Summer 6-6-2022

Draft Final 2021 Unreclaimed Sites Sampling UR-33 Site Evaluation Summary Report

Pioneer Technical Services, Inc.

Atlantic Richfield Company

317 Anaconda Road
Butte MT 59701

Mike Mc Anulty
Liability Manager

Direct (406) 782-9964
Fax (406) 782-9980

June 6, 2022

Nikia Greene
Remedial Project Manager
US EPA – Montana Office
Baucus Federal Building
10 West 15th Street, Suite 3200
Helena, Montana 59626

Erin Agee
Senior Assistant Regional Counsel
US EPA Region 8 Office of Regional Counsel
CERCLA Enforcement Section
1595 Wynkoop Street
Denver, CO 80202
Mail Code: 8ORC-C

Daryl Reed
DEQ Project Officer
P.O. Box 200901
Helena, Montana 59620-0901

Jonathan Morgan, Esq.
DEQ, Legal Counsel
P.O. Box 200901
Helena, Montana 59620-0901

RE: Butte Priority Soils Operable Unit (BPSOU) 2021 Unreclaimed Sites Sampling UR-33 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-33 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/EqRiR6mhhfBOsb7RM4U5uJEBga5K5vGmnf_Z9R41ieIVQA.

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

Sincerely,

Mike McAnulty

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

Atlantic Richfield Company

317 Anaconda Road
Butte MT 59701
Direct (406) 782-9964
Fax (406) 782-9980

Cc: Patricia Gallery / Atlantic Richfield - email
Chris Greco / Atlantic Richfield – email
Josh Bryson / Atlantic Richfield - email
Mike Mc Anulty / Atlantic Richfield - email
Loren Burmeister / Atlantic Richfield – email
Dave Griffis / Atlantic Richfield - email
Jean Martin / Atlantic Richfield - email
Irene Montero / Atlantic Richfield - email
David A. Gratson / Environmental Standards / email
Mave Gasaway / DGS - email
Brianne McClafferty / Holland & Hart - email
Joe Vranka / EPA - email
David Shanight / CDM - email
Curt Coover / CDM - email
James Freeman / DOJ - email
John Sither / DOJ - email
Dave Bowers / DEQ - email
Carolina Balliew / DEQ - email
Matthew Dorrington / DEQ - email
Jim Ford / NRDP - email
Pat Cunneen / NRDP - email
Harley Harris / NRDP - email
Katherine Hausrath / NRDP - email
Meranda Flugge / NRDP - email
Ted Duaime / MBMG - email
Gary Icopini / MBMG - email
Becky Summerville / MR - email
Kristen Stevens / UP - email
Robert Bylsma / UP - email
John Gilmour / Kelley Drye - email
Leo Berry / BNSF - email
Robert Lowry / BNSF - email
Brooke Kuhl / BNSF – email
Mark Engdahl / BNSF - email
Jeremie Maehr / Kennedy Jenks - email
Annika Silverman / Kennedy Jenks - email
Matthew Mavrinac / RARUS - email
Harrison Roughton / RARUS - email
Brad Gordon / RARUS - email
Mark Neary / BSB - email
Eric Hassler / BSB - email
Julia Crain / BSB - email

Atlantic Richfield Company

317 Anaconda Road
Butte MT 59701
Direct (406) 782-9964
Fax (406) 782-9980

Chad Anderson / BSB - email
Brandon Warner / BSB – email
Abigail Peltomaa / BSB - email
Eileen Joyce / BSB – email
Sean Peterson/BSB – email
Gordon Hart / BSB – email
Jeremy Grotbo / BSB – email
Karen Maloughney / BSB – email
Josh Vincent / WET - email
Craig Deeney / TREC - email
Scott Bradshaw / TREC - email
Brad Archibald / Pioneer - email
Pat Sampson / Pioneer - email
Joe McElroy / Pioneer – email
Andy Dare / Pioneer – email
Karen Helfrich / Pioneer - email
Leesla Jonart / Pioneer - email
Randa Colling / Pioneer – email
Ian Magruder/ CTEC- email
CTEC of Butte – email
Scott Juskiewicz / Montana Tech – email

File: MiningSharePoint@bp.com - email
BPSOU SharePoint - upload

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

Draft Final

2021 Unreclaimed Sites Sampling UR-33
Site Evaluation Summary Report

Atlantic Richfield Company

2022

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

Draft Final

2021 Unreclaimed Sites Sampling UR-33
Site Evaluation Summary Report

Prepared for:

Atlantic Richfield Company
317 Anaconda Road
Butte, Montana 59701

Prepared by:

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

2022

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ABBREVIATIONS AND ACRONYMS

Acronym	Definition	Acronym	Definition
BPSOU	Butte Priority Soils Operable Unit	**QA**	Quality Assurance
BTL	Butte Treatment Lagoons	**QAPP**	Quality Assurance Project Plan
CB	Catch Basin	**QC**	Quality Control
CD	Consent Decree	**SBC**	Silver Bow Creek
DSR	Data Summary Report	**SD**	Settling Defendants
FRESOW	Further Remedial Elements Scope of Work	**UR**	Unreclaimed
HCC	Hydraulic Control Channel	**XRF**	X-ray Fluorescence
I-115	Interstate 115		

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 9, 2021, at the UR source area UR-33 within the BPSOU (referred to herein as UR-33 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 *UR Sites Quality Assurance Project Plan* (QAPP) (Atlantic Richfield Company, 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 BPSOU will be addressed through a combination of source removal, capping, and/or land reclamation as appropriate to meet the Butte Hill Revegetation Specifications (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-33 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-33 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 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-33 is approximately 1.3 acres and is located south of the Interstate 15/90 Business Loop (West Iron Street) and west and north of South Excelsior Avenue as Excelsior curves to the west (Figure 1). The Site is owned by MDT and is vacant right-of-way land designated as open space.

Site UR-33 is near the bottom of the Missoula Gulch drainage but does not appear to drain directly into Catch Basin 8, though most of the Site slopes moderately to the south. There is a low ridge near the north edge of the Site that runs parallel to Iron Street. Thus, a small portion of the Site drains northward to the ditch along the south edge of Iron Street. There is a fence in the

southeast portion of the Site that parallels Excelsior Avenue. The remainder of the Site is not fenced.

3.0 SITE EVALUATION

The Site was evaluated following the Unreclaimed Area Logic Diagram (Appendix A.3 of the QAPP) to determine if reclamation is warranted. The 2021 Site investigation was completed on September 9, 2021. Sampling activities were performed according to specified standard operating procedures 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. Photographs of the sampling events are in Appendix B.

3.1 Data Summary

A total of 5 sample stations were sampled in the 2021 sampling event 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 15 collected soil samples, 2 were submitted to Pace Analytical 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. 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 new data and describes the following findings of the 2021 investigation:

- There were no parameters that exceeded human health standards.

3.3 Screening Criteria for Storm Water

Table 2 lists the new data and describes the following findings of the 2021 investigation:

- There were no parameters that exceeded the screening criteria for storm water.

No samples collected in 2021 exceeded 3 of the 6 contaminant screening level criteria listed in Table 1. No samples exceeded 5,000 milligrams per kilogram; therefore, it is recommended the Site not be further analyzed to determine the materiality of the load to the degradation of surface water.

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 linkage to surface water features (Figure 2).

Presence of Rills:
Rills have not been documented at the UR-33 Site. There is potential for rills in the northern portion of the Site where erosion and storm water from Interstate 115 (I-115) has created bare patches of soil. Bare patches of soil also exist throughout the entire Site due to erosion. There are established grasses and weeds stabilizing most of the slopes. The Site has good to moderate vegetation and slopes appear to be stable.

Concentrated Outflow:
It appears most of the storm water and sediment infiltrate to the ground at the UR-33 Site. The Site slopes northwest to southeast toward the ditch along the north side of South Excelsior Avenue. This open ditch appears to capture and infiltrate water before crossing South Excelsior Avenue. Any storm water or sediment from the Site that is able to cross South Excelsior Avenue is captured by the West Side Drainage and does not report to SBC.

Evaluate Metals-Impacted Sediment in Downstream Infrastructure:
No metals-impacted sediment was encountered at the UR-33 Site.

Evaluate Contributing Sediment Loading Above the Site:
The only sediment loading contributed by Sites upslope of the UR-33 Site appears to be the I-115 roadway. This sediment appears to settle on the northern portion of the Site or flow west down I-115.

Direct Linkage to Surface Water Features:
The UR-33 Site has an incomplete pathway to SBC. The UR-33 Site exhibits a potentially complete pathway to the Hydraulic Control Channel (HCC) at the Butte Treatment Lagoons (BTL) in Lower Area One via the West Side Drainage primarily via surface flow (Figure 2).

4.0 DECLARATION CONCLUSION

The Site does not exceed human health action levels or screening criteria for storm water. The sedimentation analysis (Section 3.4) indicates:

- No documentation of rills or soil loss from the Site.
- No evidence of current metals-impacted sediment within the UR Site boundary.
- Existing downstream infrastructure at Catch Basin (CB)-8 and CB-9 captures surface water and is designed to retain sediment migration from Missoula Gulch drainage mitigating potential surface water degradation.

The Site does not exhibit a completed pathway to SBC and discharges to the HCC at BTL through the West Side Drainage. Based on the criteria identified in the QAPP and established qualifying data, further actions are not warranted.

5.0 REFERENCES

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

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

UR-33-SS-04

~ 1.33 Ac.

UR-33-SS-05

UR-33-SS-03

UR-33-SS-01

UR-33-SS-02

S EXCELSIOR AVE

Site UR-33
Shallow bedrock south of an imported berm.
Very sandy soils with 3/4inch rock mix in areas of the site.

