Checklist for all samples collected for the Site are included as Attachment 2. Sample collection information was recorded in the field logbook, including sample collection date, location, and collection method. This information was reviewed for the Level A/B criteria.

As shown in Attachment 2, all the samples met both Level A and Level B criteria. No data were designated screening quality or rejected based on the results of Level A/B assessment.

4.0 PRECISION, ACCURACY, REPRESENTATIVENESS, COMPARABILITY, COMPLETENESS, AND SENSITIVITY DATA SUMMARY

This section provides the precision, accuracy, representativeness, comparability, completeness, and sensitivity assessment for the XRF and laboratory data generated from samples collected during the 2021 Site sampling event.

4.1 Precision

Precision is the amount of scatter or variance that occurs in repeated measurements of a particular analyte.

4.1.1 XRF Precision

The precision control limit used for XRF soil samples was a relative percent difference (RPD) less than 35% when both sample results were detections. For XRF data, the precision assessment is based on the RPD of XRF duplicate, XRF replicate, and field duplicate sample pairs. If an RPD was outside the control limit, the parent sample and samples considered sufficiently similar to the parent sample were qualified. No natural samples were considered sufficiently similar enough to each other to require additional qualifications based on the variability of soil matrices.

If the parent sample was a duplicate sample, the duplicate sample's parent sample was considered sufficiently similar and was qualified when applicable.

There were 2 instances where a field duplicate pair did not meet the control limit. The XRF duplicate pair and XRF replicate pair met the control limit. This resulted in the qualification of 2 natural data points due to field duplicate precision.

The natural samples qualified for poor field duplicate precision (data validation [DV] Reason Code = FD) are listed below:

Field Sample ID	Method	Analyte	DV Qualifier	DV Reason Code
BPSOU-UR35SS02-090821-2	XRF	Arsenic	J	FD
BPSOU-UR35SS02-090821-2	XRF	Cadmium	J	FD

This resulted in 2 (4%) of the 54 natural XRF data points that did not meet the precision requirements, and 52 (96%) of the 54 natural XRF data points that did meet the precision requirements.

4.1.2 Laboratory Precision

Acceptance or rejection of precision measurements is based on the RPD of the laboratory and field duplicates. For example, perfect precision would be a 0% RPD between duplicate samples (both samples have the same analytical result) for results that are greater than 5 times the laboratory RL. For total metals analysis, when both results are greater than 5 times the RL, acceptable precision is an RPD of plus or minus 35% in soil samples. For samples with 1 or both results less than 5 times the RL (including non-detect), acceptable precision is met if the absolute difference between the 2 sample results is less than 2 times the RL. This precision requirement is from Section 2.4.1 of the CFRSSI QAPP (ARCO, 1992b).

There were 3 instances where the laboratory duplicate pair results did not meet the control limit. There were no qualifications made to the natural data points because the field duplicate pair results did not meet the control limit.

The natural samples qualified for poor laboratory duplicate precision (DV Reason Code = D%) are listed below:

Field Sample ID	Method	Analyte	DV Qualifier	DV Reason Code
BPSOU-UR35SS02-090821-1	SW-846 6010D	Lead	J	D%
BPSOU-UR35SS02-090821-1	SW-846 6010D	Arsenic	J	D%, S%
BPSOU-UR35SS02-090821-1	SW-846 6010D	Zinc	J	D%

This resulted in 3 (11%) of the 28 natural laboratory data points that did not meet the precision requirements, and 25 (89%) of the 28 natural laboratory data points that did meet the precision requirements.

4.2 Accuracy

Accuracy is the ability of the analytical procedure to determine the actual or known quantity of a particular substance in a sample.

4.2.1 XRF Accuracy

For the XRF data, the SiO_2 standard and CCS are used to assess accuracy. The control limit for these samples is summarized in Attachment 3. If a SiO_2 standard or CCS result was outside the control limit, the natural sample results analyzed in the same run sequence were qualified.

If a SiO_2 standard had a detected result greater than the control limit, the natural sample results analyzed in the same analytical run were qualified "J+" if the natural sample result was a detected result less than 10 times the SiO_2 standard result.

All SiO_2 standard results were within control limits.

If the CCS result was outside the control limits summarized in Attachment 3, the natural sample results in the same analytical run as these CCS results were qualified as "J" for detected results or "UJ" for non-detected results.

All CCS analysis results were within the control limit.

For the XRF results, 54 (100%) of the 54 natural XRF data points did meet the accuracy requirements.

4.2.2 Laboratory Accuracy

For the laboratory data, MB, LCS, LCSD, LMS, and LMSD were used to assess accuracy. The QC criteria used during data validation for each QC sample are summarized in Attachment 3.

Laboratory blanks were analyzed to assess artifacts introduced during analyses that may affect the accuracy of the data. In accordance with the CFRSSI QAPP (ARCO, 1992b), a data point is qualified as "U" if it is less than 5 times an associated blank result (MB) that does not meet the control limit.

The percent recoveries (%R) of the LCS, LCSD, LMS, and LMSD are used to measure accuracy. The LCS and LCSD measure sample preparation and analysis accuracy. The LMS and LMSD measure the effect that the sample matrix has on accuracy. Perfect %R would be 100% (the analysis result is exactly the known concentration of the spike amount in the LMS, LMSD, LCS or LCSD).

For the 2021 Site sampling event, qualifications were made to natural samples due to LMS/LMSD results from Pace exceeding the control limit. These qualifications are detailed in the data validation checklists for each SDG in Attachment 1.2. There were no qualifications made due to the remaining indicators of accuracy.

There were 2 natural data points qualified due to an exceedance of the %R for the LMS and/or LMSD (DV Reason Code = S%) as listed below:

Field Sample ID	Method	Analyte	DV Qualifier	DV Reason Code
BPSOU-UR35SS02-090821-1	SW-846 6010D	Arsenic	J	D%, S%
BPSOU-UR35SS02-090821-1	SW-846 7471B	Mercury	J+	S%

This resulted in 2 (7%) of the 28 natural laboratory data points that did not meet the accuracy requirements, and 26 (93%) of the 28 natural laboratory data points that did meet the accuracy requirements.

4.3 Representativeness

Representativeness is a qualitative parameter that is addressed through proper design of the sampling program. Samples for XRF analysis and laboratory analysis were collected in accordance with the QAPP and FSP.

The XRF and laboratory results were reviewed, and a Stage 2A data validation completed. Based on information provided by Pace, the chain of custody requirements were met for the sample event. Preservation requirements were met for all samples, and all samples were analyzed within the appropriate holding times.

The representativeness goals were met.

4.4 Comparability

Comparability is assessed to determine if one set of data can be compared to another set of data. Comparisons are made by examining and comparing the laboratory and field methods used to acquire sample data for different distinct data sets. The data summarized in this report include soil samples collected and analyzed by Pioneer and Pace.

4.4.1 XRF Comparability

The soil samples were collected using standard sampling methods and Pioneer SOPs. The sampling design, SOPs, and XRF methods are based on EPA and other industry standard practices and were documented in the field logbook. Sample collection was completed by professionals who were properly trained in using the SOPs and equipment. Proper sample handling was observed during sample collection and analysis.

Consequently, data from past and future soil sampling events at the Site using comparable sampling and XRF analysis may be used in concert with this data set.

4.4.2 Laboratory Comparability

The samples were collected using standard sampling methods and Pioneer SOPs. The sampling design, SOPs, and laboratory analytical methods are based on EPA and other industry standard practices and were documented in the field logbook. Sample collection was completed by professionals who were properly trained in using the SOPs and equipment. Proper chain of custody and sample handling were observed during sample collection, delivery to the laboratory, and analysis. The analytical laboratories performed the sample analysis using industry standard methods.

Consequently, data from past and future sampling events at the Site using comparable sampling and analytical methods may be used in concert with this data set.

4.5 Completeness

Completeness is assessed to determine if enough valid data have been collected to meet the investigation needs. Completeness is assessed by comparing the number of valid sample results to the number of sample results planned for the investigation. The completeness target for this investigation was 95% or greater as designated in the CFRSSI QAPP (ARCO, 1992b).

The completeness for XRF and laboratory samples and results are summarized below:

Analysis Type	Collected Samples vs Planned Samples	Valid Data Points vs Total Data Points
XRF	100%	100%
Laboratory	100%	100%

4.5.1 XRF Completeness

The QAPP and FSP include the planned soil sample locations and list the planned analytical techniques including XRF analysis.

Samples were collected at 3 sample locations during the 2021 Site sampling event. Sample station UR-35-SS-01 was not sampled due to third party ownership. Areas of visually impacted sediment were sampled. The location of UR-35-SS-01 was in a vegetated area with no indication of impacted sediments on the surface. The completeness for XRF data based on sample collection was 100%, and the completeness goal was met.

In total, 54 XRF data points were generated. All data points are considered usable because no results were rejected. The 9 XRF samples collected were analyzed by XRF for arsenic, cadmium, copper, lead, mercury, and zinc. Therefore, the completeness for XRF data based on sample analysis was 100% and the completeness goal was met.

4.5.2 Laboratory Completeness

The requirement for confirmation samples sent to the laboratory under the QAPP is at a rate of 1 per 10 natural XRF samples (10%), with additional samples sent to the laboratory for confirmation if the field results show the contaminant of concern (COC) levels at 35% above or 35% below established action/screening levels to limit decision errors.

For the 2021 Site sampling event, 4 of the 9 natural samples collected and analyzed by XRF were sent to Pace for analysis (44%). All natural samples collected under the QAPP with XRF results requiring confirmation were sent to Pace for analysis. The frequency requirements for the confirmation samples sent to the laboratory for analysis were met. Therefore, the completeness for laboratory samples based on sample collection was 100% and the completeness goal was met.

In total, 28 natural laboratory data points were generated by the sampling event. The 4 laboratory samples collected under the QAPP were analyzed for arsenic, cadmium, copper, lead, mercury, zinc, and percent moisture. All the natural data points were usable because no sample results were rejected. Therefore, the completeness for laboratory data based on sample analysis was 100%, and the completeness goal was met.

4.6 Sensitivity

Sensitivity is a quantitative measure and is evaluated by comparing the detection limit to the project-specific sensitivity requirements.

4.6.1 XRF Sensitivity

The non-detected XRF results were reported as less than the LOD associated with each result.

The QAPP does not specify sensitivity requirements for XRF analyses; therefore, the action/screening levels in the QAPP were used to evaluate sensitivity for each analyte. The QAPP specified that samples must be sent to the laboratory for confirmation if the field results show the COC levels at 35% above or 35% below established action/screening levels to limit decision errors. Therefore, a value of 35% below the BPSOU Soil Screening Criteria for Storm Water COCs listed on Table 2 of the QAPP were used to evaluate sensitivity because they are less than the BPSOU Soil Action Level for Human Health listed in Table 1 of the QAPP. The required detection limit for XRF results is summarized below:

Analyte	Criteria	Units	Action/Screening Level	35% below
Arsenic	Storm Water	mg/kg	200	130
Cadmium	Storm Water	mg/kg	20	13
Copper	Storm Water	mg/kg	1,000	650
Lead	Storm Water	mg/kg	1,000	650
Mercury	Storm Water	mg/kg	10	6.5
Zinc	Storm Water	mg/kg	1,000	650

mg/kg: milligrams per kilogram.

The detection limit for the non-detected XRF results was less than 35% below the minimum action/screening level for each analyte except for the following results:

Field Sample ID	Method	Analyte	Units	Result (<LOD)
BPSOU-UR35SS02-090821-1	XRF	Mercury	mg/kg	<9.88
BPSOU-UR35SS02-090821-2	XRF	Mercury	mg/kg	<11.05
BPSOU-UR35SS02-090821-3	XRF	Mercury	mg/kg	<12.27
BPSOU-UR35OP01-090821-1	XRF	Mercury	mg/kg	<9.52
BPSOU-UR35OP01-090821-2	XRF	Mercury	mg/kg	<11.76
BPSOU-UR35OP01-090821-3	XRF	Mercury	mg/kg	<16
BPSOU-UR35SS03-090821-1	XRF	Mercury	mg/kg	<8.65
BPSOU-UR35SS03-090821-2	XRF	Mercury	mg/kg	<18.97
BPSOU-UR35SS03-090821-3	XRF	Mercury	mg/kg	<18.07

LOD: limit of detection. mg/kg: milligrams per kilogram.

These data points are considered usable with the recognition that the non-detected results are higher than 35% below the lowest action/screening level.

4.6.2 Laboratory Sensitivity

All sample results from Pace had detections for all analytes.

4.7 Overall Data Summary

The following list shows an overall summary of the validation performed on the data generated by Pioneer for the samples collected during the 2021 Site sampling event.