LEGEND

- NO EXCEEDANCE
- UNRECLAIMED SITE BOUNDARY

N

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

0 25 50 100
Feet

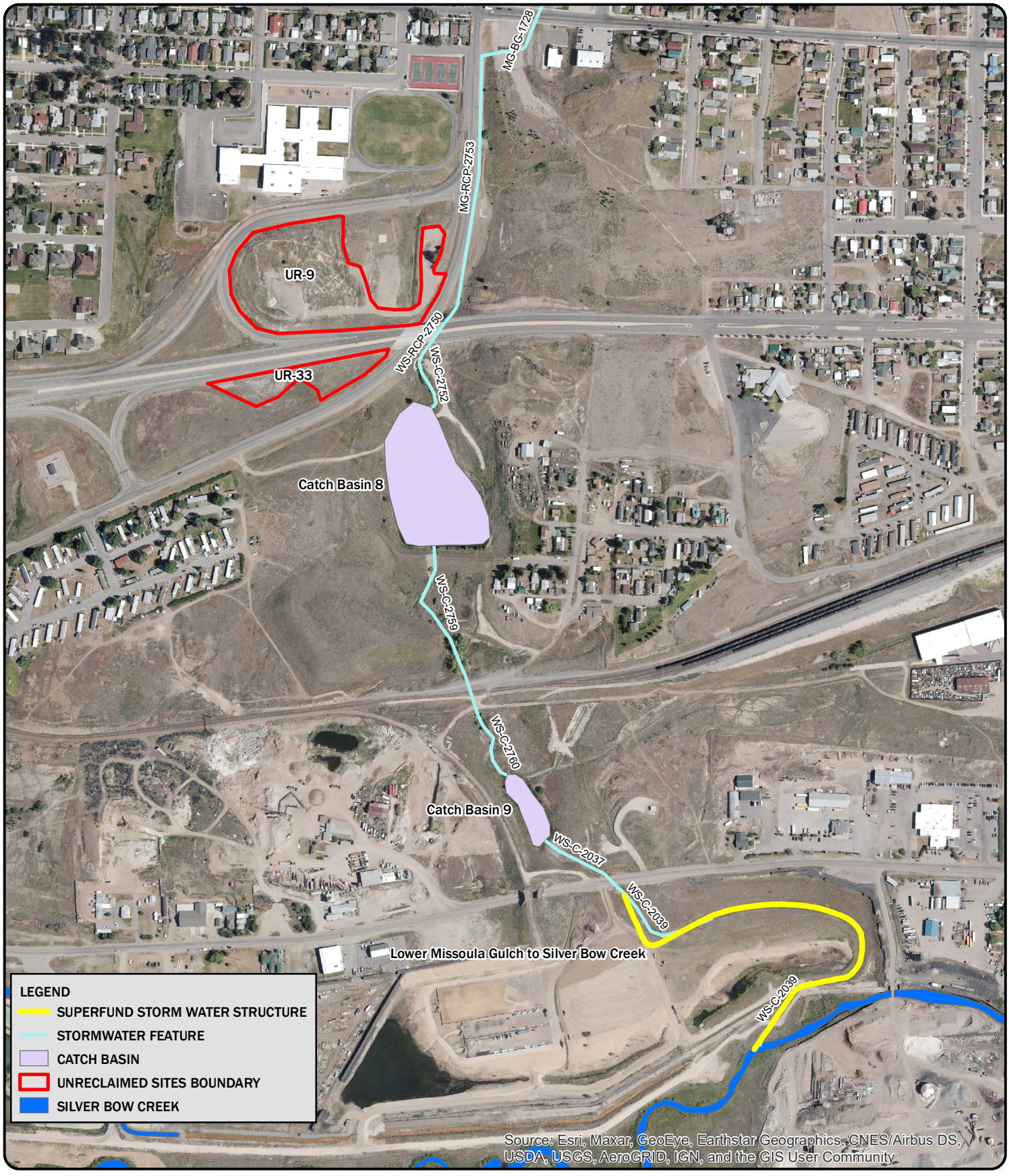
FIGURE 1

PIONEER TECHNICAL SERVICES, INC.

DATE: 3/2/2022

UR-33
2021 UR SITES
SAMPLING AND
EXCEEDANCES

Path: Z:\Shared\Active Projects\ARCO\BPSOU\LandSupport\SolidMedia\Insufficiently_Unreclaimed\SamplingResults\UR_Sampling\UR_Res_UR33_22.mxd



N

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

0 250 500 1,000
Feet

FIGURE 2

PIONEER TECHNICAL SERVICES, INC.

Unreclaimed Sites
UR-33
Storm Water Features

DATE: 2/22/2022

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

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
Mercury1	Residential	147 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: 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-33-SS-01	BPSOU-UR33SS01-090921-1	XRF	64.71	12.06	97.64	60.89	6.42 UJ	176.24					
UR-33-SS-01	BPSOU-UR33SS01-090921-2	XRF	45.57	7.44 U	86.96	90.41	7.23 UJ	314.54					
UR-33-SS-01	BPSOU-UR33SS01-090921-3	XRF	42.26	7.33 U	86.59	176.55	6.96 UJ	468.61					
UR-33-SS-02	BPSOU-UR33SS02-090921-1	XRF	47.03	7.38 U	170.53	114.39	6.70 UJ	350.62					
UR-33-SS-02	BPSOU-UR33SS02-090921-2	XRF	39.01	7.51 U	74.71	142.86	6.80 UJ	296.65					
UR-33-SS-02	BPSOU-UR33SS02-090921-3	XRF	46.72	7.83 U	78.84	168.38	7.33 UJ	526.43					
UR-33-SS-03	BPSOU-UR33SS03-090921-1	XRF	9.74	7.09 U	77.65	32.36	5.74 UJ	130.14					
UR-33-SS-03	BPSOU-UR33SS03-090921-2	Lab	1.20	0.11 A	4.80	7.10	0.009 U	51.80					
UR-33-SS-03	BPSOU-UR33SS03-090921-3	XRF	6.58	6.75 U	14.06	14.89	5.41 UJ	72.63					
UR-33-SS-04	BPSOU-UR33SS04-090921-1	XRF	70.37	7.65 U	74.12	46.37	6.73 UJ	410.61					
UR-33-SS-04	BPSOU-UR33SS04-090921-2	XRF	23.60	7.66 U	41.18	15.86	7.10 UJ	375.13					
UR-33-SS-04	BPSOU-UR33SS04-090921-3	XRF	27.74	10.98	30.47	19.71	6.91 UJ	341.71					
UR-33-SS-05	BPSOU-UR33SS05-090921-1	XRF	11.85	9.14	51.13	35.39	6.22 UJ	200.86					
UR-33-SS-05	BPSOU-UR33SS05-090921-2	XRF	8.96	7.03 U	23.74	18.47	5.79 UJ	153.67					
UR-33-SS-05	BPSOU-UR33SS05-090921-3	Lab	6.40	0.73	15.50	4.00	0.009 U	121.00					

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

Draft Final

2021 Unreclaimed Sites Sampling
UR-33 Data Summary Report (DSR)

Atlantic Richfield Company

June 2022

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

Draft Final

2021 Unreclaimed Sites Sampling
UR-33 Data Summary Report (DSR)

Prepared for:

Atlantic Richfield Company
317 Anaconda Road
Butte, Montana 59701

Prepared by:

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

June 2022

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ABBREVIATIONS AND ACRONYMS

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

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 9, 2021, at the UR source area UR-33 within the BPSOU.

For the event, 5 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; 2 soil samples of the 15 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
317 Anaconda Road
Butte, Montana 59701

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.

Approved by: _____ _____
Mike Mc Anulty — Date
Liability Manager
Atlantic Richfield Company

Approved by: _____ _____
Nikia Greene — Date
Remedial Project Manager
U.S. Environmental Protection Agency
Region VIII

Approved by: _____ _____
Daryl Reed — Date
State Project Officer
Montana Department of Environmental Quality

Approved by: _____ _____
Scott Sampson — Date
Project Manager
Pioneer Technical Services, Inc.

EXECUTIVE SUMMARY

This BPSOU UR Sites DSR presents the results of the subsurface soil sampling conducted on September 9, 2021, at the UR source area UR-33 within the BPSOU.

Sampling was conducted under the guidelines of the BPSOU UR Sites *Final UR Sites QAPP* (Atlantic Richfield Company, 2021a) (referred to herein as QAPP) and *Final Field Sampling Plan (FSP) Package #5: UR-12, UR-13, UR-33, and UR-38* (Atlantic Richfield Company, 2021b) (referred to herein as FSP). 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 5 sample stations (Figure 1). Each sample station was determined based on preliminary Site investigations and Agency approval.

In total, 5 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; 2 soil samples of the 15 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 9, 2021, at the UR source area UR-33 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). 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, MT.

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 identified in Table 1 and listed below, following the FSP.

Station Field Identification	Sample Identification
UR-33-SS-01	BPSOU-UR33SS01-090921-X
UR-33-SS-02	BPSOU-UR33SS02-090921-X
UR-33-SS-03	BPSOU-UR33SS03-090921-X
UR-33-SS-04	BPSOU-UR33SS04-090921-X
UR-33-SS-05	BPSOU-UR33SS05-090921-X

*X indicates sample depth interval.

Samples collected were analyzed by XRF. A subset of the samples was sent to Pace for laboratory analyses as listed in Section 3.1.4, Table 5 of the QAPP. The data verification and data 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 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 data 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 (DQA) (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-33 Site was assessed per the QAPP.

This DSR describes the activities conducted for soil sampling and characterization at the UR-33 Site. Supplemental information provided in the FSP (Atlantic Richfield Company, 2021b) described 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-33 is approximately 1.3 acres and is located south of the Interstate 15/90 Business Loop (West Iron Street) and west and north of South Excelsior Avenue as Excelsior curves to the west (Figure 1). The Site is owned by Montana Department of Transportation and is vacant right-of-way land designated as open space. Site UR-33 is near the bottom of the Missoula Gulch drainage but does not appear to drain directly into Catch Basin 8, though most of the Site slopes moderately to the south. There is a low ridge near the north edge of the Site that runs parallel to Iron Street. Thus, a small portion of the Site drains northward to the ditch along the south edge of Iron Street. There is a fence in the southeast portion of the Site that parallels Excelsior Avenue. The remainder of Site is not fenced.

2.0 DATA QUALITY OBJECTIVES AND ASSESSMENT

The objective of the 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 data 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. The analytical laboratories performed the sample analyses using industry-standard methods. 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 data validation checklists are included in the DVR (Attachment A); all data met the Level A and Level B criteria.

Data generated from the samples collected 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 15 natural soil samples were collected. All samples were analyzed by XRF, and 2 samples were sent to Pace for laboratory analysis. This resulted in a total of 90 natural data points generated by the XRF analyses and 14 natural data points generated by the laboratory analysis. Of the points, 16 (18%) XRF natural data points were designated screening quality, and 74 (82%) XRF natural data points were designated as enforcement quality. For the laboratory natural data points, 0 (0%) were designated screening quality, and 14 (100%) 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 15 of the 16 (94%) screening quality XRF data points were qualifications made to the mercury results due to the lack of a calibration check sample (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 3 combination samples (9 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 12-inch 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 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. Soil pH results are included in Attachment B. 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 contaminants of concern 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, mercury, zinc, and percent moisture.

4.0 DEVIATIONS

During the sampling event, there were no deviations to the QAPP or FSP.

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. Final Unreclaimed Sites Quality Assurance Project Plan. June 2021.

Atlantic Richfield Company, 2021b. BPSOU Unreclaimed Sites Draft Final Field Sampling Plan Package #5. August 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, 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. (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, January 2017.

Figures

Figure 1. Unreclaimed Sites UR-33 Sample Stations

LEGEND

- 2021 SAMPLED STATIONS
- PROPOSED SAMPLE STATIONS
- UNRECLAIMED SITE

N

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

0 40 80 160
Feet

FIGURE 1

PIONEER TECHNICAL SERVICES, INC.

Unreclaimed Sites
UR-33
2021 Sample Stations

DATE: 3/28/2022

Path: Z:\Shared\Active Projects\ARCO\BPSOU\LandSupport\SolidMedia\Insufficiently_Unreclaimed\UR_Sampling\Unreclaimed_Samplelocations_UR33.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-33-SS-01	BPSOU-UR33SS01-090921-X	654229.481	1193155.468
UR-33-SS-02	BPSOU-UR33SS02-090921-X	654186.078	1193310.849
UR-33-SS-03	BPSOU-UR33SS03-090921-X	654240.332	1193374.651
UR-33-SS-04	BPSOU-UR33SS04-090921-X	654273.613	1193574.13
UR-33-SS-05	BPSOU-UR33SS05-090921-X	654246.391	1193288.454

*Datum used is NAD83

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-33
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-33
Data Validation Report

Prepared for:

Atlantic Richfield Company
317 Anaconda Road
Butte, Montana 59701

Prepared by:

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

June 2022

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ACRONYMS AND ABBREVIATIONS

ACRONYM	DEFINITION	ACRONYM	DEFINITION
%R	Percent Recovery	**MDL**	Method Detection Limit
BPSOU	Butte Priority Soils Operable Unit	**mg/kg**	milligram per kilogram
CCS	Calibration Check Sample	**NFG**	National Functional Guidelines
CFRSSI	Clark Fork River Superfund Site Investigation	**Pace**	Pace Analytical Services, LLC.
COC	Contaminants of Concern	**Pioneer**	Pioneer Technical Services, Inc.
DM/DV	Data Management/Data Validation	**QA**	Quality Assurance
DVR	Data Validation Report	**QAPP**	Quality Assurance Project Plan
EPA	Environmental Protection Agency	**QC**	Quality Control
FSP	Field Sampling Plan	**RL**	Reporting Limit
LCS	Laboratory Control Sample	**RPD**	Relative Percent Difference
LCSD	Laboratory Control Sample Duplicate	**SiO_2**	Silicon Dioxide
LMS	Laboratory Matrix Spike	**SOP**	Standard Operating Procedure
LMSD	Laboratory Matrix Spike Duplicate	**UR**	Unreclaimed
MB	Method Blank	**XRF**	X-Ray Fluorescence

DOCUMENT MODIFICATION SUMMARY

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Rev 0	Sara Ward	Draft	Issued for Internal Review	3/22/2022
Rev 1	Sara Ward	Draft Final	Issued for Agency Review	6/06/2022

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-33 Site (referred to as Site). The samples were collected per the *Butte Priority Soils Operable Unit (BPSOU) Unreclaimed Sites - Final Field Sampling Plan (FSP) Package #5: UR-12, UR-13, UR-33, and UR-38* (Atlantic Richfield Company, 2021a) (referred to herein as the FSP). The 2021 UR-33 sampling event included samples collected under the 2021 *Unreclaimed Sites Quality Assurance Project Plan* (QAPP) (Atlantic Richfield Company, 2021b) (referred to herein as the QAPP).

All data have undergone a Stage 2A data validation (DV) as defined in the U.S. Environmental Protection Agency (EPA) *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (EPA, 2009). The DV 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 NFG 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; DV qualifiers; enforcement, screening, and rejected classifications; and DV reason codes.
- Table A2 contains the field duplicate pair samples with results, laboratory qualifiers, DV qualifiers, DV 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; DV qualifiers; enforcement, screening, and rejected classification codes; and DV 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 DV 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 DV process.

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

All data met the Level A and B criteria. Based on the DV 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 DV 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 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 DV 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 DV process were considered "screening" quality data and assigned an "S" in Table A1.

Data rejected during DV 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 DV procedures as the natural samples and the results are included on the DV 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 15 natural soil samples were collected. All samples were analyzed in the field by XRF, and 2 samples were sent to Pace for laboratory analysis of metals. This resulted in a total of 90 natural data points generated by the XRF analyses and 14 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	15	90	74 (82%)	16 (18%)	0 (0%)
Pace	2	14	14 (100%)	0 (0%)	0 (0%)

Please note that 15 of the 16 (94%) 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, DV 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 DV 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.

The DV 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 DV 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 DV Checklist for Metals Analysis by Inductively Coupled Plasma or Graphite Furnace Atomic Absorption Spectrometry 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 DV Checklist for Field QC was not filled out for each data package. Sections on field duplicates were added to each Laboratory DV Checklist worksheet.

The relevant DV checklists were completed for each sample delivery group and included the DV 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 DV 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 DV 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 2 natural samples submitted to Pace for analysis (50%); 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 15 natural XRF samples collected at the Site, 1 field duplicate sample (6.7%) was analyzed; therefore, the collection frequency requirement for field duplicates (5%) was met.

The QC criteria used to assess field duplicate pair results during DV 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 DV 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 DV 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: NIST 2709a-Joaquin Soil (NIST 2709a) sample and a Resource Conservation and Recovery Act 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, once 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 for mercury. Therefore, all detected mercury results have been qualified "J" and all non-detected mercury results have been qualified "UJ." This resulted in 15 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 15 natural XRF samples collected at the Site, 1 duplicate sample (6.7%) and 1 replicate sample (6.7%) 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 DV to evaluate the applicable laboratory QC samples are listed in Attachment 3 and Section 3.6 of the QAPP.

The Stage 2A DV 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.
- Laboratory Matrix Spike (LMS) and 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 DV 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 DV 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 was 1 instance where the field duplicate pair results did not meet the control limit. There were no qualifications made to the natural data points because the XRF duplicate or XRF replicate pair results did not meet the control limit. This resulted in qualification of 1 natural data point due to XRF precision.

The natural sample qualified for poor field duplicate precision (DV Reason Code = FD) is listed below:

Field Sample ID	Method	Analyte	DV Qualifier	DV Reason Code
BPSOU-UR33SS05-090921-3	XRF	Copper	J	FD

This resulted in 1 (1%) of the 90 natural XRF data points that did not meet the precision requirements, and 89 (99%) of the 90 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 no qualifications made due to laboratory duplicate or field duplicate precision.

For the laboratory results, 14 (100%) of the 14 natural laboratory data points 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, 90 (100%) of the 90 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 DV 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, there were no qualifications made due to indicators of accuracy.

For the laboratory results, 14 (100%) of the 14 natural laboratory data points 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 DV 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 includes 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 5 sample locations during the 2021 Site sampling event as specified in the FSP. All samples that were outlined in the FSP were collected for the Site. The completeness for XRF data based on sample collection was 100% and the completeness goal was met.

In total, 90 XRF data points were generated. All data points are considered usable because no results were rejected. The 15 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 per 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, 2 of the 15 natural samples collected and analyzed by XRF were sent to Pace for analysis (13%). All natural samples collected with XRF results requiring confirmation were sent to Pace for analysis. The frequency requirement 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, 14 natural laboratory data points were generated by the sampling event. The 2 laboratory samples collected were analyzed for arsenic, cadmium, copper, lead, mercury, zinc, and percent moisture. All the natural data points were usable as 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 limit of detection 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 in 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-UR33SS01-090921-2	XRF	Mercury	mg/kg	<7.23
BPSOU-UR33SS01-090921-3	XRF	Mercury	mg/kg	<6.96
BPSOU-UR33SS02-090921-1	XRF	Mercury	mg/kg	<6.7
BPSOU-UR33SS02-090921-2	XRF	Mercury	mg/kg	<6.8
BPSOU-UR33SS02-090921-3	XRF	Mercury	mg/kg	<7.33
BPSOU-UR33SS04-090921-1	XRF	Mercury	mg/kg	<6.73
BPSOU-UR33SS04-090921-2	XRF	Mercury	mg/kg	<7.1
BPSOU-UR33SS04-090921-3	XRF	Mercury	mg/kg	<6.91

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

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

4.6.2 Laboratory Sensitivity

The non-detected laboratory results from Pace were reported as less than the adjusted MDLs for each sample.

To evaluate sensitivity, the proposed MDLs and RLs listed in Table 3 of the QAPP for arsenic, cadmium, copper, lead, zinc, and mercury were compared to the adjusted MDL for non-detected results.

The adjusted MDL for the non-detected laboratory results were less than proposed MDLs in the QAPP.

4.7 Overall Data Summary

The following list shows an overall summary of the DV 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	15	90	B	16	0	0	74 (82%)	16 (18%)	0 (0%)
Pace	2	14	B	0	0	1	14 (100%)	0 (0%)	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-33-SS-01(0-2)					UR-33-SS-01(2-6)					UR-33-SS-01(6-12)					UR-33-SS-02(0-2)					UR-33-SS-02(2-6)					UR-33-SS-02(6-12)					UR-33-SS-03(0-2)				
Field Sample ID			BPSOU-UR33SS01-090921-1					BPSOU-UR33SS01-090921-2					BPSOU-UR33SS01-090921-3					BPSOU-UR33SS02-090921-1					BPSOU-UR33SS02-090921-2					BPSOU-UR33SS02-090921-3					BPSOU-UR33SS03-090921-1				
Lab Sample ID			N/A					N/A					N/A					N/A					N/A					N/A					N/A				
Sample Date			9/9/2021					9/9/2021					9/9/2021					9/9/2021					9/9/2021					9/9/2021					9/9/2021				
Sample Type			Natural					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	Result	Lab Qual	DV Qual	S/E	Reason Code
XRF	Arsenic	mg/kg	64.71			E		45.57			E		42.26			E		47.03			E		39.01			E		46.72			E		9.74			E	
XRF	Cadmium	mg/kg	12.06			E		<7.44	<LOD		E		<7.33	<LOD		E		<7.38	<LOD		E		<7.51	<LOD		E		<7.83	<LOD		E		<7.09	<LOD		E	
XRF	Copper	mg/kg	97.64			E		86.96			E		86.59			E		170.53			E		74.71			E		78.84			E		77.65			E	
XRF	Lead	mg/kg	60.89			E		90.41			E		176.55			E		114.39			E		142.86			E		168.38			E		32.36			E	
XRF	Mercury	mg/kg	<6.42	<LOD	UJ	S	CX	<7.23	<LOD	UJ	S	CX	<6.96	<LOD	UJ	S	CX	<6.7	<LOD	UJ	S	CX	<6.8	<LOD	UJ	S	CX	<7.33	<LOD	UJ	S	CX	<5.74	<LOD	UJ	S	CX
XRF	Zinc	mg/kg	176.24			E		314.54			E		468.61			E		350.62			E		296.65			E		526.43			E		130.14			E	
ASTM D2974	Moisture, Percent	%																																			
SW-846 6010D	Arsenic	mg/kg																																			
SW-846 6010D	Cadmium	mg/kg																																			
SW-846 6010D	Copper	mg/kg																																			
SW-846 6010D	Lead	mg/kg																																			
SW-846 6010D	Zinc	mg/kg																																			
SW-846 7471B	Mercury	mg/kg																																			