Analysis Type	Total Natural		Level A/B	DV Qual J, J+, J-, or UJ	DV Qual R	DV Qual U or A	Enforcement Quality	Screening Quality	Rejected
	Samples	Data Points	A/B	Data Points	Data Points	Data Points	Data Points (% of total)	Data Points (% of Total)	Data Points (% of Total)
XRF	9	54	B	11	0	0	43 (80%)	11 (20%)	0 (0%)
Pace	4	28	B	4	0	0	24 (86%)	4 (14%)	0 (0%)

5.0 REFERENCES

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TABLES

Table A1. Natural Sample Results with Laboratory Qualifiers; Data Validation Qualifiers; Enforcement, Screening, and Rejected Classifications; and Data Validation Reason Codes

Station (Depth Interval)			UR-35-OP-01(0-2)					UR-35-OP-01(2-6)					UR-35-OP-01(6-12)					UR-35-SS-02(0-2)					UR-35-SS-02(2-6)					UR-35-SS-02(6-12)				
Field Sample ID			BPSOU-UR35OP01-090821-1					BPSOU-UR35OP01-090821-2					BPSOU-UR35OP01-090821-3					BPSOU-UR35SS02-090821-1					BPSOU-UR35SS02-090821-2					BPSOU-UR35SS02-090821-3				
Lab Sample ID			N/A					N/A					10578172004					10578172001					10578172002					N/A				
Sample Date			9/8/2021					9/8/2021					9/8/2021					9/8/2021					9/8/2021					9/8/2021				
Sample Type			Natural					Natural					Natural					Natural					Natural					Natural				
Method	Analyte	Units	Result	Lab Qual	DV Qual	S/E	Reason Code	Result	Lab Qual	DV Qual	S/E	Reason Code	Result	Lab Qual	DV Qual	S/E	Reason Code	Result	Lab Qual	DV Qual	S/E	Reason Code	Result	Lab Qual	DV Qual	S/E	Reason Code	Result	Lab Qual	DV Qual	S/E	Reason Code
XRF	Arsenic	mg/kg	127.43			E		113.89			E		193.47			E		61.91			E		152.84		J	S	FD	207.68			E	
XRF	Cadmium	mg/kg	11.29			E		23.11			E		29.77			E		<7.72	<LOD		E		14.96		J	S	FD	16.82			E	
XRF	Copper	mg/kg	250.03			E		571.82			E		578.65			E		996.15			E		1,180.62			E		1,306.65			E	
XRF	Lead	mg/kg	2,722.09			E		4,506.57			E		5,412.23			E		1409.22			E		2,928.28			E		3,156.28			E	
XRF	Mercury	mg/kg	<9.52	<LOD	UJ	S	CX	<11.76	<LOD	UJ	S	CX	<16	<LOD	UJ	S	CX	<9.88	<LOD	UJ	S	CX	<11.05	<LOD	UJ	S	CX	<12.27	<LOD	UJ	S	CX
XRF	Zinc	mg/kg	3,706.89			E		6,274.07			E		13,258.80			E		3,690.90			E		5,025.02			E		6,538.22			E	
ASTM D2974	Moisture, Percent	%											5.5	N2		E		3.2	N2		E		5.1	N2		E						
SW-846 6010D	Arsenic	mg/kg											67.0			E		57.0	R1,M1	J	S	D%, S%	129			E						
SW-846 6010D	Cadmium	mg/kg											20.0			E		7.0			E		13.8			E						
SW-846 6010D	Copper	mg/kg											449			E		563	P6		E		983			E						
SW-846 6010D	Lead	mg/kg											5,690			E		1,100	R1,P6	J	S	D%	3,760			E						
SW-846 6010D	Zinc	mg/kg											6,470			E		2,410	R1,P6	J	S	D%	4,230			E						
SW-846 7471B	Mercury	mg/kg											1.0			E		0.30	M1	J+	S	S%	0.80			E						

Notes:
Depth intervals are inches below ground surface.

Qualification (Qual) and Reason Codes are
defined in Table A4.

< - Not detected at the detection limit.

Abbreviations:
mg/kg - milligram per kilogram

Table A1. Natural Sample Results with Laboratory Qualifiers; Data Validation Qualifiers; Enforcement, Screening, and Rejected Classifications; and Data Validation Reason Codes

Station (Depth Interval)			UR-35-SS-03(0-2)					UR-35-SS-03(2-6)					UR-35-SS-03(6-12)				
Field Sample ID			BPSOU-UR35SS03-090821-1					BPSOU-UR35SS03-090821-2					BPSOU-UR35SS03-090821-3				
Lab Sample ID			N/A					10578172005					N/A				
Sample Date			9/8/2021					9/8/2021					9/8/2021				
Sample Type			Natural					Natural					Natural				
Method	Analyte	Units	Result	Lab Qual	DV Qual	S/E	Reason Code	Result	Lab Qual	DV Qual	S/E	Reason Code	Result	Lab Qual	DV Qual	S/E	Reason Code
XRF	Arsenic	mg/kg	<39.2	<LOD		E		126.35			E		102.38			E	
XRF	Cadmium	mg/kg	18.13			E		37.47			E		24.80			E	
XRF	Copper	mg/kg	195.23			E		954.51			E		1,361.11			E	
XRF	Lead	mg/kg	1,893.62			E		5,464.07			E		3,989.22			E	
XRF	Mercury	mg/kg	<8.65	<LOD	UJ	S	CX	<18.97	<LOD	UJ	S	CX	<18.07	<LOD	UJ	S	CX
XRF	Zinc	mg/kg	2,604.40			E		20,954.91			E		19,346.14			E	
ASTM D2974	Moisture, Percent	%						5.7	N2		E						
SW-846 6010D	Arsenic	mg/kg						111			E						
SW-846 6010D	Cadmium	mg/kg						24.2			E						
SW-846 6010D	Copper	mg/kg						430			E						
SW-846 6010D	Lead	mg/kg						6,090			E						
SW-846 6010D	Zinc	mg/kg						10,100			E						
SW-846 7471B	Mercury	mg/kg						0.67			E						

Notes:
Depth intervals are inches below ground surface.

Qualification (Qual) and Reason Codes are
defined in Table A4.

< - Not detected at the detection limit.

Abbreviations:
mg/kg - milligram per kilogram

Table A2. Field Duplicate Pair Samples with Results, Laboratory Qualifiers, Data Validation Qualifiers, Data Validation Reason Codes, and QC Criteria Assessment

Station (Depth Interval)			UR-35-SS-02(2-6)						UR-35-SS-02(2-6)-FD									
Field Sample ID			BPSOU-UR35SS02-090821-2						BPSOU-UR35SS02-090821-2-FD									
Lab Sample ID			10578172002						10578172003									
Sample Date			9/8/2021						9/8/2021									
Sample Type			Natural Sample						Field Duplicate									
Method	Analyte	Units	Result	Lab Qual	DV Qual	Reason Code	DF	RL	Result	Lab Qual	DV Qual	Reason Code	DF	RL	Control Limit[1]	ABS DIF	RPD	Meets Control Limit?
XRF	Arsenic	mg/kg	152.84		J	FD	1	N/A	246.79		J	FD	1	N/A	RPD≤35%		47%	RPD>35%
XRF	Cadmium	mg/kg	14.96		J	FD	1	N/A	21.64		J	FD	1	N/A	RPD≤35%		37%	RPD>35%
XRF	Copper	mg/kg	1,180.62				1	N/A	1,135.88				1	N/A	RPD≤35%		4%	Yes
XRF	Lead	mg/kg	2,928.28				1	N/A	4,056.24				1	N/A	RPD≤35%		32%	Yes
XRF	Mercury	mg/kg	<11.05	<LOD	UJ	CX	1	N/A	<12.69	<LOD	UJ	CX	1	N/A	N/A		-	-
XRF	Zinc	mg/kg	5,025.02				1	N/A	6,180.56				1	N/A	RPD≤35%		21%	Yes
ASTM D2974	Moisture, Percent	%	5.1	N2			1	0.1	4.7	N2			1	0.1	RPD≤35%		8%	Yes
SW-846 6010D	Arsenic	mg/kg	129				2	2.1	99.1				2	2.0	RPD≤35%		26%	Yes
SW-846 6010D	Cadmium	mg/kg	13.8				2	0.31	10.6				2	0.30	RPD≤35%		26%	Yes
SW-846 6010D	Copper	mg/kg	983				2	1.0	758				2	0.99	RPD≤35%		26%	Yes
SW-846 6010D	Lead	mg/kg	3,760				2	1.0	3,960				2	0.99	RPD≤35%		5%	Yes
SW-846 6010D	Zinc	mg/kg	4,230				2	4.1	3,480				2	4.0	RPD≤35%		19%	Yes
SW-846 7471B	Mercury	mg/kg	0.80				1	0.019	1.0				2	0.038	RPD≤35%		22%	Yes

Notes:

Qualification (Qual) and Reason Codes are defined in Table A4.

< - Not detected at the detection limit.

The qualifications made to the field duplicate samples (DV Qual/Reason Code) are not included in the summary of qualifications made to natural samples discussed in the Data Validation Report.

Depth intervals are inches below ground surface.

Abbreviations:

DF - dilution factor

RL - reporting limit

ABS DIF - absolute difference

RPD - relative percent difference

mg/kg - milligram per kilogram

Footnotes:

1. If the control limit is an absolute difference less than 2 times the reporting limit, the minimum adjusted reporting limit will be used.

Table A3. Sample Identification

Station ID	Field Sample ID	Sample Type	Depth Interval (in bgs)	Sample Date	XRF	Lab ID	ASTM D2974	SW-846 6010D	SW-846 7471B
UR-35-OP-01	BPSOU-UR35OP01-090821-1	Natural	0 - 2	9/8/2021	As, Cd, Cu, Pb, Hg, Zn	N/A			
UR-35-OP-01	BPSOU-UR35OP01-090821-2	Natural	2 - 6	9/8/2021	As, Cd, Cu, Pb, Hg, Zn	N/A			
UR-35-OP-01	BPSOU-UR35OP01-090821-3	Natural	6 - 12	9/8/2021	As, Cd, Cu, Pb, Hg, Zn	10578172004	moisture	As, Cd, Cu, Pb, Zn	Hg
UR-35-SS-02	BPSOU-UR35SS02-090821-1	Natural	0 - 2	9/8/2021	As, Cd, Cu, Pb, Hg, Zn	10578172001	moisture	As, Cd, Cu, Pb, Zn	Hg
UR-35-SS-02	BPSOU-UR35SS02-090821-2	Natural	2 - 6	9/8/2021	As, Cd, Cu, Pb, Hg, Zn	10578172002	moisture	As, Cd, Cu, Pb, Zn	Hg
UR-35-SS-02	BPSOU-UR35SS02-090821-2-FD	Field Duplicate	2 - 6	9/8/2021	As, Cd, Cu, Pb, Hg, Zn	10578172003	moisture	As, Cd, Cu, Pb, Zn	Hg
UR-35-SS-02	BPSOU-UR35SS02-090821-3	Natural	6 - 12	9/8/2021	As, Cd, Cu, Pb, Hg, Zn	N/A			
UR-35-SS-03	BPSOU-UR35SS03-090821-1	Natural	0 - 2	9/8/2021	As, Cd, Cu, Pb, Hg, Zn	N/A			
UR-35-SS-03	BPSOU-UR35SS03-090821-2	Natural	2 - 6	9/8/2021	As, Cd, Cu, Pb, Hg, Zn	10578172005	moisture	As, Cd, Cu, Pb, Zn	Hg
UR-35-SS-03	BPSOU-UR35SS03-090821-3	Natural	6 - 12	9/8/2021	As, Cd, Cu, Pb, Hg, Zn	N/A			

Abbreviations:
in bgs - inches below ground surface
As - arsenic
Cd - cadmium
Cu - copper
Pb - lead
Hg - mercury
Zn - zinc

Table A4. Laboratory Qualifiers; Data Validation Qualifiers; Enforcement, Screening, and Rejected Codes; and Reason Codes Definitions

Lab Qual (Pace Analytical Services [Pace] Qualifiers)

M1 = Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

N2 = The lab does not hold NELAC/TNI accreditation for this parameter but other accreditations/certifications may apply.

P6 = Matrix spike recovery was outside laboratory control limits due to a parent sample concentration notably higher than the spike level.

R1 = RPD value was outside control limits.

XRF Qual (XRF Qualifiers)

<LOD = Not detected at the reporting limit.

DV Qual (Data Validation Qualifiers)

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

J+ = The result is an estimated quantity, but the result may be biased high.

UJ = The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

S/E (Screening/Enforcement Quality Designation)

E = Enforcement quality.

S = Screening quality.

R = Unusable (Rejected) quality.

Reason Code (Data Validation Reason Codes)

CX = Qualified because frequency of XRF check samples was not satisfied.

D% = Qualified due to XRF or laboratory duplicate results outside control limits.

S% = Qualified due to percent recovery of the laboratory matrix spike outside of control limits.

FD = Qualified due to field duplicate results outside of control limits.