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-33-SS-03(2-6)					UR-33-SS-03(6-12)					UR-33-SS-04(0-2)					UR-33-SS-04(2-6)					UR-33-SS-04(6-12)					UR-33-SS-05(0-2)					UR-33-SS-05(2-6)				
Field Sample ID			BPSOU-UR33SS03-090921-2					BPSOU-UR33SS03-090921-3					BPSOU-UR33SS04-090921-1					BPSOU-UR33SS04-090921-2					BPSOU-UR33SS04-090921-3					BPSOU-UR33SS05-090921-1					BPSOU-UR33SS05-090921-2				
Lab Sample ID			10578891001					N/A					N/A					N/A					N/A					N/A					N/A				
Sample Date			9/9/2021					9/9/2021					9/9/2021					9/9/2021					9/9/2021					9/9/2021					9/9/2021				
Sample Type			Natural					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	Result	Lab Qual	DV Qual	S/E	Reason Code
XRF	Arsenic	mg/kg	<4.77	<LOD		E		6.58			E		70.37			E		23.60			E		27.74			E		11.85			E		8.96			E	
XRF	Cadmium	mg/kg	6.94			E		<6.75	<LOD		E		<7.65	<LOD		E		<7.66	<LOD		E		10.98			E		9.14			E		<7.03	<LOD		E	
XRF	Copper	mg/kg	21.67			E		14.06			E		74.12			E		41.18			E		30.47			E		51.13			E		23.74			E	
XRF	Lead	mg/kg	15.7			E		14.89			E		46.37			E		15.86			E		19.71			E		35.39			E		18.47			E	
XRF	Mercury	mg/kg	<5.45	<LOD	UJ	S	CX	<5.41	<LOD	UJ	S	CX	<6.73	<LOD	UJ	S	CX	<7.1	<LOD	UJ	S	CX	<6.91	<LOD	UJ	S	CX	<6.22	<LOD	UJ	S	CX	<5.79	<LOD	UJ	S	CX
XRF	Zinc	mg/kg	80.89			E		72.63			E		410.61			E		375.13			E		341.71			E		200.86			E		153.67			E	
ASTM D2974	Moisture, Percent	%	9.0	N2		E																															
SW-846 6010D	Arsenic	mg/kg	1.2			E																															
SW-846 6010D	Cadmium	mg/kg	0.11	J	A	E	<RL																														
SW-846 6010D	Copper	mg/kg	4.8			E																															
SW-846 6010D	Lead	mg/kg	7.1			E																															
SW-846 6010D	Zinc	mg/kg	51.8			E																															
SW-846 7471B	Mercury	mg/kg	<0.0092	U		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-33-SS-05(6-12)				
Field Sample ID			BPSOU-UR33SS05-090921-3				
Lab Sample ID			10578891002				
Sample Date			9/9/2021				
Sample Type			Natural				
Method	Analyte	Units	Result	Lab Qual	DV Qual	S/E	Reason Code
XRF	Arsenic	mg/kg	10.62			E	
XRF	Cadmium	mg/kg	<7.1	<LOD		E	
XRF	Copper	mg/kg	17.84		J	S	FD
XRF	Lead	mg/kg	19.67			E	
XRF	Mercury	mg/kg	<5.91	<LOD	UJ	S	CX
XRF	Zinc	mg/kg	165.9			E	
ASTM D2974	Moisture, Percent	%	9.5	N2		E	
SW-846 6010D	Arsenic	mg/kg	6.4			E	
SW-846 6010D	Cadmium	mg/kg	0.73			E	
SW-846 6010D	Copper	mg/kg	15.5			E	
SW-846 6010D	Lead	mg/kg	4.0			E	
SW-846 6010D	Zinc	mg/kg	121			E	
SW-846 7471B	Mercury	mg/kg	<0.0093	U		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-33-SS-05(6-12)						UR-33-SS-05(6-12)-FD									
Field Sample ID			BPSOU-UR33SS05-090921-3						BPSOU-UR33SS05-090921-3-FD									
Lab Sample ID			10578891002						10578891003									
Sample Date			9/9/2021						9/9/2021									
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	10.62				1	N/A	13.69				1	N/A	RPD≤35%		25%	Yes
XRF	Cadmium	mg/kg	<7.1	<LOD			1	N/A	<7.06	<LOD			1	N/A	N/A		-	-
XRF	Copper	mg/kg	17.84		J	FD	1	N/A	26.8		J	FD	1	N/A	RPD≤35%		40%	RPD>35%
XRF	Lead	mg/kg	19.67				1	N/A	21.67				1	N/A	RPD≤35%		10%	Yes
XRF	Mercury	mg/kg	<5.91	<LOD	UJ	CX	1	N/A	<5.67	<LOD	UJ	CX	1	N/A	N/A		-	-
XRF	Zinc	mg/kg	165.9				1	N/A	162.87				1	N/A	RPD≤35%		2%	Yes
ASTM D2974	Moisture, Percent	%	9.5	N2			1	0.1	9.2	N2			1	0.1	RPD≤35%		3%	Yes
SW-846 6010D	Arsenic	mg/kg	6.4				1	1.1	6.3				1	1.1	RPD≤35%		2%	Yes
SW-846 6010D	Cadmium	mg/kg	0.73				1	0.16	0.79				1	0.16	ABS DIF≤2xRL	0.060		Yes
SW-846 6010D	Copper	mg/kg	15.5				1	0.55	15.2				1	0.53	RPD≤35%		2%	Yes
SW-846 6010D	Lead	mg/kg	4.0				1	0.55	3.7				1	0.53	RPD≤35%		8%	Yes
SW-846 6010D	Zinc	mg/kg	121				1	2.2	131				1	2.1	RPD≤35%		8%	Yes
SW-846 7471B	Mercury	mg/kg	<0.0093	U			1	0.021	<0.0096	U			1	0.022	ABS DIF≤2xRL	both U		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-33-SS-01	BPSOU-UR33SS01-090921-1	Natural	0 - 2	9/9/2021	As, Cd, Cu, Pb, Hg, Zn	N/A			
UR-33-SS-01	BPSOU-UR33SS01-090921-2	Natural	2 - 6	9/9/2021	As, Cd, Cu, Pb, Hg, Zn	N/A			
UR-33-SS-01	BPSOU-UR33SS01-090921-3	Natural	6 - 12	9/9/2021	As, Cd, Cu, Pb, Hg, Zn	N/A			
UR-33-SS-02	BPSOU-UR33SS02-090921-1	Natural	0 - 2	9/9/2021	As, Cd, Cu, Pb, Hg, Zn	N/A			
UR-33-SS-02	BPSOU-UR33SS02-090921-2	Natural	2 - 6	9/9/2021	As, Cd, Cu, Pb, Hg, Zn	N/A			
UR-33-SS-02	BPSOU-UR33SS02-090921-3	Natural	6 - 12	9/9/2021	As, Cd, Cu, Pb, Hg, Zn	N/A			
UR-33-SS-03	BPSOU-UR33SS03-090921-1	Natural	0 - 2	9/9/2021	As, Cd, Cu, Pb, Hg, Zn	N/A			
UR-33-SS-03	BPSOU-UR33SS03-090921-2	Natural	2 - 6	9/9/2021	As, Cd, Cu, Pb, Hg, Zn	10578891001	moisture	As, Cd, Cu, Pb, Zn	Hg
UR-33-SS-03	BPSOU-UR33SS03-090921-3	Natural	6 - 12	9/9/2021	As, Cd, Cu, Pb, Hg, Zn	N/A			
UR-33-SS-04	BPSOU-UR33SS04-090921-1	Natural	0 - 2	9/9/2021	As, Cd, Cu, Pb, Hg, Zn	N/A			
UR-33-SS-04	BPSOU-UR33SS04-090921-2	Natural	2 - 6	9/9/2021	As, Cd, Cu, Pb, Hg, Zn	N/A			
UR-33-SS-04	BPSOU-UR33SS04-090921-3	Natural	6 - 12	9/9/2021	As, Cd, Cu, Pb, Hg, Zn	N/A			
UR-33-SS-05	BPSOU-UR33SS05-090921-1	Natural	0 - 2	9/9/2021	As, Cd, Cu, Pb, Hg, Zn	N/A			
UR-33-SS-05	BPSOU-UR33SS05-090921-2	Natural	2 - 6	9/9/2021	As, Cd, Cu, Pb, Hg, Zn	N/A			
UR-33-SS-05	BPSOU-UR33SS05-090921-3	Natural	6 - 12	9/9/2021	As, Cd, Cu, Pb, Hg, Zn	10578891002	moisture	As, Cd, Cu, Pb, Zn	Hg
UR-33-SS-05	BPSOU-UR33SS05-090921-3-FD	Field Duplicate	6 - 12	9/9/2021	As, Cd, Cu, Pb, Hg, Zn	10578891003	moisture	As, Cd, Cu, Pb, Zn	Hg

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)

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

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

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

XRF Qual (XRF Qualifiers)

<LOD = Not detected at the reporting limit.

DV Qual (Data Validation Qualifiers)

A = results between the MDL and RL with no other qualifiers required are considered enforcement quality data.

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

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 check samples was not satisfied.