Table A5. XRF SiO2 Standard and Calibration Check Sample Results

		Analyte	Arsenic		Cadmium		Copper		Lead		Mercury		Zinc	
Standard Type	Sample ID	Analysis Date	Result (mg/kg)	Meets Control Limit (<10 mg/kg)	Result (mg/kg)	Meets Control Limit (<50 mg/kg)	Result (mg/kg)	Meets Control Limit (<20 mg/kg)	Result (mg/kg)	Meets Control Limit (<10 mg/kg)	Result (mg/kg)	Meets Control Limit (<10 mg/kg)	Result (mg/kg)	Meets Control Limit (<10 mg/kg)
SiO2	P_20210908_98052_488	9/8/2021	<2.66	Yes	13.29	Yes	<11.42	Yes	<3.43	Yes	<4.75	Yes	<5.39	Yes
SiO2	P_20210908_98052_504	9/8/2021	<2.48	Yes	13.57	Yes	<11.33	Yes	<3.17	Yes	<4.77	Yes	<5.4	Yes
SiO2	P_20210908_98052_508	9/8/2021	<2.7	Yes	<6.45	Yes	<11.88	Yes	<3.44	Yes	<4.9	Yes	<5.42	Yes

		Analyte	Arsenic		Cadmium		Copper		Lead		Mercury		Zinc	
Standard Type	Sample ID	Analysis Date	Result (mg/kg)	Meets Control Limit (0-35 mg/kg)	Result (mg/kg)	Meets Control Limit (0-60 mg/kg)	Result (mg/kg)	Meets Control Limit (0-60 mg/kg)	Result (mg/kg)	Meets Control Limit (0-35 mg/kg)	Result (mg/kg)	Meets Control Limit (0-12 mg/kg)	Result (mg/kg)	Meets Control Limit (50-160 mg/kg)
NIST 2709a	P_20210908_98052_489	9/8/2021	9.91	Yes	11.00	Yes	44.38	Yes	15.83	Yes	<6.43	Yes	89.49	Yes
NIST 2709a	P_20210908_98052_511	9/8/2021	12.93	Yes	14.48	Yes	31.73	Yes	14.87	Yes	<6.31	Yes	86.80	Yes

		Analyte	Arsenic		Cadmium		Copper		Lead		Mercury		Zinc	
Standard Type	Sample ID	Analysis Date	Result (mg/kg)	Meets Control Limit (400-600 mg/kg)	Result (mg/kg)	Meets Control Limit (400-600 mg/kg)	Result (mg/kg)	Meets Control Limit (N/A)	Result (mg/kg)	Meets Control Limit (400-600 mg/kg)	Result (mg/kg)	Meets Control Limit (N/A)	Result (mg/kg)	Meets Control Limit (N/A)
RCRA	P_20210908_98052_490	9/8/2021	489.32	Yes	504.43	Yes	19.90	N/A	474.33	Yes	<7	N/A	47.72	N/A
RCRA	P_20210908_98052_510	9/8/2021	500.16	Yes	502.64	Yes	<16	N/A	483.23	Yes	<7.16	N/A	41.01	N/A

Notes:

< - Not detected value is the XRF error for analysis.

Abbreviations:

mg/kg - milligram per kilogram

SiO2 - Silicon Dioxide standard

NIST 2709a - NIST 2709a- Joaquin Soil sample

RCRA - Resource Conservation and Recovery Act Sample

Table A6. XRF Duplicate and Replicate Sample Results and QC Criteria Assessment

				Analyte	Arsenic		Cadmium		Copper		Lead		Mercury		Zinc	
Standard Type	Sample ID	Sample Name	Parent Sample	Analysis Date	Result (mg/kg)	RPD	Result (mg/kg)	RPD	Result (mg/kg)	RPD	Result (mg/kg)	RPD	Result (mg/kg)	RPD	Result (mg/kg)	RPD
Natural	P_20210908_98052_500	BPSOU-UR35OP01-090821-3		9/8/2021	193.47		29.77		578.65		5,412.23		<16		13,258.80	
XRF Replicate	P_20210908_98052_502	BPSOU-UR35OP01-090821-3-R	BPSOU-UR35OP01-090821-3	9/8/2021	182.08	6.1%	37.89	24%	581.18	0.4%	5,495.13	1.5%	<15.9	ND	13,290.99	0.2%
XRF Duplicate	P_20210908_98052_503	BPSOU-UR35OP01-090821-3-D	BPSOU-UR35OP01-090821-3	9/8/2021	185.34	4.3%	33.10	10.6%	652.53	12%	5,516.16	1.9%	<15.9	ND	13,144.54	0.9%

Notes:

< - Not detected value is the XRF error for analysis.

Abbreviations:

mg/kg - milligram per kilogram

ND = non-detected

RPD = relative percent differnce

Attachment 1
Data Validation Checklists

Attachment 1.1
Data Validation Checklists for XRF Analyses

Data Validation Checklist XRF Sample Analysis

Site: Butte Priority Soils Operable Unit
Project: Unreclaimed Sites 2021
Sample Date: 9/7/2021, 9/8/2021
Data Validator: Sara Ward

Case No: P_20210908
Sample Matrix: Soil
Analysis Dates: 9/8/2021
Validation Dates: 10/20/2021

Laboratory: Pioneer Technical Services, Inc.
Analyses: Arsenic; Cadmium; Copper; Lead; Mercury; Zinc

1. Holding Times

Analyte	Laboratory	Matrix	Method	Holding Times	Collection Date	Analysis Date(s)	Holding Time Met (Y/N)	Affected Data Flagged (Y/N)
As, Cd, Cu, Pb, Hg, Zn	Pioneer	Soil	XRF	N/A	9/7/2021, 9/8/2021	9/8/2021	N/A	N/A

Were any data flagged because of holding time? Y [ ] N [X]

What sample preparation steps were performed (i.e. drying, sieving etc.)? Drying and sieving

Were the samples prepped according to the SAP/QAPP? Y [X] N [ ]

Describe Any Actions Taken: None required

Comments:

2. Energy Calibration (System Check)

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

Describe Any Actions Taken: None required

Comments:

3. SiO_2 Standards

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

Describe Any Actions Taken: None required

Comments: Detections for cadmium (7.43 mg/kg, 13.29 mg/kg, and 13.57 mg/kg) in the SiO_2 Standards did not require qualifications since the detections were below the control limit (50 mg/kg).

4. Calibration Check Samples

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

Describe Any Actions Taken: There were no calibration check samples that had a known amount (true value) of mercury greater than the limit of detection (LOD). Therefore, all mercury results have been qualified "UJ".

Comments:

5. Duplicate Sample Results

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

Describe Any Actions Taken: The following XRF duplicate samples were analyzed on 9/8/2021:

XRF Duplicate Sample	Primary Sample
BPSOU-UR36OP01-090821-1-D	BPSOU-UR36OP01-090821-1
BPSOU-UR35OP01-090821-3-D	BPSOU-UR35OP01-090821-3

For the BPSOU-UR36OP01-090821-1-D and BPSOU-UR36OP01-090821-1 duplicate pair, the RPD for zinc (69%) was outside control limits (35%). BPSOU-UR36OP01-090821-1 was qualified "J" for zinc.

The following XRF field duplicate samples were analyzed on 9/8/2021:

XRF Field Duplicate Sample	Primary Sample
BPSOU-UR36SS04-090721-1-FD	BPSOU-UR36SS04-090721-1
BPSOU-UR35SS02-090821-2-FD	BPSOU-UR35SS02-090821-2

For the BPSOU-UR35SS02-090821-2-FD and BPSOU-UR35SS02-090821-2 duplicate pair, the RPD for arsenic (47%) and cadmium (37%) were outside control limits (35%). BPSOU-UR35SS02-090821-2 and BPSOU-UR35SS02-090821-2-FD were qualified "J" for arsenic and cadmium.

Comments:

6. Replicate Sample Results

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

Describe Any Actions Taken: None required

Comments: The following XRF replicate sample was analyzed on 9/8/2021:

XRF Replicate Sample	Primary Sample
BPSOU-UR36OP01-090821-1-R	BPSOU-UR36OP01-090821-1
BPSOU-UR35OP01-090821-3-R	BPSOU-UR35OP01-090821-3

7. Overall Assessment

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

If so, explain: On this WO P_20210908, the following qualifications were made:

Two (2) cadmium results were qualified "J" due to an elevated XRF field duplicate RPD.
Two (2) arsenic results were qualified "J" due to an elevated XRF field duplicate RPD.
One (1) zinc result was qualified "J" due to an elevated XRF duplicate RPD.
Thirty (30) mercury results have been qualified "UJ" due to the lack of an appropriate calibration check sample.

Comments:

8. Authorization of Data Validation

Data Validator
Name: Sara Ward

Signature: Sara Ward **Date:** 10/20/2021

Reviewed by: Josie McElroy **Date:** 10/21/2021

Attachment 1.2
Data Validation Checklists for Laboratory Analyses

Stage 2A Data Validation Checklist for Sample Analysis

Site: Butte Priority Soils Operable Unit
Project: Unreclaimed Sites 2021
Sample Date(s): 09/08/2021
Data Validator: Sara Ward
Case No: 10578172
Sample Matrix: Soil
Analysis Date(s): 09/13/2021, 09/16/2021, 09/20/2021
Validation Date(s): 10/19/2021
Laboratory: Pace Analytical
Analyses: As, Cd, Cu, Pb, Zn (EPA 6010D), Hg (EPA 7471B), and Percent Moisture (ASTM D2974)

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)
As, Cd, Cu, Pb, and Zn	Pace	Soil	EPA 6010D	6 months	09/08/2021	09/16/2021	Y	N/A
Hg			EPA 7471B	28 days		09/20/2021	Y	N/A
Percent Moisture			ASTM D2974	N/A		09/13/2021	Y	N/A

Were any data flagged because of holding time? Y [ ] N [X]
Were any data flagged because of preservation problems? Y [ ] N [X]

Describe Any Actions Taken: None Required.

Comments: The receiving temperature as reported by the laboratory was 3.7°C. The samples were shipped on ice and analyzed within holding time.

2. Blanks

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

Describe Any Actions Taken: None Required.

Comments: MB for EPA 7471B was non-detect.

For EPA 6010D, there was a detection of copper (0.21 mg/kg) and zinc (0.23 mg/kg) in the MB at a level less than ½ the reporting limit (0.49 mg/kg and 1.9 mg/kg, respectively). No qualifications were warranted since the detections were less than ½ the reporting limits. All other analytes were non-detect.

A MB was not analyzed for ASTM D2974.

3. Laboratory Control Samples

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

Describe Any Actions Taken: None Required.

Comments: The LCS %R were within limits for EPA 6010D and EPA 7471B. An LCS was not analyzed for ASTM D2974.

Work Order: 10578172

4. Duplicate Sample Results

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

Describe Any Actions Taken: For method EPA 6010D batch 769643, an LMS/LMS Duplicate (LMSD) generated from BPSOU-UR35SS02-090821-1 was used for the LDS calculations. The RPDs for arsenic (27%), lead (23%), and zinc (25%) were all outside control limits (20%). BPSOU-UR35SS02-090821-1 was qualified "J" for arsenic, lead, and zinc. Per the NFG, "*For a duplicate sample analysis that does not meet the technical criteria, apply the action to all samples of the same matrix if the samples are considered sufficiently similar"* (EPA, 2020). There are no samples that are considered sufficiently similar to warrant qualification. The remaining RPDs were within control limits.

Comments: For method EPA 7471B batch 769648, an LMS/LMS Duplicate (LMSD) generated from BPSOU-UR35SS02-090821-1 was used for the LDS calculation. The RPD was within control limits.

For ASTM D2974, a duplicate generated from BPSOU-UR35SS02-090821-1 and a duplicate generated from a sample not from this work order were used for the LDS calculations. The RPDs were within control limits.

5. Matrix Spike Sample Results

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

Describe Any Actions Taken: For method EPA 7471B batch 769648, an LMS/LMSD was generated from BPSOU-UR35SS02-090821-1. The %R of the LMS/MSD for mercury (123% and 131%, respectively) were outside control limits (80-120%); therefore, BPSOU-UR35SS02-090821-1 was qualified "J+" for mercury. Per the NFG, "*For a spike sample analysis that does not meet the technical criteria, apply the action to all samples of the same matrix if the samples are considered sufficiently similar"* (EPA, 2020). Since no samples are considered sufficiently similar, no additional qualifications were warranted.

For method EPA 6010D batch 769643, an LMS/LMSD was generated from BPSOU-UR35SS02-090821-1. The %R of the LMS for arsenic (161%) was outside control limits (75-125%); therefore, BPSOU-UR35SS02-090821-1 was qualified "J+" for arsenic. BPSOU-UR35SS02-090821-1 had a previous qualification for arsenic of "J" for poor duplicate precision; therefore, the final qualification is "J". Per the NFG, "*For a spike sample analysis that does not meet the technical criteria, apply the action to all samples of the same matrix if the samples are considered sufficiently similar"* (EPA, 2020). Since no samples are considered sufficiently similar, no additional qualifications were warranted.

Comments: For method EPA 6010D batch 769643, an LMS/LMSD was generated from BPSOU-UR35SS02-090821-1. The %R of the LMS/LMSD for copper (168% and 56%, respectively), lead (976% and 317%, respectively), and zinc (989% and -302%, respectively) were outside control limits. Per the NFG, "*Spike recovery limits do not apply when the original sample concentration is ≥ 4 times the spike added. In such an event, the data shall be reported unflagged, even if the %R does not meet acceptance criteria*" (EPA, 2020). The original sample concentrations of copper, lead, and zinc were greater than 4 times the spike added for these analytes; therefore, no qualifications were warranted. All other %R were within limits.

An LMS was not analyzed for ASTM D2974.

6. Field Blanks

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

Describe Any Actions Taken: None Required.

Comments: Field blanks were not required as there is no sampling equipment re-used.

7. Field Duplicates

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

Describe Any Actions Taken: None Required.

Comments: One field duplicate pair was submitted on this work order, BPSOU-UR35SS02-090821-2 and BPSOU-UR35SS02-090821-2-FD. The precision for all analytes was within control limits.

8. Overall Assessment

Are there analytical limitations of the data that users should be aware of? Y [X] N [ ]

If so, explain: On this WO 10578172, the following qualifications were made:

In addition to the qualifications outlined in the sections above, results which were reported between the method detection limit and the reporting limit were qualified "A" when no additional qualifications were warranted.

The table below lists the qualifications on the natural samples:

Field ID	Analyte	Final Qualification	Reason Code
BPSOU-UR35SS02-090821-1	Arsenic	J	D%, S%
BPSOU-UR35SS02-090821-1	Lead	J	D%
BPSOU-UR35SS02-090821-1	Zinc	J	D%
BPSOU-UR35SS02-090821-1	Mercury	J+	S%

Reason for qualification:
S% = Laboratory matrix spike recovery was outside control limits.
D% = Laboratory duplicate sample precision was outside control limits.