<RL = Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

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_20210909_98052_540	9/9/2021	<2.6	Yes	13.98	Yes	<11.44	Yes	<3.51	Yes	<4.82	Yes	<5.53	Yes
SiO2	P_20210909_98052_562	9/9/2021	<2.57	Yes	13.36	Yes	<11.16	Yes	<3.29	Yes	<4.72	Yes	<5.83	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_20210909_98052_541	9/9/2021	11.12	Yes	<7.69	Yes	27.81	Yes	13.32	Yes	<6.34	Yes	95.69	Yes
NIST 2709a	P_20210909_98052_563	9/9/2021	13.27	Yes	10.87	Yes	27.98	Yes	14.37	Yes	<6.42	Yes	94.46	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_20210909_98052_542	9/9/2021	474.72	Yes	512.36	Yes	22.99	N/A	478.80	Yes	<6.99	N/A	46.07	N/A
RCRA	P_20210909_98052_564	9/9/2021	487.42	Yes	506.04	Yes	16.61	N/A	484.70	Yes	<6.93	N/A	48.10	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_20210909_98052_559	BPSOU-UR33SS05-090921-3		9/9/2021	10.62		<7.1		17.84		19.67		<5.91		165.90	
XRF Replicate	P_20210909_98052_561	BPSOU-UR33SS05-090921-3-R	BPSOU-UR33SS05-090921-3	9/9/2021	11.82	10.7%	<6.99	ND	16.86	5.7%	22.75	14.5%	<5.91	ND	153.04	8.1%
XRF Duplicate	P_20210909_98052_560	BPSOU-UR33SS05-090921-3-D	BPSOU-UR33SS05-090921-3	9/9/2021	14.06	27.9%	<6.97	ND	22.77	24.3%	18.41	6.6%	<5.75	ND	154.03	7.4%

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: 9/9/2021
Data Validator: Sara Ward

Case No: P_20210909
Sample Matrix: Soil
Analysis Dates: 9/9/2021
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	9/9/2021	9/9/2021	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 arsenic (2.73 mg/kg) and cadmium (10.7 mg/kg, 13.98 mg/kg, and 13.36 mg/kg) in the SiO_2 Standards did not require qualifications since the detections were below the control limit for arsenic (10 mg/kg) and cadmium (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 "J" for detects and "UJ" for non-detected.

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 field duplicate samples were analyzed on 9/9/2021:

XRF Field Duplicate Sample	Primary Sample
BPSOU-UR38SS03-090921-2-FD	BPSOU-UR38SS03-090921-2
BPSOU-UR33SS05-090921-3-FD	BPSOU-UR33SS05-090921-3

For the BPSOU-UR38SS03-090921-2-FD and BPSOU-UR38SS03-090921-2 duplicate pair, the RPD for arsenic (39%) was outside control limits (35%). BPSOU-UR38SS03-090921-2 and BPSOU-UR38SS03-090921-2-FD were qualified "J" for arsenic.

For the BPSOU-UR33SS05-090921-3-FD and BPSOU-UR33SS05-090921-3 duplicate pair, the RPD for copper (40%) was outside control limits (35%). BPSOU-UR33SS05-090921-3 and BPSOU-UR33SS05-090921-3-FD were qualified "J" for copper.

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

XRF Duplicate Sample	Primary Sample
BPSOU-UR38OP01-090921-3-D	BPSOU-UR38OP01-090921-3
BPSOU-UR33SS05-090921-3-D	BPSOU-UR33SS05-090921-3

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

XRF Replicate Sample	Primary Sample
BPSOU-UR38OP01-090921-3-R	BPSOU-UR38OP01-090921-3
BPSOU-UR33SS05-090921-3-R	BPSOU-UR33SS05-090921-3

For the BPSOU-UR38OP01-090921-3-R and BPSOU-UR38OP01-090921-3 duplicate pair, the RPD for zinc (36%) was outside control limits (35%). BPSOU-UR38OP01-090921-3 was qualified "J" for zinc.

Comments:

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_20210909, the following qualifications were made:

One (1) zinc result was qualified "J" due to an elevated XRF replicate RPD.
Two (2) arsenic results were qualified "J" due to an elevated XRF field duplicate RPD.
Two (2) copper results were qualified "J" due to an elevated XRF field duplicate RPD.
One (1) mercury result was qualified "J" due to the lack of an appropriate calibration check sample.
Twenty-nine (29) 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): 09/09/2021
Data Validator: Sara Ward
Case No: 10578891
Sample Matrix: Soil
Analysis Date(s): 09/16/2021, 09/22/2021, 09/23/2021
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	09/09/2021	09/22/2021	Y	N/A
Hg			EPA 7471B	28 days		09/23/2021	Y	N/A
Percent Moisture			ASTM D2974	N/A		09/16/2021	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 2.1°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 (0.18 mg/kg) in the MB at a level less than ½ the reporting limit (0.50 mg/kg). 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: 10578891

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		N	X

Describe Any Actions Taken: None Required.

Comments: For method EPA 7471B batch 770534, an LMS/LMS Duplicate (LMSD) generated from a sample not from this work order was used for the LDS calculations. The RPDs were within control limits.

For method EPA 6010D batch 770533, an LMS/LMS Duplicate (LMSD) generated from a sample not from this work order was used for the LDS calculations. The RPD for lead (45%) was outside control limits (20%). Since the parent sample was not from this work order, no qualifications were warranted. The remaining RPDs were within control limits.

For ASTM D2974, duplicates generated from two samples 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		N	X

Describe Any Actions Taken: None Required.

Comments: For method EPA 7471B batch 770534, an LMS/LMSD was generated from a sample not from this work order. The %R of the LMS/MSD for mercury were within control limits (80-120%); therefore, no qualifications were warranted.

For method EPA 6010D batch 770533, an LMS/LMSD was generated from a sample not from this work order. The %R of the LMS for arsenic (58%) and the LMS/LMSD for copper (11% and 14%, respectively), lead (-2300% and -1050%, respectively), and zinc (-328% and 71%, respectively) were outside control limits. Since the parent sample was not from this work order, 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-UR33SS05-090921-3 and BPSOU-UR33SS05-090921-3-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 [ ] N [X]

If so, explain: On this WO 10578891, 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-UR33SS03-090921-2	Cadmium	A	<RL

Reason for qualification:
<RL = The result is above the method detection limit and below the reporting limit.

Comments:

9. Authorization of Data Validation

Data Validator

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

Signature: Sara Ward Josie McElroy

Date: 10/19/2021 10/20/2021

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 10578891 and P_20210909_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

9/9/21 Thurs

Ran XRF. Lab Req Per ±35% Storm Water COCs
BPSOU-UR38SS02-090921-2 @ 8:30
Ran XRF. Lab Req Per ±35% Storm Water COCs
BPSOU-UR38SS02-090921-3 @ 8:25
Ran XRF. Lab Req. Per ±35% Storm Water COCs
-SS03 Sample Location 3
BPSOU-UR38SS03-090921-1 @ 8:45
Ran XRF. No Lab Req.
BPSOU-UR38SS03-090921-2 @ 8:35
Ran XRF. Lab Per 1 in 10 Confirmation
BPSOU-UR38SS03-090921-2-FD @ 8:40
Field Duplicate. Ran XRF. Parent
Sample = BPSOU-UR38SS03-090921-2
BPSOU-UR38SS03-090921-3 @ 8:30
Ran XRF. No Lab Req.
-SS04 Sample Site
BPSOU-UR38SS04-090921-1 @ 8:50
Ran XRF. Lab Req Per ±35% Criteria for Storm Waters
BPSOU-UR38SS04-090921-2 @ 8:45
Ran XRF. No Lab Req.
BPSOU-UR38SS04-090921-3 @ 8:40
Ran XRF. Lab Req. Per ±35% for Storm Water Cocs
OP01 - Opportunistic Area 1.
Location added for spatial
representation + to meet the
5 Sample area requirement for

9/9/21 Thurs.
sites less than 1 acre.
BPSOU-UR38OP01-090921-1 @ 11:25
Ran XRF. No Lab Req.
BPSOU-UR38OP01-090921-2 @ 11:20
Ran XRF. No Lab Req.
BPSOU-UR38OP01-090921-3 @ 11:15
Ran XRF. No Lab Req.
Site Characterization/Sampling @
UR38 Completed.
1300 On site @ UR33 to
Sample/Characterize. Sampled
per pgs 2+3. Summarized
Below for Each Site location.
-SS01 Sample location 1
BPSOU-UR33SS01-090921-1 @ 13:55
Ran XRF. No Lab
BPSOU-UR33SS01-090921-2 @ 13:50
Ran XRF. No Lab
BPSOU-UR33SS01-090921-3 @ 13:45
Ran XRF. No Lab Req
SS-02 Sample Site 2
BPSOU-UR33SS02-090921-1 @ 14:25
Ran XRF. No Lab
BPSOU-UR33SS02-090921-2 @ 14:20
Ran XRF. No Lab
BPSOU-UR33SS02-090921-3 @ 14:15

9/9/21 Thurs

Ran XRF. No Lab Req.

SS-03 Sample Site 3

BPSOU-UR335503-090921-1 @ 14:20

Ran XRF. No Lab

BPSOU-UR335503-090921-2 @ 14:15

Ran XRF. Lab Split Submitted per 1 & 10 Req. for lab confirmation

BPSOU-UR335503-090921-3 @ 14:10

Ran XRF. No lab Req.

SS-04 Sample Site 4

BPSOU-UR335504-090921-1 @ 1440

Ran XRF. No lab Req.

BPSOU-UR335504-090921-2 @ 14:35

Ran XRF. No lab Req.

BPSOU-UR335504-090921-3 @ 14:30

Ran XRF. No lab Req.

SS-05 Sample Site 5

BPSOU-UR335505-090921-1 @ 1455

Ran XRF. No lab Req.

BPSOU-UR335505-090921-2 @ 1450

Ran XRF. No lab Req.

BPSOU-UR335505-090921-3 @ 14:40

Ran XRF. Lab Per Lin 10 Req.

BPSOU-UR335505-090921-3-FD @ 14:45

Field Duplicate per Req. Parent Sample = BPSOU-UR335505-090921-3

9/9/21 Thurs

All samples collected & Site Characterization @ UR 33 completed. All lab samples submitted are 1 Qt 2 gallon bag for As, Cd, Cu, Pb, Zn by 6010 & Hg by 7471. All Data collected Electronically & on field data sheets. All datum per pg 3 of 21 and sample pics. by pg 4.

Sample Crew for the day was Cole D., Molly S., Jesse S.

Cole Pullman

9/9/21

BPSOU: Unreclaimed Sites Field XRF and Soil pH Results

Site Number: 33 Operator: JLS, MJS, CJD, MCS
Land Use: Residential XRF Unit #: 98052 73
pH probe #: 1

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

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
539	~~BPSOU-UR33~~ System Check	—	—	9/9/21	—	—	Time:	56.1	RES:	173.8	—	—	—
540	~~BPSOU-UR33~~ SRM2	—	—		—	—	<3	14	<11	<4	<6	<5	—
541	~~BPSOU-UR33~~ NIST	—	—		—	—	11	<8	28	13	96	<6	—
542	~~BPSOU-UR33~~ RCRA	—	—		—	—	475	512	23	479	46	<7	—
543	~~BPSOU-UR33~~ USGS	—	—		—	—	68	13	222	822	732	<7	—
544	BPSOU-UR33 SS01-090921-1	0-2	8.71		1355	9/9/21	65	12	98	61	176	<6	—
545	BPSOU-UR33 SS01-090921-2	2-6	8.54		1350		46	<7	87	90	315	(<7)	—
546	BPSOU-UR33 SS01-090921-3	6-12	9.03		1345		42	<7	87	177	469	(<7)	—
547	BPSOU-UR33 SS02-090921-1	0-2	8.66		1425		49	<7	171	114	351	(<7)	—
548	BPSOU-UR33 SS02-090921-2	2-6	8.77		1420		39	28	75	143	297	(<7)	—
549	BPSOU-UR33 SS02-090921-3	6-12	8.81		1415		47	<8	79	168	526	(<7)	—
550	BPSOU-UR33 SS03-090921-1	0-2	8.33		1420		10	<7	78	32	130	<6	—
551	BPSOU-UR33 SS03-090921-2	2-6	8.67		1415		<5	7	22	16	81	25	Yes
552	BPSOU-UR33 SS03-090921-3	6-12	8.78		1410		7	<7	14	15	73	<5	—
553	BPSOU-UR33 SS04-090921-1	0-2	8.16		1440		70	28	74	46	411	(<7)	—
554	BPSOU-UR33 SS04-090921-2	2-6	8.84		1435		24	<8	41	16	375	(<7)	—
555	BPSOU-UR33 SS04-090921-3	6-12	8.95		1430		28	11	30	20	342	(<7)	—
556	BPSOU-UR33 SS05-090921-1	0-2	8.84		1455		12	9	51	35	201	<6	—
557	BPSOU-UR33 SS05-090921-2	2-6	9.07		1450		9	<7	24	18	154	<6	—
558	BPSOU-UR33 SS05-090921-3-FD	6-12	9.13		1445		14	<7	27	22	163	<6	Yes
559	BPSOU-UR33 SS05-090921-3	6-12	8.95		1440		11	<7	18	20	166	<6	Yes

1 in 10

P5

BPSOU: Unreclaimed Sites Field XRF and Soil pH Results

Site Number: 33 Operator: JLS, MJS, CJD, MCS
Land Use: Residential XRF Unit #:
pH probe #: 1

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

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)						Lab Sample
							As	Cd	Cu	Pb	Zn	Hg	
560	BPSOU-UR33 SSOS-090921-3-D	6-12	—	9/9/21	1430	9/9/21	14	<7	23	18	154	<6	—
561	BPSOU-UR33 SSOS-090921-3-R	6-12	—		1435		12	<7	17	23	153	<6	—
562	~~BPSOU-UR33~~ SIO2	—	—		—		<3	13	<11	<3	<6	<5	—
563	~~BPSOU-UR33~~ NIST	—	—		—		13	11	28	14	94	<6	—
564	~~BPSOU-UR33~~ RCRA	—	—		—		487	506	17	485	48	<7	—
565	~~BPSOU-UR33~~ USGS	—	—		—		81	21	231	791	755	<7	—
	BPSOU-UR33												
	BPSOU-UR33												
	BPSOU-UR33												
	BPSOU-UR33												
	BPSOU-UR33												
	BPSOU-UR33												
	BPSOU-UR33												
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	BPSOU-UR33												
	BPSOU-UR33												
	BPSOU-UR33												
	BPSOU-UR33												
	BPSOU-UR33												

Attachment C
Laboratory Data Packages

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

September 27, 2021

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

RE: Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578891

Dear Scott Sampson:

Enclosed are the analytical results for sample(s) received by the laboratory on September 14, 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.: 10578891

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 (*).

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

SAMPLE SUMMARY

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578891

Lab ID	Sample ID	Matrix	Date Collected	Date Received
10578891001	**BPSOU-UR33SS03-090921-2**	Solid	09/09/21 14:15	09/14/21 08:50
10578891002	**BPSOU-UR33SS05-090921-3**	Solid	09/09/21 14:40	09/14/21 08:50
10578891003	**BPSOU-UR33SS05-090921-3-FD**	Solid	09/09/21 14:45	09/14/21 08:50

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

SAMPLE ANALYTE COUNT

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578891

Lab ID	Sample ID	Method	Analysts	Analytes Reported
10578891001	**BPSOU-UR33SS03-090921-2**	EPA 6010D	DM	5
		EPA 7471B	LMW	1
		ASTM D2974	JL5	1
10578891002	**BPSOU-UR33SS05-090921-3**	EPA 6010D	DM	5
		EPA 7471B	LMW	1
		ASTM D2974	JL5	1
10578891003	**BPSOU-UR33SS05-090921-3-FD**	EPA 6010D	DM	5
		EPA 7471B	LMW	1
		ASTM D2974	JL5	1

PASI-M = Pace Analytical Services - Minneapolis

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

PROJECT NARRATIVE

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578891

Method: **EPA 6010D**
Description: 6010D MET ICP
Client: BPAR-PIONEER-MT
Date: September 27, 2021

General Information:
3 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: 770533

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 10578889001

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

- MS (Lab ID: 4105424)
  - Copper
- MSD (Lab ID: 4105425)
  - Copper

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

- MS (Lab ID: 4105424)
  - Arsenic
  - Lead
  - Zinc
- MSD (Lab ID: 4105425)
  - Lead
  - Zinc

R1: RPD value was outside control limits.

- MSD (Lab ID: 4105425)

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

PROJECT NARRATIVE

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578891

Method: **EPA 6010D**
Description: 6010D MET ICP
Client: BPAR-PIONEER-MT
Date: September 27, 2021

QC Batch: 770533

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 10578889001

R1: RPD value was outside control limits.

- Lead

Additional Comments:

REPORT OF LABORATORY ANALYSIS

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

PROJECT NARRATIVE

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578891

Method: **EPA 7471B**
Description: 7471B Mercury
Client: BPAR-PIONEER-MT
Date: September 27, 2021

General Information:
3 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.

Additional Comments:

Analyte Comments:

QC Batch: 770534

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

- MS (Lab ID: 4105428)
  - Mercury
- MSD (Lab ID: 4105429)
  - Mercury

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.: 10578891

Sample: BPSOU-UR33SS03-090921-2 **Lab ID: 10578891001** Collected: 09/09/21 14:15 Received: 09/14/21 08:50 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	**1.2**	mg/kg	1.1	0.16	1	09/16/21 11:02	09/22/21 13:29	7440-38-2	
Cadmium	**0.11J**	mg/kg	0.16	0.036	1	09/16/21 11:02	09/22/21 13:29	7440-43-9	
Copper	**4.8**	mg/kg	0.53	0.078	1	09/16/21 11:02	09/22/21 13:29	7440-50-8	
Lead	**7.1**	mg/kg	0.53	0.11	1	09/16/21 11:02	09/22/21 13:29	7439-92-1	
Zinc	**51.8**	mg/kg	2.1	0.24	1	09/16/21 11:02	09/22/21 13:29	7440-66-6	
7471B Mercury	Analytical Method: EPA 7471B Preparation Method: EPA 7471B Pace Analytical Services - Minneapolis								
Mercury	**<0.0092**	mg/kg	0.021	0.0092	1	09/16/21 13:19	09/23/21 18:23	7439-97-6	
Dry Weight / %M by ASTM D2974	Analytical Method: ASTM D2974 Pace Analytical Services - Minneapolis								
Percent Moisture	**9.0**	%	0.10	0.10	1		09/16/21 15:16		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.: 10578891

Sample: BPSOU-UR33SS05-090921-3 **Lab ID: 10578891002** Collected: 09/09/21 14:40 Received: 09/14/21 08:50 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	**6.4**	mg/kg	1.1	0.17	1	09/16/21 11:02	09/22/21 13:31	7440-38-2	
Cadmium	**0.73**	mg/kg	0.16	0.037	1	09/16/21 11:02	09/22/21 13:31	7440-43-9	
Copper	**15.5**	mg/kg	0.55	0.080	1	09/16/21 11:02	09/22/21 13:31	7440-50-8	
Lead	**4.0**	mg/kg	0.55	0.11	1	09/16/21 11:02	09/22/21 13:31	7439-92-1	
Zinc	**121**	mg/kg	2.2	0.24	1	09/16/21 11:02	09/22/21 13:31	7440-66-6	
7471B Mercury	Analytical Method: EPA 7471B Preparation Method: EPA 7471B Pace Analytical Services - Minneapolis								
Mercury	**<0.0093**	mg/kg	0.021	0.0093	1	09/16/21 13:19	09/23/21 18:24	7439-97-6	
Dry Weight / %M by ASTM D2974	Analytical Method: ASTM D2974 Pace Analytical Services - Minneapolis								
Percent Moisture	**9.5**	%	0.10	0.10	1		09/16/21 15:16		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.: 10578891

Sample: BPSOU-UR33SS05-090921-3-FD **Lab ID: 10578891003** Collected: 09/09/21 14:45 Received: 09/14/21 08:50 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	**6.3**	mg/kg	1.1	0.16	1	09/16/21 11:02	09/22/21 13:33	7440-38-2	
Cadmium	**0.79**	mg/kg	0.16	0.036	1	09/16/21 11:02	09/22/21 13:33	7440-43-9	
Copper	**15.2**	mg/kg	0.53	0.078	1	09/16/21 11:02	09/22/21 13:33	7440-50-8	
Lead	**3.7**	mg/kg	0.53	0.11	1	09/16/21 11:02	09/22/21 13:33	7439-92-1	
Zinc	**131**	mg/kg	2.1	0.24	1	09/16/21 11:02	09/22/21 13:33	7440-66-6	
7471B Mercury	Analytical Method: EPA 7471B Preparation Method: EPA 7471B Pace Analytical Services - Minneapolis								
Mercury	**<0.0096**	mg/kg	0.022	0.0096	1	09/16/21 13:19	09/23/21 18:26	7439-97-6	
Dry Weight / %M by ASTM D2974	Analytical Method: ASTM D2974 Pace Analytical Services - Minneapolis								
Percent Moisture	**9.2**	%	0.10	0.10	1		09/16/21 15:16		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.: 10578891

QC Batch: 770534
QC Batch Method: EPA 7471B
Analysis Method: EPA 7471B
Analysis Description: 7471B Mercury Solids
Laboratory: Pace Analytical Services - Minneapolis
Associated Lab Samples: 10578891001, 10578891002, 10578891003

METHOD BLANK: 4105426 Matrix: Solid
Associated Lab Samples: 10578891001, 10578891002, 10578891003

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Mercury	mg/kg	<0.0079	0.018	0.0079	09/23/21 17:57	

LABORATORY CONTROL SAMPLE: 4105427

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	mg/kg	0.45	0.49	107	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 4105428 4105429