Comments:

9. Authorization of Data Validation

Data Validator
Name: Sara Ward **Reviewed by:** Josie McElroy

Signature: Sara Ward Josie McElroy

Date: 10/19/2021 10/19/2021

Attachment 2
Level A/B Assessment Checklist

Level A/B Assessment Checklist

1. General Information

Site: Butte Priority Soils Operable Unit
Project: Unreclaimed Sites 2021
Client: Atlantic Richfield Company
Sample Matrix: Soil

2. Screening Result

Data are:

1. Unusable
2. Level A
3. Level B 10578172 and P_20210908_98052

I. **Level A**

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

II**. Level B**

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

Attachment 3
Data Validation Quality Control Criteria

XRF							
Quality Control	**Frequency**	**Acceptance Criteria**	**Criteria**	**Action**			**Reference**
				Associated Sample Result Detected	**Associated Sample Result Non-Detected**	**Reason Code**	
System Check	Performed daily, prior to sample analysis	Performed daily, prior to sample analysis	System Check not performed	Professional Judgment J/R	Professional Judgment UJ/R	CX	SOP-SFM-02
		Resolution < 195	Resolution ≥ 195	Professional Judgment J/R	Professional Judgment UJ/R	SC	
SiO_2 Standard	Performed daily, prior to sample analysis, at least 1 for every 20 sample analyses, and at end of each day of analysis	Performed daily, prior to sample analysis, at least 1 for every 20 sample analyses, and at end of each day of analysis	Frequency criteria not met	J	UJ	CX	SOP-SFM-02 Niton XL3 Soil QC Sheet
		Arsenic ≤10 mg/kg Cadmium ≤50 mg/kg Copper ≤20 mg/kg Lead ≤10 mg/kg Mercury ≤10 mg/kg Zinc ≤10 mg/kg	>10 mg/kg >50 mg/kg >20 mg/kg >10 mg/kg >10 mg/kg >10 mg/kg	Results < 10x the SiO2 result - J+	No Qualification	B	
Calibration Check Samples	Performed daily, prior to sample analysis, at least 1 for every 20 sample analyses, and at end of each day of analysis	Performed daily, prior to sample analysis, at least 1 for every 20 sample analyses, and at end of each day of analysis	Frequency criteria not met	J	UJ	CX	SOP-SFM-02 Niton XL3 Soil QC Sheet
		NIST Standard: Arsenic 0 - 35 mg/kg Cadmium 0 - 60 mg/kg Copper 0 - 60 mg/kg Lead 0 - 35 mg/kg Mercury 0 - 12 mg/kg Zinc 50 - 160 mg/kg	< Lower Control Limit	J-	UJ	CSS	
		RCRA Standard: Arsenic 400 - 600 mg/kg Cadmium 400 - 600 mg/kg Lead 400 - 600 mg/kg	> Upper Control Limit	J+	No Qualification		
XRF Duplicate	1 per 20 samples	RPD ≤ 35% for detected results	Frequency criteria not met	J	UJ	DX	SOP-SFM-02 UR QAPP
			RPD ≤ 35%	No Qualification	No Qualification	D%	
			RPD > 35%	J	UJ		
XRF Replicate	1 per 20 samples	RPD ≤ 35% for detected results	Frequency criteria not met	J	UJ	RX	SOP-SFM-02 UR QAPP
			RPD ≤ 35%	No Qualification	No Qualification	R%	
			RPD > 35%	J	UJ		
Field Duplicate	1 per 20 samples	RPD ≤ 35% for detected results	Frequency criteria not met	J	UJ	FDX	UR QAPP
			RPD ≤ 35%	No Qualification	No Qualification	FD	
			RPD > 35%	J	UJ		

Laboratory							
Quality Control	**Frequency**	**Acceptance Criteria**	**Criteria**	**Data Validation Action**			**Reference**
				Associated Sample Result -Detected	**Associated Sample Result - Non-Detected**	**Reason Code**	
Laboratory Quality Control Samples							
Holding Time	Every Sample	EPA 6010D (metals/metalloids)	≤ 6 months	J-	Professional Judgement UJ or R	H	NFG
		EPA 7471B (mercury)	≤ 28 days	J-	Professional Judgement UJ or R		
Preservation	Every Sample	EPA 6010D (metals/metalloids)	N/A (solids)	No Qualification	No Qualification	Pres	NFG
		EPA 7471B (mercury)	≤ 6 ºC	No Qualification	No Qualification		
			≥ 6 ºC but ≤ 10 ºC	Professional Judgement J	Professional Judgement UJ		
			> 10 ºC	J-	Professional Judgement UJ or R		
Method Blank (MB)	One per batch of up to 20 samples.	≤ 1/2 RL (6010D) ≤ Absolute Value of RL (7471B)	≤ 1/2 RL (6010D) or Absolute Value of RL (7471B)	No Qualification	No Qualification	MB	CFRSSI QAPP Pace SOP
			> 1/2 RL (6010D) or Absolute Value of RL (7471B)	sample result < 10x blank detection: U	No Qualification		
Laboratory Control Sample (LCS)	One per batch of up to 20 samples.	%R 80-120% (all methods)	%R < 40%	J-	R	L%	CFRSSI QAPP NFG Pace SOP
			%R 40-79%	J-	UJ		
			%R 80-120%	No Qualification	No Qualification		
			%R > 120%	J+	No Qualification		
			%R > 150%	R	No Qualification		
Laboratory Duplicate Sample (LDS)[3]	One per batch of up to 20 samples.	All methods: 1. If both original sample and duplicate sample results are ≥ 5x the RL, then RPD ≤ 20% (LCSD/MSD), RPD ≤35% (soil); 2. If original sample or duplicate sample result < 5x the RL, then absolute difference between sample and duplicate ≤ 2x RL (soils)	Both original and duplicate sample results are ≥ 5x the RL and RPD ≤ 20% (LCSD/MSD), RPD ≤35% (soil).	No Qualification	No Qualification	D%	CFRSSI QAPP NFG Pace SOP
			Both original and duplicate sample results are ≥ 5x the RL and RPD is > 20% (LCSD/MSD), > 35% (soil).	J	UJ		
			RPD > 100%	Professional Judgement	Professional Judgement		
			Original sample or duplicate sample result < 5x the RL, and absolute difference between sample and duplicate ≤ 2x RL (soils)	No Qualification	No Qualification		
			Original sample or duplicate sample result is < 5x the RL and absolute difference between the sample and duplicate > 2x RL (soil).	J	UJ		
Laboratory Matrix Spike (LMS)	One per batch of up to 20 samples.	6010D - %R 75-125% 7471B - %R 80-120% if sample analyte concentration < 4x spike concentration	%R < 30%	J-	R	S%	CFRSSI QAPP NFG Pace SOP
			%R 30-74% (6010D) %R 30-79% (7471B)	J-	UJ		
			%R 75-125% (6010D) %R 80-120% (7471B)	No Qualification	No Qualification		
			%R >125% (6010D) %R >120% (7471B)	J+	No Qualification		
			sample analyte concentration ≥ 4x spike concentration	No Qualification	No Qualification		

Field Quality Control Samples							
Field Duplicate Sample	One per 20 samples collected.	All methods: 1. If both original sample and duplicate sample results are ≥ 5x the RL, RPD ≤ 35% (soil); 2. If original sample or duplicate sample result < 5x the RL, then absolute difference between sample and duplicate ≤ 2x RL (soils)	Both original and duplicate sample results are ≥ 5x the RL and RPD RPD ≤35% (soil).	No Qualification	No Qualification	FD	CFRSSI QAPP NFG
			Both original and duplicate sample results are ≥ 5x the RL and RPD is > 35% (soil).	J	UJ		
			RPD > 100%	Professional Judgement	Professional Judgement		
			Original sample or duplicate sample result < 5x the RL, and absolute difference between sample and duplicate ≤ 2xRL (soils)	No Qualification	No Qualification		
			Original sample or duplicate sample result is < 5x the RL and absolute difference between the sample and duplicate > 2xRL (soil).	J	UJ		

Notes:

1. Associated sample results:

For Field Blank results that do not meet technical criteria, apply action to all samples in the SDG.

For Field Duplicate results that do not meet technical criteria, apply action to field duplicate pair and any samples from the same sample location in the SDG.

For MB and LCS results that do not meet technical criteria, apply action to all samples in the analytical batch.

For LDS or LMS/MSD results that do not meet technical criteria, apply action to the parent sample and, per the NFG, "apply the action to all samples of the same matrix if the samples are considered sufficiently similar."

For holding time and preservation that do not meet technical criteria, apply action to sample.

2. For consistency in validations between validators, if a sample result is reported as non-detect, the MDL is used for the duplicate absolute difference calculations.

3. An LCS, an LMS, or an original sample may all be used to perform a laboratory duplicate. If a LCS Duplicate or LMS Duplicate is used, the QC sample must also meet the applicable %R technical criteria.

Qualifications:

U - Non-detect
UJ - Estimated non-detect
J - Estimated
J+ - Estimated high
J- - Estimated low
R - Rejected

Abbreviations:

MDL - method detection limit
RL - reporting limit
%R - percent recovery
RPD - relative percent difference

References:

CFRSSI QAPP - ARCO, 1992. Clark Fork River Superfund Site Investigations (CFRSSI) Quality Assurance Project Plan (QAPP). Prepared for ARCO by PTI Environmental Services, Bellevue, Washington. May 1992.

NFG - EPA, 2020. National Functional Guidelines for Inorganic Superfund Methods Data Review. November 2020.

-- Available at EPA's Superfund Analytical Services and Contract Laboratory Program website: https://www.epa.gov/clp/contract-laboratory-program-national-functional-guidelines-data-review

SOP-SFM-02 - Operating XL3-X-Ray Fluorescence Analyzer General. Pioneer Technical Services, Inc. January 2018.

UR QAPP - Silver Bow Creek/Butte Area NPL Site Butte Priority Soils Operable Unit 2022 Final Unrelaimed Sites Quality Assurance Project Plan (QAPP). Prepared for Atlantic Richfield Company by Pioneer Technical Services, Inc, Butte, Montana. June 2021.

Niton XL3 Soil QC Sheet - Niton XL3 Soil QC Certificate of Calibration. Thermo Fisher Scientific. June 2014.

Pace SOP -

EPA 6010D - ENV-SOP-MIN4-0052: Metals Analysis by ICP - Method 6010 and 200.7

EPA 7471B - ENV-SOP-MIN4-0054: Mercury in Liquid and Solid/Semi-Solid Waste by 7470A, 7471, 7471B, and 245.1

Attachment B
Field Forms and Related Documents

BPSOU: Unreclaimed Sites Field XRF and Soil pH Results

Site Number: 35 Operator: JS, MS, CD, MS
Land Use: Residential XRF Unit #: ~~92951~~ 98052
pH probe #: 1

*Reference 2021 UR Confirmation Sample Decision Tree for more information on declaring the need for a confirmation sample.

Note: starting Blanks + SRM recorded on UR36 Data sheet

Soil Action/Screening Levels (mg/kg)						
Residential	250			1,200		10
Non-Residential				2,300		
Recreational	1,000					
Commercial	500					
Storm Water	200	20	1000	1000	1000	10

XRF Reading #	Sample Name	Depth (inches)	Soil pH (s.u.)	Date Collected	Time Collected	Date Analysed	XRF Results (mg/kg) As	Cd	Cu	Pb	Zn	Hg	Lab Sample
494	BPSOU-UR35 ~~SS02~~ SS02-090821-1	0-2	5.08	9/8/21	10:30	9/8/21	(62	<8	(996)	(2409)	(8691)	(<10)	Yes
495	BPSOU-UR35 SS02-090821-2	2-6	4.41	9/8/21	10:25	9/8/21	153	15	(1181)	2928	(5025)	<11	~~Yes~~ CD
496	BPSOU-UR35 SS02-090821-2-FD	2-6	4.27	9/8/21	10:20	9/8/21	(247)	(22)	(1136)	4056	(6181)	<13	Yes
497	BPSOU-UR35 SS02-090821-3	6-12	4.24	9/8/21	10:15	9/8/21	(208)	17	(1307)	3156	(6538)	<12	~~Yes~~ CD
498	BPSOU-UR35 OP01-090821-1	0-2	2.78	9/8/21	1005	9/8/21	127	11	250	(2722)	(3707)	(<10)	~~Yes~~ CD
499	BPSOU-UR35 OP01-090821-2	2-6	3.85	9/8/21	1000	9/8/21	114	(23)	572	(4507)	(6274)	(<12)	~~Yes~~ CD
500	BPSOU-UR35 OP01-090821-3	6-12	3.41	9/8/21	0955	9/8/21	193	(30)	579	(5412)	(13.3K)	(<16)	Yes
502	BPSOU-UR35 OP01-090821-3-R	6-12		9/8/21	0955	9/8/21	182	(38)	581	(5495)	(13.3K)	(<16)	~~Yes~~ CD
503	BPSOU-UR35 OP01-090821-3-D	6-12		9/8/21	0955	9/8/21	185	(33)	(653)	(5516)	(13.1K)	(<16)	
504	~~BPSOU-UR35~~ SiO2	—	—	—	—	—	<2	14	<11	<3	<5	<5	-
—	~~BPSOU-UR35~~ 3 more samples to run will restart standards after.												-
505	BPSOU-UR35 SS03-090821-1	0-2	4.81	9/8/21	1010	9/8/21	<39	18	195	(1894)	(2604)	<9	—
506	BPSOU-UR35 SS03-090821-2	2-6	5.42	9/8/21	1005	9/8/21	126	(37)	955	(5464)	(21.0K)	(<19)	Yes
507	BPSOU-UR35 SS03-090821-3	6-12	5.17	9/8/21	1000	9/8/21	102	(25)	(1361)	(3989)	(19.3K)	(<18)	—
508	~~BPSOU-UR35~~ SiO2	—	—	—	—	—	<3	<6	<12	<3	<5	<5	-
509	~~BPSOU-UR35~~ USGS						75	18	238	801	719	<7	-
510	~~BPSOU-UR35~~ RCRA						500	503	<16	483	41	<7	-
511	~~BPSOU-UR35~~ NIST						13	14	32	15	87	<6	-
	BPSOU-UR35												
	BPSOU-UR35												
	BPSOU-UR35												
	BPSOU-UR35												

501 only ran for 0.2sec. Re ran sample.

9/8/21 Wed

BPSOU-UR360P01-090821-1 @ 8:20
Ran XRF. Lab Req Per Storm Water CoC
BPSOU-UR360P01-090821-2 @ 8:45
Ran XRF, Lab Req Per Storm water CoC
BPSOU-UR360P01-090821-3 @ 8:40
Ran XRF. Lab Req Per Storm Water CoC
Completed UR-36 Site Characterization
~~8:30~~ ~~10:00~~ CJD On site @ UR35 to Characterize site. Sample location SS01 on the northern portion of site will not be able to be sample due to no Access from landowner. Was approved to proceed & collect data that is obtainable from other AR + BSB owned portions of the site. Added Sample location OP01 to gain Spatial representativeness. Samples collected per pg. 2 + 3 + summarized below.
- SS02 Sample location 2
BPSOU-UR35SS02-090821-1 @ 10:30
Ran XRF. Submitted lab due to >35% for Pb Residential Action Level
BPSOU-UR35SS02-090821-2 @ 10:25

9/8/21 Wed.

Ran XRF. Lab per 1 in 10
BPSOU-UR35SS02-090821-2-FD @ 10:20. Field Duplicate per event Req. Parent Sample = BPSOU-UR35SS02-090821-2
BPSOU-UR35SS02-090821-3 @ 10:15
Ran XRF. No lab Req. Well above Residential Action Level for Pb.
SS03 Sample location 3
BPSOU-UR35SS03-090821-1 @ 10:10
Ran XRF. Well above Res Action for Pb
BPSOU-UR35SS03-090821-2 @ 10:05
Ran XRF. Submitted lab even tho well above levels for Pb + Zn to help w/ XRF Correlation to have data points on that End of the curve.
BPSOU-UR35SS03-090821-3 @ 10:00
Ran XRF. Well above Res Action level Pb
OP01 Opportunistic location 1
BPSOU-UR35OP01-090821-1 @ 10:05
Ran XRF. Well above Pb Res Action Level
BPSOU-UR35OP01-090821-2 @ 10:00
Ran XRF. Well above Action Levels for Pb ~~but Submitted for lab to find NO lab XRF correlation for COCs w/ exceedance~~
CJD

9/8/21 Wed.

BPSOU-UR35SS01-090821-3 @ 9:55

Ran XRF. Well above Action level for Pb + ±5K for Storm Water COC but submitted lab split to Aid XRF Correlation.

Completed UR 35 Characterization. Prepped + shipped samples collected @ UR-36 + UR-35 for lab confirmation. Shipped 1- Cooler chilled w/ ICE w/ 2 COCs (5+6) for ~~lab~~ lab Analysis to Pace Minneapolis Fed EX overnight tracking info: 4278 9935 1728

14:30] Going to delinate locations at both UR-33 + UR-38 in prep for sampling/characterization on 9/9/21. Completed ~~stak~~ WP staking Sampling locations @ UR-33 + UR-38 + off site for Day @ 16:00

[signature] 9/8/21

9/9/21 Thurs.

0630] On site @ Pallet to load Equip + Go through Safety.

pH Probe Calibration

Hannah pH probe (HI99121)

Cal Check Verified

Live Reading			Buffer
3.98	@	21.7°C	4.0
~~7.00~~ 6.96	@	22.1°C	7.0
9.99	@	22.4°C	10.0

All within 0.1 Req.

0730] On site @ UR-38 to begin sampling/Characterization. All samples collected per procedures on page 2+3. Summarized By Each Sample location below

- SS01 Sample location 1

BPSOU-UR38SS01-090921-1 @ 8:10

Ran XRF. Lab Req Per ±35% Storm Water COCs

BPSOU-UR38SS01-090921-2 @ 8:05

Ran XRF. Lab Req Per ±35% for As Commercial Action Level

BPSOU-UR38SS01-090921-3 @ 8:00

Ran XRF. Lab Req Per ±35% As Commercial Action Level

- SS02 Sample location 2

BPSOU-UR38SS02-090921-1 @ 8:35

Attachment C
Laboratory Data Packages

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

September 21, 2021

Scott Sampson
Pioneer Technical Services
1101 S. Montana Street
Butte, MT 59701

RE: Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578172

Dear Scott Sampson:

Enclosed are the analytical results for sample(s) received by the laboratory on September 09, 2021. The results relate only to the samples included in this report. Results contained within this report conform to the most current version of the TNI standards, BP LaMP Technical Requirements Revision 12.1, and any applicable Quality Assurance Project Plan (QAPP), or Work Plan unless otherwise narrated in the body of this report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Minneapolis

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jennifer Anderson
jennifer.anderson@pacelabs.com
(612)607-6436
Project Manager

Enclosures

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

CERTIFICATIONS

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578172

Pace Analytical Services, LLC - Minneapolis MN
1700 Elm Street SE, Minneapolis, MN 55414
A2LA Certification #: 2926.01*
1800 Elm Street SE, Minneapolis, MN 55414--Satellite Air Lab
Alabama Certification #: 40770
Alaska Contaminated Sites Certification #: 17-009*
Alaska DW Certification #: MN00064
Arizona Certification #: AZ0014*
Arkansas DW Certification #: MN00064
Arkansas WW Certification #: 88-0680
California Certification #: 2929
Colorado Certification #: MN00064
Connecticut Certification #: PH-0256
EPA Region 8 Tribal Water Systems+Wyoming DW Certification #: via MN 027-053-137
Florida Certification #: E87605*
Georgia Certification #: 959
Hawaii Certification #: MN00064
Idaho Certification #: MN00064
Illinois Certification #: 200011
Indiana Certification #: C-MN-01
Iowa Certification #: 368
Kansas Certification #: E-10167
Kentucky DW Certification #: 90062
Kentucky WW Certification #: 90062
Louisiana DEQ Certification #: AI-03086*
Louisiana DW Certification #: MN00064
Maine Certification #: MN00064*
Maryland Certification #: 322
Michigan Certification #: 9909
Minnesota Certification #: 027-053-137*
Minnesota Dept of Ag Approval: via MN 027-053-137
Minnesota Petrofund Registration #: 1240*
Mississippi Certification #: MN00064
Missouri Certification #: 10100
Montana Certification #: CERT0092
Nebraska Certification #: NE-OS-18-06
Nevada Certification #: MN00064
New Hampshire Certification #: 2081*
New Jersey Certification #: MN002
New York Certification #: 11647*
North Carolina DW Certification #: 27700
North Carolina WW Certification #: 530
North Dakota Certification #: R-036
Ohio DW Certification #: 41244
Ohio VAP Certification (1700) #: CL101
Ohio VAP Certification (1800) #: CL110*
Oklahoma Certification #: 9507*
Oregon Primary Certification #: MN300001
Oregon Secondary Certification #: MN200001*
Pennsylvania Certification #: 68-00563*
Puerto Rico Certification #: MN00064
South Carolina Certification #:74003001
Tennessee Certification #: TN02818
Texas Certification #: T104704192*
Utah Certification #: MN00064*
Vermont Certification #: VT-027053137
Virginia Certification #: 460163*
Washington Certification #: C486*
West Virginia DEP Certification #: 382
West Virginia DW Certification #: 9952 C
Wisconsin Certification #: 999407970
Wyoming UST Certification #: via A2LA 2926.01
USDA Permit #: P330-19-00208
*Please Note: Applicable air certifications are denoted with an asterisk (*).

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Minneapolis, MN 55414
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SAMPLE SUMMARY

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578172

Lab ID	Sample ID	Matrix	Date Collected	Date Received
10578172001	**BPSOU-UR35SS02-090821-1**	Solid	09/08/21 10:30	09/09/21 09:55
10578172002	**BPSOU-UR35SS02-090821-2**	Solid	09/08/21 10:25	09/09/21 09:55
10578172003	**BPSOU-UR35SS02-090821-2-FD**	Solid	09/08/21 10:20	09/09/21 09:55
10578172004	**BPSOU-UR35OP01-090821-3**	Solid	09/08/21 09:55	09/09/21 09:55
10578172005	**BPSOU-UR35SS03-090821-2**	Solid	09/08/21 10:05	09/09/21 09:55

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SAMPLE ANALYTE COUNT

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578172

Lab ID	Sample ID	Method	Analysts	Analytes Reported
10578172001	**BPSOU-UR35SS02-090821-1**	EPA 6010D	DM	5
		EPA 7471B	LMW	1
		ASTM D2974	JDL	1
10578172002	**BPSOU-UR35SS02-090821-2**	EPA 6010D	DM	5
		EPA 7471B	LMW	1
		ASTM D2974	JDL	1
10578172003	**BPSOU-UR35SS02-090821-2-FD**	EPA 6010D	DM	5
		EPA 7471B	LMW	1
		ASTM D2974	JDL	1
10578172004	**BPSOU-UR35OP01-090821-3**	EPA 6010D	DM	5
		EPA 7471B	LMW	1
		ASTM D2974	JDL	1
10578172005	**BPSOU-UR35SS03-090821-2**	EPA 6010D	DM	5
		EPA 7471B	LMW	1
		ASTM D2974	JDL	1

PASI-M = Pace Analytical Services - Minneapolis

Pace Analytical Services, LLC
1700 Elm Street
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(612)607-1700

PROJECT NARRATIVE

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578172

Method: **EPA 6010D**
Description: 6010D MET ICP
Client: BPAR-PIONEER-MT
Date: September 21, 2021

General Information:
5 samples were analyzed for EPA 6010D by Pace Analytical Services Minneapolis. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 3050B with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: 769643

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 10578172001

M1: Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

- MS (Lab ID: 4101094)
  - Arsenic

P6: Matrix spike recovery was outside laboratory control limits due to a parent sample concentration notably higher than the spike level.

- MS (Lab ID: 4101094)
  - Copper
  - Lead
  - Zinc
- MSD (Lab ID: 4101095)
  - Copper
  - Lead
  - Zinc

R1: RPD value was outside control limits.

- MSD (Lab ID: 4101095)
  - Arsenic

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PROJECT NARRATIVE

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578172

Method: **EPA 6010D**
Description: 6010D MET ICP
Client: BPAR-PIONEER-MT
Date: September 21, 2021

QC Batch: 769643

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 10578172001

R1: RPD value was outside control limits.

- Lead
- Zinc

Additional Comments:

Pace Analytical Services, LLC
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PROJECT NARRATIVE

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578172

Method: **EPA 7471B**
Description: 7471B Mercury
Client: BPAR-PIONEER-MT
Date: September 21, 2021

General Information:
5 samples were analyzed for EPA 7471B by Pace Analytical Services Minneapolis. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 7471B with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: 769648

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 10578172001

M1: Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

- MS (Lab ID: 4101114)
  - Mercury
- MSD (Lab ID: 4101115)
  - Mercury

Additional Comments:

Analyte Comments:

QC Batch: 769648

E: Analyte concentration exceeded the calibration range. The reported result is estimated.

- MS (Lab ID: 4101114)
  - Mercury
- MSD (Lab ID: 4101115)
  - Mercury

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
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PROJECT NARRATIVE

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578172

Method: **EPA 7471B**
Description: 7471B Mercury
Client: BPAR-PIONEER-MT
Date: September 21, 2021

This data package has been reviewed for quality and completeness and is approved for release.