Parameter	Units	10578889001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	mg/kg	0.51	0.51	0.49	1.0	1.0	103	98	80-120	4	20	E

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.: 10578891

QC Batch: 770533
QC Batch Method: EPA 3050B
Analysis Method: EPA 6010D
Analysis Description: 6010D Solids
Laboratory: Pace Analytical Services - Minneapolis
Associated Lab Samples: 10578891001, 10578891002, 10578891003

METHOD BLANK: 4105422 Matrix: Solid
Associated Lab Samples: 10578891001, 10578891002, 10578891003

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Arsenic	mg/kg	<0.15	0.99	0.15	09/22/21 12:52	
Cadmium	mg/kg	<0.034	0.15	0.034	09/22/21 12:52	
Copper	mg/kg	0.18J	0.50	0.072	09/22/21 12:52	
Lead	mg/kg	<0.10	0.50	0.10	09/22/21 12:52	
Zinc	mg/kg	<0.22	2.0	0.22	09/22/21 12:52	

LABORATORY CONTROL SAMPLE: 4105423

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/kg	50	48.8	98	80-120	
Cadmium	mg/kg	50	51.3	103	80-120	
Copper	mg/kg	50	50.2	100	80-120	
Lead	mg/kg	50	50.4	101	80-120	
Zinc	mg/kg	50	50.2	100	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 4105424 4105425

Parameter	Units	10578889001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/kg	241	49.5	51.5	270	290	58	95	75-125	7	20	P6
Cadmium	mg/kg	6.7	49.5	51.5	52.7	58.3	93	100	75-125	10	20	
Copper	mg/kg	119	49.5	51.5	125	126	11	14	75-125	1	20	M1
Lead	mg/kg	2170	49.5	51.5	1030	1630	-2300	-1050	75-125	45	20	P6,R1
Zinc	mg/kg	1300	49.5	51.5	1140	1340	-328	71	75-125	16	20	P6

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
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Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578891

QC Batch: 770550
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: 10578891001, 10578891002, 10578891003

SAMPLE DUPLICATE: 4105483

Parameter	Units	10578889007 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	2.7	2.5	7	30	N2

SAMPLE DUPLICATE: 4106470

Parameter	Units	10578889001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	2.9	3.1	8	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.: 10578891

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
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Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10578891

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10578891001	**BPSOU-UR33SS03-090921-2**	EPA 3050B	770533	EPA 6010D	770712
10578891002	**BPSOU-UR33SS05-090921-3**	EPA 3050B	770533	EPA 6010D	770712
10578891003	**BPSOU-UR33SS05-090921-3-FD**	EPA 3050B	770533	EPA 6010D	770712
10578891001	**BPSOU-UR33SS03-090921-2**	EPA 7471B	770534	EPA 7471B	770797
10578891002	**BPSOU-UR33SS05-090921-3**	EPA 7471B	770534	EPA 7471B	770797
10578891003	**BPSOU-UR33SS05-090921-3-FD**	EPA 7471B	770534	EPA 7471B	770797
10578891001	**BPSOU-UR33SS03-090921-2**	ASTM D2974	770550		
10578891002	**BPSOU-UR33SS05-090921-3**	ASTM D2974	770550		
10578891003	**BPSOU-UR33SS05-090921-3-FD**	ASTM D2974	770550		

Laboratory Management Program (LaMP) Chain of Custody Record

Soil, Sediment and Groundwater Samples

BP Site Node Path: _____ **Req Due Date (mm/dd/yy):** 09/28/21 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-UR33SS03-090921-2	14:15	in	C	1	S		x	x	001
	BPSOU-UR33SS05-090921-3	14:40	in	C	1	S		x	x	002
	BPSOU-UR33SS05-090921-3-FD	14:45	in	C	1	S		x	x	No Lab QA 003

WO# : 10578891

10578891

Sampler's Name: Cole Dallaserra	Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
Sampler's Company: Pioneer Technical Services	[signature] PTS	9/13/21	1530	[signature] Pace	9/14/21	830
Ship Method: FedEx Overnight 9/13/2021						
Shipment Tracking No: 4J7899341 6380						

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: 2.1 °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: pp rm

Project #: WO#: 10578891
PM: JMA Due Date: 09/27/21
CLIENT: BP-PIONEER

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

Tracking Number: 427899346380 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: Plastic bags **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:** 2.1 °C **Average Corrected Temp (no temp blank only):** ____ °C ☐ See Exceptions ENV-FRM-MIN4-0142 ☐ 1 Container

Correction Factor: TNJC **Cooler Temp Corrected w/temp blank:** 2.1 °C

USDA Regulated Soil: (☐ N/A, water sample/Other: ____) **Date/Initials of Person Examining Contents:** KB3 9/15/21
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
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	
Triple Volume Provided for MS/MSD (if more than 10 samples)?	☑ Yes ☐ No ☐ N/A	7.
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 contaners?	☐ 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: 1457	Temp: 2.1	Corrected Temp:
Time: 1417	put in cooler	
Time:	Temp: 2.1	Corrected Temp:

CLIENT NOTIFICATION/RESOLUTION **Field Data Required?** ☐ Yes ☐ No
Person Contacted: Date/Time:
Comments/Resolution:

Project Manager Review: [signature] **Date:** 09/16/2021

Note: Whenever there is a discrepancy affecting North Carolina 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: KB3(1)

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_20210909_98052_513	SiO2	SiO2	9/9/2021	mg/kg	2.73	1.69	10.70	4.36	<LOD	11.55	<LOD	3.16	<LOD	4.68	<LOD	5.53
P_20210909_98052_514	NIST 2709a	NIST 2709a	9/9/2021	mg/kg	13.82	3.59	9.80	5.18	28.07	11.18	10.11	3.92	<LOD	6.32	96.03	9.01
P_20210909_98052_515	RCRA	RCRA	9/9/2021	mg/kg	492.99	18.38	523.80	11.52	22.86	10.85	471.47	18.08	<LOD	6.91	44.11	7.06
P_20210909_98052_516	USGS SdAR-M2	USGS SdAR-M2	9/9/2021	mg/kg	75.55	17.44	16.77	5.35	206.16	17.07	805.17	21.09	<LOD	6.97	724.90	22.37
P_20210909_98052_517	Natural	BPSOU-UR38SS01-090921-1	9/9/2021	mg/kg	306.87	22.95	18.69	5.61	136.69	16.65	1,035.67	25.65	<LOD	8.30	1,131.11	29.79
P_20210909_98052_518	Natural	BPSOU-UR38SS01-090921-2	9/9/2021	mg/kg	399.46	22.94	<LOD	7.76	69.17	13.80	1,009.33	24.76	<LOD	7.49	550.05	20.59
P_20210909_98052_519	Natural	BPSOU-UR38SS01-090921-3	9/9/2021	mg/kg	352.06	23.91	10.23	5.25	74.14	14.54	1,086.89	26.43	<LOD	7.92	622.61	22.52
P_20210909_98052_520	Natural	BPSOU-UR38SS02-090921-1	9/9/2021	mg/kg	134.94	19.13	<LOD	7.85	36.12	12.98	819.41	22.47	<LOD	8.14	1,078.59	28.60
P_20210909_98052_521	Natural	BPSOU-UR38SS02-090921-2	9/9/2021	mg/kg	167.68	20.66	9.30	5.28	72.24	14.22	959.00	24.16	<LOD	8.47	1,736.28	35.89
P_20210909_98052_522	Natural	BPSOU-UR38SS02-090921-3	9/9/2021	mg/kg	155.34	29.20	22.38	5.83	51.52	14.39	1,920.31	35.43	<LOD	8.91	1,289.69	32.37
P_20210909_98052_523	Natural	BPSOU-UR38SS03-090921-1	9/9/2021	mg/kg	104.93	11.89	<LOD	7.66	38.87	12.41	277.57	13.02	<LOD	7.61	825.73	24.45
P_20210909_98052_524	Natural	BPSOU-UR38SS03-090921-2	9/9/2021	mg/kg	105.23	10.98	<LOD	7.41	26.24	11.38	237.90	11.81	<LOD	6.94	630.80	20.93
P_20210909_98052_525	Field Duplicate	BPSOU-UR38SS03-090921-2-FD	9/9/2021	mg/kg	156.42	13.41	10.56	5.19	33.85	12.19	332.64	14.24	<LOD	7.32	582.25	20.83
P_20210909_98052_526	Natural	BPSOU-UR38SS03-090921-3	9/9/2021	mg/kg	200.44	13.39	<LOD	7.54	43.75	12.16	312.01	13.51	<LOD	7.04	426.33	17.59
P_20210909_98052_527	Natural	BPSOU-UR38SS04-090921-1	9/9/2021	mg/kg	106.05	18.94	<LOD	7.95	518.66	26.10	787.26	22.51	<LOD	8.40	1,288.71	31.94
P_20210909_98052_528	Natural	BPSOU-UR38SS04-090921-2	9/9/2021	mg/kg	106.26	15.17	11.16	5.33	166.42	16.57	516.49	17.58	<LOD	7.44	951.48	26.31
P_20210909_98052_529	Natural	BPSOU-UR38SS04-090921-3	9/9/2021	mg/kg	134.19	23.68	10.44	5.39	96.52	14.92	1,326.79	28.51	<LOD	8.32	735.12	23.88
P_20210909_98052_530	Natural	BPSOU-UR38OP01-090921-1	9/9/2021	mg/kg	202.86	11.78	8.52	5.29	63.01	13.30	173.42	10.61	<LOD	7.09	275.37	14.80
P_20210909_98052_531	Natural	BPSOU-UR38OP01-090921-2	9/9/2021	mg/kg	178.61	10.71	<LOD	7.44	50.23	12.10	157.41	9.75	<LOD	6.76	348.63	15.78
P_20210909_98052_532	Natural	BPSOU-UR38OP01-090921-3	9/9/2021	mg/kg	201.43	10.94	<LOD	7.56	40.71	11.80	146.16	9.49	7.01	4.57	244.30	13.54
P_20210909_98052_533	XRF Replicate	BPSOU-UR38OP01-090921-3-R	9/9/2021	mg/kg	170.76	10.35	<LOD	7.66	38.00	11.98	130.04	9.14	<LOD	6.82	351.48	16.11
P_20210909_98052_534	XRF Duplicate	BPSOU-UR38OP01-090921-3-D	9/9/2021	mg/kg	197.02	10.67	9.24	5.17	34.27	11.77	127.37	9.02	<LOD	6.89	235.63	13.47
P_20210909_98052_535	SiO2	SiO2	9/9/2021	mg/kg	<LOD	2.39	<LOD	6.38	<LOD	11.66	<LOD	3.17	<LOD	4.86	<LOD	5.80
P_20210909_98052_536	NIST 2709a	NIST 2709a	9/9/2021	mg/kg	11.82	3.52	12.62	5.27	35.22	11.55	10.18	3.94	<LOD	6.34	94.15	9.06
P_20210909_98052_537	RCRA	RCRA	9/9/2021	mg/kg	496.07	18.94	522.41	11.65	24.02	11.14	481.01	18.67	<LOD	7.24	43.33	7.29
P_20210909_98052_538	USGS SdAR-M2	USGS SdAR-M2	9/9/2021	mg/kg	94.14	17.23	13.84	5.25	214.55	17.13	781.85	20.61	<LOD	7.14	720.47	22.11
P_20210909_98052_540	SiO2	SiO2	9/9/2021	mg/kg	<LOD	2.60	13.98	4.62	<LOD	11.44	<LOD	3.51	<LOD	4.82	<LOD	5.53
P_20210909_98052_541	NIST 2709a	NIST 2709a	9/9/2021	mg/kg	11.12	3.63	<LOD	7.69	27.81	11.23	13.32	4.13	<LOD	6.34	95.69	9.13
P_20210909_98052_542	RCRA	RCRA	9/9/2021	mg/kg	474.72	18.41	512.36	11.47	22.99	10.98	478.80	18.30	<LOD	6.99	46.07	7.22
P_20210909_98052_543	USGS SdAR-M2	USGS SdAR-M2	9/9/2021	mg/kg	67.53	17.46	12.60	5.18	222.00	17.49	821.59	21.22	<LOD	7.24	731.53	22.39
P_20210909_98052_544	Natural	BPSOU-UR33SS01-090921-1	9/9/2021	mg/kg	64.71	6.78	12.06	5.17	97.64	13.62	60.89	6.53	<LOD	6.42	176.24	11.68
P_20210909_98052_545	Natural	BPSOU-UR33SS01-090921-2	9/9/2021	mg/kg	45.57	7.57	<LOD	7.44	86.96	14.42	90.41	8.20	<LOD	7.23	314.54	16.09
P_20210909_98052_546	Natural	BPSOU-UR33SS01-090921-3	9/9/2021	mg/kg	42.26	9.02	<LOD	7.33	86.59	13.70	176.55	10.44	<LOD	6.96	468.61	18.43
P_20210909_98052_547	Natural	BPSOU-UR33SS02-090921-1	9/9/2021	mg/kg	47.03	7.68	<LOD	7.38	170.53	15.94	114.39	8.48	<LOD	6.70	350.62	15.92
P_20210909_98052_548	Natural	BPSOU-UR33SS02-090921-2	9/9/2021	mg/kg	39.01	8.20	<LOD	7.51	74.71	13.15	142.86	9.41	<LOD	6.80	296.65	14.86
P_20210909_98052_549	Natural	BPSOU-UR33SS02-090921-3	9/9/2021	mg/kg	46.72	9.30	<LOD	7.83	78.84	14.19	168.38	10.62	<LOD	7.33	526.43	20.24
P_20210909_98052_550	Natural	BPSOU-UR33SS03-090921-1	9/9/2021	mg/kg	9.74	4.13	<LOD	7.09	77.65	11.96	32.36	4.91	<LOD	5.74	130.14	9.75
P_20210909_98052_551	Natural	BPSOU-UR33SS03-090921-2	9/9/2021	mg/kg	<LOD	4.77	6.94	4.62	21.67	9.60	15.70	3.96	<LOD	5.45	80.89	7.90
P_20210909_98052_552	Natural	BPSOU-UR33SS03-090921-3	9/9/2021	mg/kg	6.58	3.20	<LOD	6.75	14.06	9.10	14.89	3.85	<LOD	5.41	72.63	7.50
P_20210909_98052_553	Natural	BPSOU-UR33SS04-090921-1	9/9/2021	mg/kg	70.37	6.93	<LOD	7.65	74.12	13.66	46.37	6.28	<LOD	6.73	410.61	17.85
P_20210909_98052_554	Natural	BPSOU-UR33SS04-090921-2	9/9/2021	mg/kg	23.60	4.46	<LOD	7.66	41.18	12.42	15.86	4.59	<LOD	7.10	375.13	16.93
P_20210909_98052_555	Natural	BPSOU-UR33SS04-090921-3	9/9/2021	mg/kg	27.74	4.69	10.98	5.27	30.47	11.71	19.71	4.70	<LOD	6.91	341.71	16.06
P_20210909_98052_556	Natural	BPSOU-UR33SS05-090921-1	9/9/2021	mg/kg	11.85	4.47	9.14	4.94	51.13	11.65	35.39	5.26	<LOD	6.22	200.86	12.04
P_20210909_98052_557	Natural	BPSOU-UR33SS05-090921-2	9/9/2021	mg/kg	8.96	3.61	<LOD	7.03	23.74	10.19	18.47	4.24	<LOD	5.79	153.67	10.51
P_20210909_98052_558	Field Duplicate	BPSOU-UR33SS05-090921-3-FD	9/9/2021	mg/kg	13.69	3.84	<LOD	7.06	26.80	9.98	21.67	4.34	<LOD	5.67	162.87	10.56