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578172

Sample: BPSOU-UR35SS02-090821-1 **Lab ID: 10578172001** Collected: 09/08/21 10:30 Received: 09/09/21 09:55 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010D MET ICP	Analytical Method: EPA 6010D Preparation Method: EPA 3050B Pace Analytical Services - Minneapolis								
Arsenic	**57.0**	mg/kg	2.0	0.30	2	09/13/21 11:45	09/16/21 15:22	7440-38-2	M1,R1
Cadmium	**7.0**	mg/kg	0.30	0.067	2	09/13/21 11:45	09/16/21 15:22	7440-43-9	
Copper	**563**	mg/kg	0.98	0.14	2	09/13/21 11:45	09/16/21 15:22	7440-50-8	P6
Lead	**1100**	mg/kg	0.98	0.20	2	09/13/21 11:45	09/16/21 15:22	7439-92-1	P6,R1
Zinc	**2410**	mg/kg	3.9	0.44	2	09/13/21 11:45	09/16/21 15:22	7440-66-6	P6,R1
7471B Mercury	Analytical Method: EPA 7471B Preparation Method: EPA 7471B Pace Analytical Services - Minneapolis								
Mercury	**0.30**	mg/kg	0.020	0.0087	1	09/13/21 13:24	09/20/21 12:26	7439-97-6	M1
Dry Weight / %M by ASTM D2974	Analytical Method: ASTM D2974 Pace Analytical Services - Minneapolis								
Percent Moisture	**3.2**	%	0.10	0.10	1		09/13/21 14:33		N2

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578172

Sample: BPSOU-UR35SS02-090821-2 **Lab ID: 10578172002** Collected: 09/08/21 10:25 Received: 09/09/21 09:55 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010D MET ICP	Analytical Method: EPA 6010D Preparation Method: EPA 3050B Pace Analytical Services - Minneapolis								
Arsenic	**129**	mg/kg	2.1	0.32	2	09/13/21 11:45	09/16/21 15:34	7440-38-2	
Cadmium	**13.8**	mg/kg	0.31	0.070	2	09/13/21 11:45	09/16/21 15:34	7440-43-9	
Copper	**983**	mg/kg	1.0	0.15	2	09/13/21 11:45	09/16/21 15:34	7440-50-8	
Lead	**3760**	mg/kg	1.0	0.21	2	09/13/21 11:45	09/16/21 15:34	7439-92-1	
Zinc	**4230**	mg/kg	4.1	0.46	2	09/13/21 11:45	09/16/21 15:34	7440-66-6	
7471B Mercury	Analytical Method: EPA 7471B Preparation Method: EPA 7471B Pace Analytical Services - Minneapolis								
Mercury	**0.80**	mg/kg	0.019	0.0081	1	09/13/21 13:24	09/20/21 12:31	7439-97-6	
Dry Weight / %M by ASTM D2974	Analytical Method: ASTM D2974 Pace Analytical Services - Minneapolis								
Percent Moisture	**5.1**	%	0.10	0.10	1		09/13/21 14:33		N2

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578172

Sample: BPSOU-UR35SS02-090821-2-FD **Lab ID: 10578172003** Collected: 09/08/21 10:20 Received: 09/09/21 09:55 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010D MET ICP	Analytical Method: EPA 6010D Preparation Method: EPA 3050B Pace Analytical Services - Minneapolis								
Arsenic	**99.1**	mg/kg	2.0	0.30	2	09/13/21 11:45	09/16/21 15:35	7440-38-2	
Cadmium	**10.6**	mg/kg	0.30	0.068	2	09/13/21 11:45	09/16/21 15:35	7440-43-9	
Copper	**758**	mg/kg	0.99	0.14	2	09/13/21 11:45	09/16/21 15:35	7440-50-8	
Lead	**3960**	mg/kg	0.99	0.20	2	09/13/21 11:45	09/16/21 15:35	7439-92-1	
Zinc	**3480**	mg/kg	4.0	0.44	2	09/13/21 11:45	09/16/21 15:35	7440-66-6	
7471B Mercury	Analytical Method: EPA 7471B Preparation Method: EPA 7471B Pace Analytical Services - Minneapolis								
Mercury	**1.0**	mg/kg	0.038	0.017	2	09/13/21 13:24	09/20/21 13:00	7439-97-6	
Dry Weight / %M by ASTM D2974	Analytical Method: ASTM D2974 Pace Analytical Services - Minneapolis								
Percent Moisture	**4.7**	%	0.10	0.10	1		09/13/21 14:33		N2

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578172

Sample: BPSOU-UR35OP01-090821-3 **Lab ID: 10578172004** Collected: 09/08/21 09:55 Received: 09/09/21 09:55 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010D MET ICP	Analytical Method: EPA 6010D Preparation Method: EPA 3050B Pace Analytical Services - Minneapolis								
Arsenic	**67.0**	mg/kg	2.0	0.31	2	09/13/21 11:45	09/16/21 15:37	7440-38-2	
Cadmium	**20.0**	mg/kg	0.31	0.069	2	09/13/21 11:45	09/16/21 15:37	7440-43-9	
Copper	**449**	mg/kg	1.0	0.15	2	09/13/21 11:45	09/16/21 15:37	7440-50-8	
Lead	**5690**	mg/kg	1.0	0.21	2	09/13/21 11:45	09/16/21 15:37	7439-92-1	
Zinc	**6470**	mg/kg	20.4	2.3	10	09/13/21 11:45	09/16/21 16:02	7440-66-6	
7471B Mercury	Analytical Method: EPA 7471B Preparation Method: EPA 7471B Pace Analytical Services - Minneapolis								
Mercury	**1.0**	mg/kg	0.038	0.017	2	09/13/21 13:24	09/20/21 13:01	7439-97-6	
Dry Weight / %M by ASTM D2974	Analytical Method: ASTM D2974 Pace Analytical Services - Minneapolis								
Percent Moisture	**5.5**	%	0.10	0.10	1		09/13/21 14:33		N2

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578172

Sample: BPSOU-UR35SS03-090821-2 **Lab ID: 10578172005** Collected: 09/08/21 10:05 Received: 09/09/21 09:55 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010D MET ICP	Analytical Method: EPA 6010D Preparation Method: EPA 3050B Pace Analytical Services - Minneapolis								
Arsenic	**111**	mg/kg	10.0	1.5	10	09/13/21 11:45	09/16/21 16:04	7440-38-2	
Cadmium	**24.2**	mg/kg	1.5	0.34	10	09/13/21 11:45	09/16/21 16:04	7440-43-9	
Copper	**430**	mg/kg	5.0	0.73	10	09/13/21 11:45	09/16/21 16:04	7440-50-8	
Lead	**6090**	mg/kg	5.0	1.0	10	09/13/21 11:45	09/16/21 16:04	7439-92-1	
Zinc	**10100**	mg/kg	20.0	2.2	10	09/13/21 11:45	09/16/21 16:04	7440-66-6	
7471B Mercury	Analytical Method: EPA 7471B Preparation Method: EPA 7471B Pace Analytical Services - Minneapolis								
Mercury	**0.67**	mg/kg	0.019	0.0084	1	09/13/21 13:24	09/20/21 12:36	7439-97-6	
Dry Weight / %M by ASTM D2974	Analytical Method: ASTM D2974 Pace Analytical Services - Minneapolis								
Percent Moisture	**5.7**	%	0.10	0.10	1		09/13/21 14:33		N2

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578172

QC Batch: 769648
QC Batch Method: EPA 7471B
Analysis Method: EPA 7471B
Analysis Description: 7471B Mercury Solids
Laboratory: Pace Analytical Services - Minneapolis
Associated Lab Samples: 10578172001, 10578172002, 10578172003, 10578172004, 10578172005

METHOD BLANK: 4101112 Matrix: Solid
Associated Lab Samples: 10578172001, 10578172002, 10578172003, 10578172004, 10578172005

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Mercury	mg/kg	<0.0081	0.019	0.0081	09/20/21 12:23	

LABORATORY CONTROL SAMPLE: 4101113

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	mg/kg	0.48	0.49	102	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 4101114 4101115

Parameter	Units	10578172001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	mg/kg	0.30	0.49	0.45	0.90	0.90	123	131	80-120	0	20	E,M1

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578172

QC Batch: 769643
QC Batch Method: EPA 3050B
Analysis Method: EPA 6010D
Analysis Description: 6010D Solids
Laboratory: Pace Analytical Services - Minneapolis
Associated Lab Samples: 10578172001, 10578172002, 10578172003, 10578172004, 10578172005

METHOD BLANK: 4101092 Matrix: Solid
Associated Lab Samples: 10578172001, 10578172002, 10578172003, 10578172004, 10578172005

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Arsenic	mg/kg	<0.15	0.97	0.15	09/16/21 15:16	
Cadmium	mg/kg	<0.033	0.15	0.033	09/16/21 15:16	
Copper	mg/kg	0.21J	0.49	0.071	09/16/21 15:16	
Lead	mg/kg	<0.10	0.49	0.10	09/16/21 15:16	
Zinc	mg/kg	0.23J	1.9	0.22	09/16/21 15:16	

LABORATORY CONTROL SAMPLE: 4101093

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/kg	48.5	47.3	97	80-120	
Cadmium	mg/kg	48.5	49.4	102	80-120	
Copper	mg/kg	48.5	49.5	102	80-120	
Lead	mg/kg	48.5	48.5	100	80-120	
Zinc	mg/kg	48.5	48.6	100	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 4101094 4101095

Parameter	Units	10578172001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/kg	57.0	50.1	50.6	137	105	161	94	75-125	27	20	M1,R1
Cadmium	mg/kg	7.0	50.1	50.6	52.9	50.7	92	86	75-125	4	20	
Copper	mg/kg	563	50.1	50.6	647	591	168	56	75-125	9	20	P6
Lead	mg/kg	1100	50.1	50.6	1590	1260	976	317	75-125	23	20	P6,R1
Zinc	mg/kg	2410	50.1	50.6	2900	2250	989	-302	75-125	25	20	P6,R1

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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Minneapolis, MN 55414
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QUALITY CONTROL DATA

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578172

QC Batch: 769638
QC Batch Method: ASTM D2974
Analysis Method: ASTM D2974
Analysis Description: Dry Weight / %M by ASTM D2974
Laboratory: Pace Analytical Services - Minneapolis
Associated Lab Samples: 10578172001, 10578172002, 10578172003, 10578172004, 10578172005

SAMPLE DUPLICATE: 4101078

Parameter	Units	10578172001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	3.2	3.2	0	30	N2

SAMPLE DUPLICATE: 4101079

Parameter	Units	10578227003 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	8.7	8.4	3	30	N2

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALIFIERS

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578172

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Reported results are not rounded until the final step prior to reporting. Therefore, calculated parameters that are typically reported as "Total" may vary slightly from the sum of the reported component parameters.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

E	Analyte concentration exceeded the calibration range. The reported result is estimated.
M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
N2	The lab does not hold NELAC/TNI accreditation for this parameter but other accreditations/certifications may apply. A complete list of accreditations/certifications is available upon request.
P6	Matrix spike recovery was outside laboratory control limits due to a parent sample concentration notably higher than the spike level.
R1	RPD value was outside control limits.

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578172

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10578172001	**BPSOU-UR35SS02-090821-1**	EPA 3050B	769643	EPA 6010D	769888
10578172002	**BPSOU-UR35SS02-090821-2**	EPA 3050B	769643	EPA 6010D	769888
10578172003	**BPSOU-UR35SS02-090821-2-FD**	EPA 3050B	769643	EPA 6010D	769888
10578172004	**BPSOU-UR35OP01-090821-3**	EPA 3050B	769643	EPA 6010D	769888
10578172005	**BPSOU-UR35SS03-090821-2**	EPA 3050B	769643	EPA 6010D	769888
10578172001	**BPSOU-UR35SS02-090821-1**	EPA 7471B	769648	EPA 7471B	769999
10578172002	**BPSOU-UR35SS02-090821-2**	EPA 7471B	769648	EPA 7471B	769999
10578172003	**BPSOU-UR35SS02-090821-2-FD**	EPA 7471B	769648	EPA 7471B	769999
10578172004	**BPSOU-UR35OP01-090821-3**	EPA 7471B	769648	EPA 7471B	769999
10578172005	**BPSOU-UR35SS03-090821-2**	EPA 7471B	769648	EPA 7471B	769999
10578172001	**BPSOU-UR35SS02-090821-1**	ASTM D2974	769638		
10578172002	**BPSOU-UR35SS02-090821-2**	ASTM D2974	769638		
10578172003	**BPSOU-UR35SS02-090821-2-FD**	ASTM D2974	769638		
10578172004	**BPSOU-UR35OP01-090821-3**	ASTM D2974	769638		
10578172005	**BPSOU-UR35SS03-090821-2**	ASTM D2974	769638		

WO#: 10578172

10578172

bp rm

Laboratory Management Program (LaMP) Chain of Custody Record
Soil, Sediment and Groundwater Samples

BP Site Node Path: _____ **Req Due Date (mm/dd/yy):** 09/23/21 Rush TAT Yes 14 day No _____

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

Lab Name: Pace Analytical	BP/ARC Facility Address:	Consultant/Contractor:	Pioneer Technical Services
Lab Address: 1700 Elm Street SE, Minneapolis, MN 55414	City, State, ZIP Code:	Consultant/Contractor Project No:	BPSOU Unreclaimed Sampling
Lab PM: Jennifer Anderson	Lead Regulatory Agency:	Address:	1101 S. Montana St.
Lab Phone: 612-607-6436	California Global ID No.:	Consultant/Contractor PM:	Scott Sampson
Lab Shipping Accnt:	Enfos Proposal No:	Phone: 406-697-0946 Email:	ssampson@pioneer-technical.com
Lab Bottle Order No:	Accounting Mode: Provision ____ OOC-BU ____ OOC-RM ____	Send/Submit EDD to:	Scott Sampson
Other Info:	Stage Activity	Invoice To:	BP-RM ____ BP-Other ____

BP/RM PM: Mike Mc Anulty

PM Phone: 406-723-1822

PM Email: mcanumc@bp.com

Requested Analyses

Report Type & QC Level

Limited (Standard) Package ____

Limited Plus Package ____

Full Package Level 2

Lab No.	Unique Sample ID, must follow format of SAMPLENAMEYYYYMMDD Examples: MW01_20190101; BH01_3-5_20190101	Time	Depth Unit	Grab (G) or Composite (C)	Total Number of Containers	Matrix	Analysis	Total Metals 6010 As, Cd, Cu, Pb, Zn	7471 Mercury	Comments
	BPSOU-UR35SS02-090821-1	10:30	in	C	1	S		x	x	001
	BPSOU-UR35SS02-090821-2	10:25	in	C	1	S		x	x	002
	BPSOU-UR35SS02-090821-2-FD	10:20	in	C	1	S		x	x	No lab QA 003
	BPSOU-UR35OP01-090821-3	9:55	in	C	1	S		x	x	004
	BPSOU-UR35SS03-090821-2	10:05	in	C	1	S		x	x	005

Sampler's Name: Cole Dallaserra	Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
Sampler's Company: Pioneer Technical Services	Cole Dallaserra PTS	9/9/21	1600	[illegible]	9/9/21	955
Ship Method: FedEx Overnight 9/8/2021						
Shipment Tracking No: 4278 9935 1725						

Special Instructions: *Maximum 14 day TAT

THIS LINE - LAB USE ONLY: Custody Seals In Place: Yes / No | Temp Blank: Yes / No | Cooler Temp on Receipt: 3.7 °F/C | Trip Blank: Yes / No | MS/MSD Sample Submitted: Yes / No

BP LaMP Soil/H2O COC March 2019

Pace Analytical®	Document Name: **Sample Condition Upon Receipt (SCUR) - ESI**	Document Revised: 12Aug2020 **Page 1 of 1**
	Document No.: **ENV-FRM-MIN4-0149 Rev.01**	Pace Analytical Services - **Minneapolis**

Sample Condition Upon Receipt – ESI Tech Specs

Client Name: bp - Pioneer

Project #: WO#: 10578172

PM: JMA Due Date: 09/22/21

CLIENT: BP-PIONEER

Courier: ☒ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Pace ☐ SpeeDee ☐ Commercial

Tracking Number: 927899351725 See Exceptions ☐ ENV-FRM-MIN4-0142

Custody Seal on Cooler/Box Present? ☒ Yes ☐ No **Seals Intact?** ☒ Yes ☐ No **Biological Tissue Frozen?** ☐ Yes ☐ No ☒ N/A

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☒ None ☐ Other:_____ **Temp Blank?** ☒ Yes ☐ No

Thermometer: ☐ T1(0461) ☐ T2(1336) ☐ T3(0459) ☒ T4(0254) ☐ T5(0489) **Type of Ice:** ☒ Wet ☐ Blue ☐ None ☐ Dry ☐ Melted

Temp should be above freezing to 6°C **Cooler Temp Read w/temp blank:** 3.7 °C

Correction Factor: True **Cooler Temp Corrected w/temp blank:** 3.7 °C

Average Corrected Temp (no temp blank only): _____ °C ☐ See Exceptions ENV-FRM-MIN4-0142 ☐ 1 Container

USDA Regulated Soil: (☐ N/A, water sample/Other:_____)

Did samples originate in a quarantine zone within the United States: AL, AR, CA, FL, GA, ID, LA. MS, NC, NM, NY, OK, OR, SC, TN, TX or VA (check maps)? ☐ Yes ☒ No

Date/Initials of Person Examining Contents: MN 9-9-21

Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? ☐ Yes ☒ No

If Yes to either question, fill out a Regulated Soil Checklist (F-MN-Q-338) and include with SCUR/COC paperwork.

				COMMENTS:
Chain of Custody Present and Filled Out?	☒ Yes	☐ No		1.
Chain of Custody Relinquished?	☒ Yes	☐ No		2.
Sampler Name and/or Signature on COC?	☒ Yes	☐ No	☐ N/A	3.
Samples Arrived within Hold Time?	☒ Yes	☐ No		4.
Short Hold Time Analysis (<72 hr)?	☐ Yes	☒ No		5. ☐ Fecal Coliform ☐ HPC ☐ Total Coliform/E coli ☐ BOD/cBOD ☐ Hex Chrome ☐ Turbidity ☐ Nitrate ☐ Nitrite ☐ Orthophos ☐
Rush Turn Around Time Requested?	☐ Yes	☒ No		6.
Sufficient Sample Volume?	☒ Yes	☐ No		7.
Triple Volume Provided for MS/MSD (if more than 10 samples)?	☐ Yes	☐ No	☒ N/A	
Correct Containers Used?	☒ Yes	☐ No		8.
-Pace Containers Used?	☐ Yes	☒ No		
Containers Intact?	☒ Yes	☐ No		9.
Field Filtered Volume Received for Dissolved Tests?	☐ Yes	☐ No	☒ N/A	10. Is sediment visible in the dissolved container? ☐ Yes ☐ No
Is sufficient information available to reconcile the samples to the COC	☒ Yes	☐ No		11. **If no, write ID/ Date/Time on Container Below:** **See Exception** ☐ **ENV-FRM-MIN4-0142**
Matrix: ☐ Water ☒ Soil ☐ Oil ☐ Other_____				
All containers needing acid/base preservation have been checked?	☐ Yes	☐ No	☒ N/A	12. Sample #
All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, <2pH, NaOH >9 Sulfide, NaOH>10 Cyanide)	☐ Yes	☐ No	☒ N/A	☐ NaOH ☐ HNO_3 ☐ H_2SO_4 ☐ Zinc Acetate
Exceptions: VOA, Coliform, TOC/DOC Oil and Grease, DRO/8015 (water) and Dioxin/PFAS *If adding preservative to a container it must be added to associated field and equipment blanks (verify with PM first)	☐ Yes	☐ No	☒ N/A	Positive for Res. Chlorine? ☐ Yes ☐ No **pH Paper Lot#** **See Exception** ☐ **ENV-FRM-MIN4-0142**
				Res. Chlorine | 0-6 Roll | 0-6 Strip | 0-14 Strip
Extra labels present on soil VOA or WIDRO containers?	☐ Yes	☐ No	☒ N/A	13. **See Exception** ☐ **ENV-FRM-MIN4-0140**
Headspace in VOA Vials (greater than 6mm)?	☐ Yes	☐ No	☒ N/A	
3 Trip Blanks Present?	☐ Yes	☐ No	☒ N/A	14.
Trip Blank Custody Seals Present?	☐ Yes	☐ No	☒ N/A	Pace Trip Blank Lot # (if purchased):_____

Temp Log: Temp must be maintained at <6°C during login, record temp every 20 mins

Opened Time: 1625 Temp: 3.7	Corrected Temp: 3.7	
Time: put in cooler 1640		
Time: Temp:	Corrected Temp:	

CLIENT NOTIFICATION/RESOLUTION **Field Data Required?** ☐ Yes ☐ No

Person Contacted: Date/Time:

Comments/Resolution:

Project Manager Review: _____ **Date:** 09/10/2021

Note: Whenever there is a discrepancy affecting NC compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

Labeled by: MN 3

1700 Elm Street, Suite 200
Minneapolis, MN 55414
(612)607-1700

SAMPLE ACKNOWLEDGMENT

Samples Submitted By: BPAR-PIONEER-MT
Client Project ID: BPSOU Unreclaimed Sampling
Client PO#:

Pace Project Manager: Jennifer Anderson
Phone (612)607-6436
jennifer.anderson@pacelabs.com
Pace Analytical Project ID: 10578172
Samples Received: September 9, 2021 09:55 AM
Estimated Completion: September 22, 2021

CC: Scott Sampson

Customer Sample ID	Pace Analytical Lab ID	Matrix	Date/Time Collected	Method
BPSOU-UR35SS02-090821-1	10578172001	Solid	09/08/21 10:30	6010D MET ICP Arsenic, Cadmium, Copper, Lead, Zinc 7471B Mercury Dry Weight / %M by ASTM D2974 Environmental Impact Fee Sample Disposal
BPSOU-UR35SS02-090821-2	10578172002	Solid	09/08/21 10:25	6010D MET ICP Arsenic, Cadmium, Copper, Lead, Zinc 7471B Mercury Dry Weight / %M by ASTM D2974 Sample Disposal
BPSOU-UR35SS02-090821-2-FD	10578172003	Solid	09/08/21 10:20	6010D MET ICP Arsenic, Cadmium, Copper, Lead, Zinc 7471B Mercury Dry Weight / %M by ASTM D2974 Sample Disposal
BPSOU-UR35OP01-090821-3	10578172004	Solid	09/08/21 09:55	6010D MET ICP Arsenic, Cadmium, Copper, Lead, Zinc 7471B Mercury Dry Weight / %M by ASTM D2974 Sample Disposal
BPSOU-UR35SS03-090821-2	10578172005	Solid	09/08/21 10:05	6010D MET ICP Arsenic, Cadmium, Copper, Lead, Zinc 7471B Mercury Dry Weight / %M by ASTM D2974 Sample Disposal

Please contact your project manager if you recognize any discrepancy in this form or have any questions about your project.

Thank you for choosing Pace Analytical Services, LLC.

1700 Elm Street, Suite 200
Minneapolis, MN 55414
(612)607-1700

SAMPLE ACKNOWLEDGMENT

Analyte List

Customer Sample ID	Method	Compound	Reporting Limit	Units
BPSOU-UR35SS02-090821-1	6010D MET ICP	Arsenic	1	mg/kg
		Cadmium	0.15	mg/kg
		Copper	0.5	mg/kg
		Lead	0.5	mg/kg
		Zinc	2	mg/kg
	7471B Mercury	Mercury	0.02	mg/kg
	Dry Weight / %M by ASTM D2974	Percent Moisture	0.1	%
BPSOU-UR35SS02-090821-2	6010D MET ICP	Arsenic	1	mg/kg
		Cadmium	0.15	mg/kg
		Copper	0.5	mg/kg
		Lead	0.5	mg/kg
		Zinc	2	mg/kg
	7471B Mercury	Mercury	0.02	mg/kg
	Dry Weight / %M by ASTM D2974	Percent Moisture	0.1	%
BPSOU-UR35SS02-090821-2-FD	6010D MET ICP	Arsenic	1	mg/kg
		Cadmium	0.15	mg/kg
		Copper	0.5	mg/kg
		Lead	0.5	mg/kg
		Zinc	2	mg/kg
	7471B Mercury	Mercury	0.02	mg/kg
	Dry Weight / %M by ASTM D2974	Percent Moisture	0.1	%
BPSOU-UR35OP01-090821-3	6010D MET ICP	Arsenic	1	mg/kg
		Cadmium	0.15	mg/kg
		Copper	0.5	mg/kg
		Lead	0.5	mg/kg
		Zinc	2	mg/kg
	7471B Mercury	Mercury	0.02	mg/kg
	Dry Weight / %M by ASTM D2974	Percent Moisture	0.1	%
BPSOU-UR35SS03-090821-2	6010D MET ICP	Arsenic	1	mg/kg
		Cadmium	0.15	mg/kg
		Copper	0.5	mg/kg
		Lead	0.5	mg/kg
		Zinc	2	mg/kg
	7471B Mercury	Mercury	0.02	mg/kg
	Dry Weight / %M by ASTM D2974	Percent Moisture	0.1	%

Please contact your project manager if you recognize any discrepancy in this form or have any questions about your project.

Thank you for choosing Pace Analytical Services, LLC.

Attachment C.2 - XRF Data

XRF Sample ID	Sample Type	Field Sample ID	Analysis Date	Units	Arsenic Result	Arsenic Error	Cadmium Result	Cadmium Error	Copper Result	Copper Error	Lead Result	Lead Error	Mercury Result	Mercury Error	Zinc Result	Zinc Error
P_20210908_98052_489	NIST 2709a	NIST 2709a	9/8/2021 11:13	mg/kg	9.91	3.69	11.00	5.22	44.38	11.81	15.83	4.29	<LOD	6.43	89.49	8.89
P_20210908_98052_490	RCRA	RCRA	9/8/2021 11:17	mg/kg	489.32	18.68	504.43	11.48	19.90	10.93	474.33	18.46	<LOD	7.00	47.72	7.28
P_20210908_98052_491	USGS SdAR-M2	USGS SdAR-M2	9/8/2021 11:20	mg/kg	65.27	17.24	16.64	5.29	223.25	17.43	810.00	20.96	<LOD	7.09	728.83	22.25
P_20210908_98052_492	Natural	BPSOU-UR36OP01-090821-2	9/8/2021 11:26	mg/kg	149.22	14.67	10.61	5.33	1,145.04	36.22	395.10	16.04	<LOD	9.02	2,303.35	42.19
P_20210908_98052_493	Natural	BPSOU-UR36OP01-090821-3	9/8/2021 11:31	mg/kg	149.84	15.90	<LOD	7.67	1,118.86	35.36	507.25	17.82	<LOD	8.49	1,383.73	32.59
P_20210908_98052_494	Natural	BPSOU-UR35SS02-090821-1	9/8/2021 11:42	mg/kg	61.91	23.85	<LOD	7.72	996.15	33.85	1,409.22	29.43	<LOD	9.88	3,690.90	52.60
P_20210908_98052_495	Natural	BPSOU-UR35SS02-090821-2	9/8/2021 11:50	mg/kg	152.84	35.68	14.96	5.42	1,180.62	38.07	2,928.28	43.83	<LOD	11.05	5,025.02	63.58
P_20210908_98052_496	Field Duplicate	BPSOU-UR35SS02-090821-2-FD	9/8/2021 11:58	mg/kg	246.79	45.01	21.64	5.82	1,135.88	40.22	4,056.24	55.06	<LOD	12.69	6,180.56	75.23
P_20210908_98052_497	Natural	BPSOU-UR35SS02-090821-3	9/8/2021 12:05	mg/kg	207.68	39.20	16.82	5.65	1,306.65	42.04	3,156.28	47.85	<LOD	12.27	6,538.22	76.17
P_20210908_98052_498	Natural	BPSOU-UR35OP01-090821-1	9/8/2021 12:11	mg/kg	127.43	32.41	11.29	5.09	250.03	19.37	2,722.09	39.90	<LOD	9.52	3,706.89	51.49
P_20210908_98052_499	Natural	BPSOU-UR35OP01-090821-2	9/8/2021 12:15	mg/kg	113.89	44.42	23.11	5.63	571.82	28.71	4,506.57	55.19	<LOD	11.76	6,274.07	72.01
P_20210908_98052_500	Natural	BPSOU-UR35OP01-090821-3	9/8/2021 12:19	mg/kg	193.47	51.62	29.77	5.88	578.65	31.11	5,412.23	63.84	<LOD	16.00	13,258.80	110.32
P_20210908_98052_502	XRF Replicate	BPSOU-UR35OP01-090821-3-R	9/8/2021 12:24	mg/kg	182.08	52.81	37.89	6.07	581.18	31.64	5,495.13	65.38	<LOD	15.90	13,290.99	112.23
P_20210908_98052_503	XRF Duplicate	BPSOU-UR35OP01-090821-3-D	9/8/2021 12:28	mg/kg	185.34	52.56	33.10	5.87	652.53	32.84	5,516.16	65.07	<LOD	15.90	13,144.54	110.89
P_20210908_98052_504	SiO2	SiO2	9/8/2021 12:32	mg/kg	<LOD	2.48	13.57	4.44	<LOD	11.33	<LOD	3.17	<LOD	4.77	<LOD	5.40
P_20210908_98052_505	Natural	BPSOU-UR35SS03-090821-1	9/8/2021 12:40	mg/kg	<LOD	39.20	18.13	5.26	195.23	17.56	1,893.62	32.84	<LOD	8.65	2,604.40	42.61
P_20210908_98052_506	Natural	BPSOU-UR35SS03-090821-2	9/8/2021 12:44	mg/kg	126.35	54.20	37.47	6.50	954.51	40.24	5,464.07	67.40	<LOD	18.97	20,954.91	145.63
P_20210908_98052_507	Natural	BPSOU-UR35SS03-090821-3	9/8/2021 12:47	mg/kg	102.38	44.75	24.80	5.89	1,361.11	44.99	3,989.22	55.60	<LOD	18.07	19,346.14	135.04
P_20210908_98052_508	SiO2	SiO2	9/8/2021 12:54	mg/kg	<LOD	2.70	<LOD	6.45	<LOD	11.88	<LOD	3.44	<LOD	4.90	<LOD	5.42
P_20210908_98052_509	USGS SdAR-M2	USGS SdAR-M2	9/8/2021 12:57	mg/kg	74.54	17.33	18.44	5.41	237.81	17.88	801.22	20.97	<LOD	7.15	719.00	22.24
P_20210908_98052_510	RCRA	RCRA	9/8/2021 13:01	mg/kg	500.16	19.05	502.64	11.58	<LOD	16.00	483.23	18.80	<LOD	7.16	41.01	7.06
P_20210908_98052_511	NIST 2709a	NIST 2709a	9/8/2021 13:05	mg/kg	12.93	3.72	14.48	5.32	31.73	11.21	14.87	4.15	<LOD	6.31	86.80	8.73