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_20210909_98052_559	Natural	BPSOU-UR33SS05-090921-3	9/9/2021	mg/kg	10.62	3.75	<LOD	7.10	17.84	10.01	19.67	4.36	<LOD	5.91	165.90	10.90
P_20210909_98052_560	XRF Duplicate	BPSOU-UR33SS05-090921-3-D	9/9/2021	mg/kg	14.06	3.76	<LOD	6.97	22.77	10.00	18.41	4.20	<LOD	5.75	154.03	10.34
P_20210909_98052_561	XRF Replicate	BPSOU-UR33SS05-090921-3-R	9/9/2021	mg/kg	11.82	3.86	<LOD	6.99	16.86	9.79	22.75	4.46	<LOD	5.91	153.04	10.39
P_20210909_98052_562	SiO2	SiO2	9/9/2021	mg/kg	<LOD	2.57	13.36	4.51	<LOD	11.16	<LOD	3.29	<LOD	4.72	<LOD	5.83
P_20210909_98052_563	NIST 2709a	NIST 2709a	9/9/2021	mg/kg	13.27	3.77	10.87	5.19	27.98	11.28	14.37	4.22	<LOD	6.42	94.46	9.05
P_20210909_98052_564	RCRA	RCRA	9/9/2021	mg/kg	487.42	18.25	506.04	11.34	16.61	10.47	484.70	18.09	<LOD	6.93	48.10	7.18
P_20210909_98052_565	USGS SdAR-M2	USGS SdAR-M2	9/9/2021	mg/kg	80.88	17.18	20.66	5.38	230.75	17.57	790.77	20.70	<LOD	7.27	755.09	22.64

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: UR33-1	Photographer: JLS
Date: 09/09/2021 14:02	Photo Direction: South East
Description: SS01. Material looks to be imported gravel, shallow bedrock.	
Project: BPSOU Unreclaimed and Insufficiently Reclaimed Sites 2021	

Atlantic Richfield Company

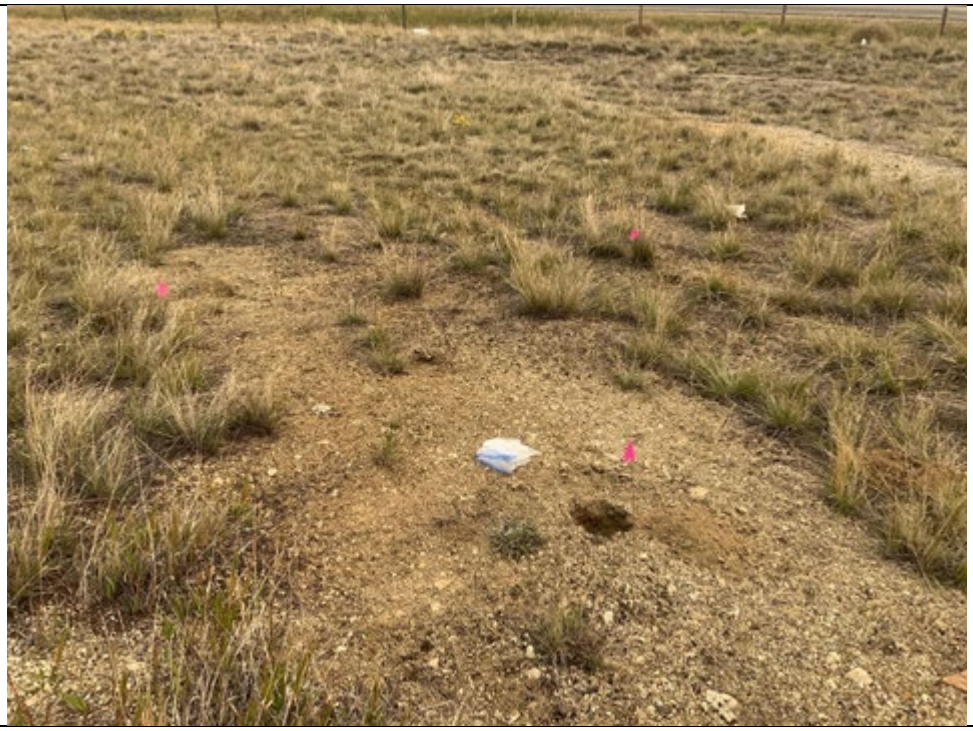
PhotoNumber: UR33-2	Photographer: JLS
Date: 09/09/2021	Photo Direction: North West
Description: SS04, material is orange in color and contains fines and some manganese/iron staining..	
Project: BPSOU Unreclaimed and Insufficiently Reclaimed Sites 2021	

Atlantic Richfield Company

PhotoNumber: UR33-3	Photographer: JLS
Date: 09/09/2021	Photo Direction: East
Description: SS03, located on what apears to be an imported berm. Fines and rocks three-quarter inch to 2 inch are mixed throughout.	
Project: BPSOU Unreclaimed and Insufficiently Reclaimed Sites 2021	

Atlantic Richfield Company

PhotoNumber: UR33-4	Photographer: JLS
Date: 09/09/2021	Photo Direction: South East
Description: SS05, site is located on top of what appears to be in the imported berm. Material is light in color and contains fines.	
Project: BPSOU Unreclaimed and Insufficiently Reclaimed Sites 2021	



Atlantic Richfield Company

PhotoNumber: UR33-5	Photographer: JLS
Date: 09/09/2021	Photo Direction: North East
Description: SS02, site appears to have shallow bedrock. Piles of dumped asphalt or above the sample site. Sub sample locations were dug around the original holes until depth was achieved.	
Project: BPSOU Unreclaimed and Insufficiently Reclaimed Sites 2021	