Notes:

[1] XRF Sample ID is P_"Analysis Date"_"XRF Instrument Number"_"XRF Reading Number"

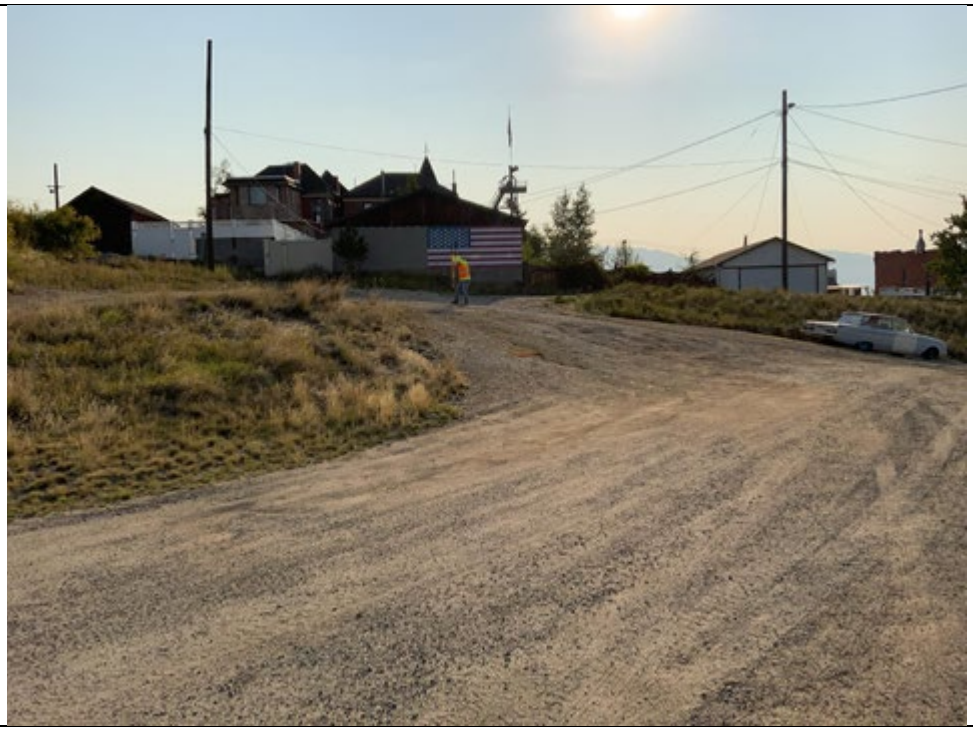
Abbreviations:

mg/kg - milligram per kilogram
SiO2 - Silicon Dioxide standard
NIST 2709a - NIST 2709a- Joaquin Soil sample
RCRA - Resource Conservation and Recovery Act Sample
<LOD - not detected (less than detection limit)

Attachment D
Electronic Data Deliverable File

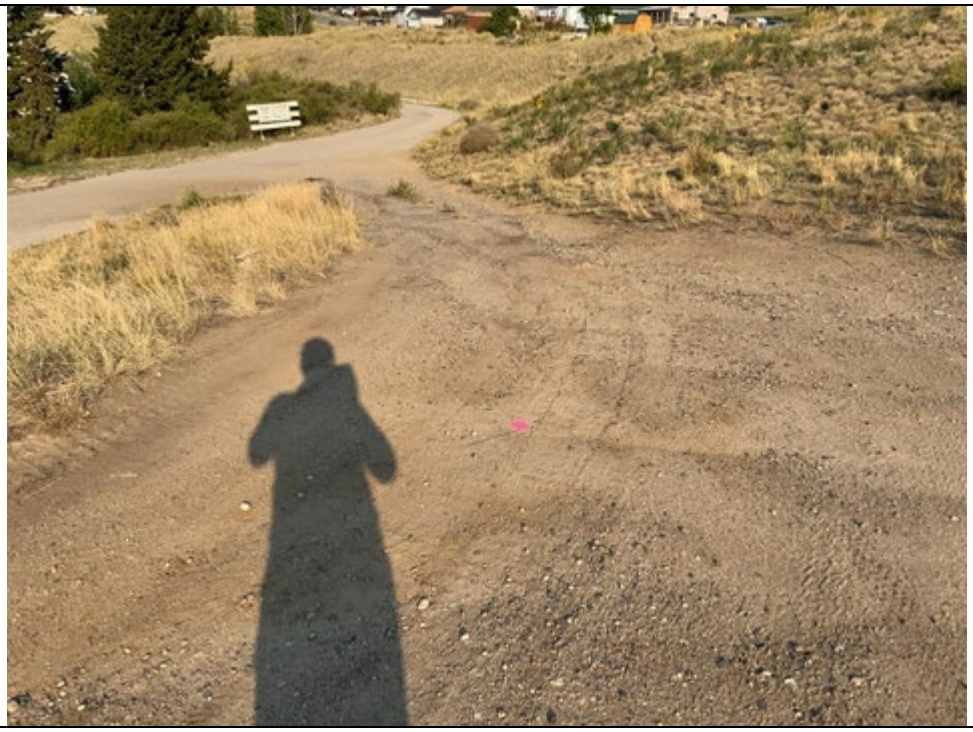
Included separately

Appendix B
Site Photographs



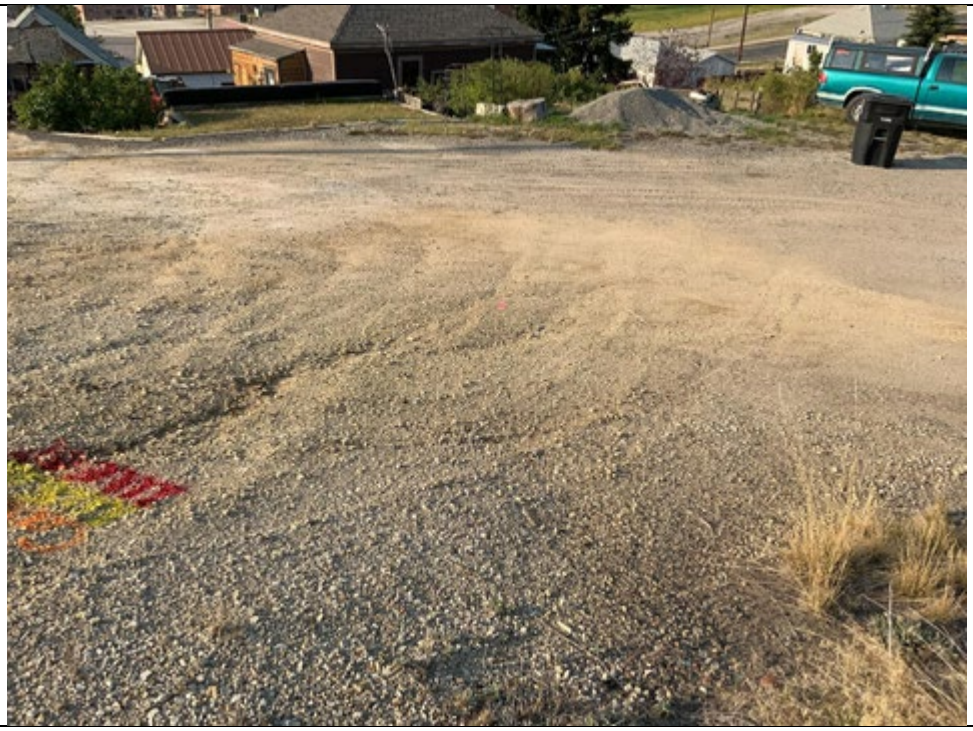
Atlantic Richfield Company

PhotoNumber: UR35-1	Photographer: JLS
Date: 09/08/2021 09:07	Photo Direction: North
Description: General area.	
Project: BPSOU Unreclaimed and Insufficiently Reclaimed Sites 2021	



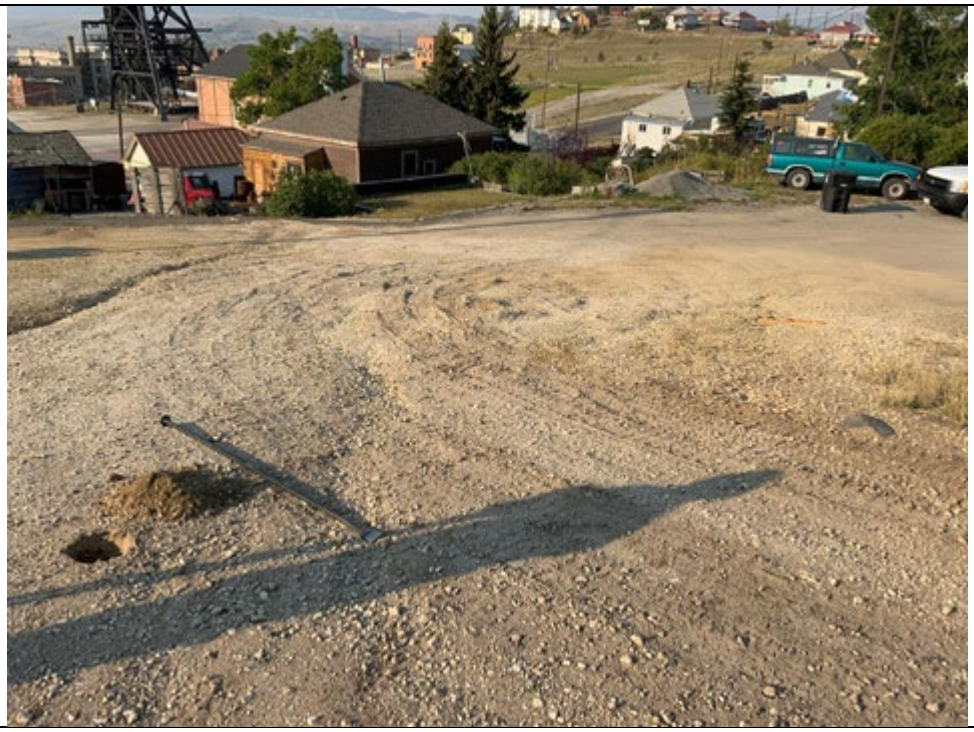
Atlantic Richfield Company

PhotoNumber: UR35-2	Photographer: JLS
Date: 09/08/2021	Photo Direction: South
Description: SS02 has active motor vehicle impact. Ground is being disturbed and conveyed throughout the site.	
Project: BPSOU Unreclaimed and Insufficiently Reclaimed Sites 2021	



Atlantic Richfield Company

PhotoNumber: UR35-3	Photographer: JLS
Date: 09/08/2021	Photo Direction: South East
Description: SS03 has different colors of material. Active erosion is depositing where sub locations are located.	
Project: BPSOU Unreclaimed and Insufficiently Reclaimed Sites 2021	



Atlantic Richfield Company

PhotoNumber: UR35-4	Photographer: JLS
Date: 09/08/2021	Photo Direction: South East
Description: OP01 was determined to be collected due to lack of access on North area. Some sub locations contain different colored material and active erosion and motor vehicle disturbance.	
Project: BPSOU Unreclaimed and Insufficiently Reclaimed Sites 2021	

Atlantic Richfield Company	PhotoNumber: UR35-5	Photographer: JLS
	Date: 09/08/2021	Photo Direction: North West
	Description: Master locates.	
	Project: BPSOU Unreclaimed and Insufficiently Reclaimed Sites 2021	