

**SITE INSPECTION REPORT
FOR
ELKHORN MINING DISTRICT**

**C & D MINE
ELKHORN CREEK TAILINGS
UNION ELKHORN MINE
GREYBACK GULCH
TRUMLEY HEAP LEACH
ELKHORN SKYLINE MINE
BOULAWAY MINE
ELKHORN QUEEN MINE**

JEFFERSON COUNTY, MONTANA

Prepared for
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 8

Prepared by
WESTON SOLUTIONS, INC.
Region 8 Superfund Technical Assessment and Response Team

Date Prepared	June 2020
CERCLA ID/Site Spill Identifier No.:	MTN0008/A8V9
TDD No.	0004/1807-06
Document Control No.	W0621.1A.02221
Contract No.	EP-S8-13-01
U.S. EPA Site Assessment Manager	Joseph Chisholm

**SITE INSPECTION REPORT
FOR
ELKHORN MINING DISTRICT**

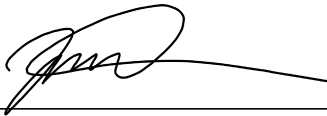
**C & D MINE
ELKHORN CREEK TAILINGS
UNION ELKHORN MINE
GREYBACK GULCH
TRUMLEY HEAP LEACH
SKYLINE MINE
BOULAWAY MINE
ELKHORN QUEEN MINE
JEFFERSON COUNTY, MONTANA**

Prepared for
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 8

Prepared by
WESTON SOLUTIONS, INC.
Region 8 Superfund Technical Assessment and Response Team

June 2020

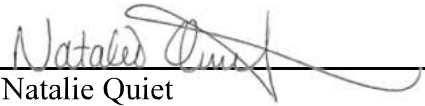
Reviewed and Approved by:



Joseph Chisholm
EPA Site Assessment Manager

Date: 6/26/2020

Prepared by:



Natalie Quiet
WESTON START Project Manager

Date: 6/26/2020

Reviewed and Approved by:



Mark Blanchard, P.G.
WESTON START Program Manager

Date: 6/26/2020

TABLE OF CONTENTS

1.0	INTRODUCTION.....	1
1.1	Project Objectives	1
1.2	Project Scope	1
2.0	SITE BACKGROUND	3
2.1	Location	3
2.2	Site Description.....	6
2.2.1	Elkhorn Mining District.....	6
2.2.1.1	Climate.....	6
2.2.1.2	Vegetation and Wildlife.....	7
2.3	Operational History.....	8
2.3.1	Elkhorn Mining District Operational History	8
2.3.2	Investigation Sites	9
2.3.2.1	Elkhorn Creek	10
2.3.2.2	Slaughterhouse Gulch.....	12
2.3.2.3	Greyback Gulch	12
2.3.2.4	Turnley Creek.....	13
2.3.2.5	Queen Gulch	13
2.3.2.6	South Fork Queen Gulch	14
2.4	Previous Investigations and Regulatory Involvement	14
2.5	Current Conditions and Waste Characteristics	21
2.5.1.1	Elkhorn Creek	21
2.5.1.2	Slaughterhouse Gulch.....	22
2.5.1.3	Greyback Gulch	22
2.5.1.4	Turnley Creek.....	24
2.5.1.5	Queen Gulch	25
2.5.1.6	South Fork Queen Gulch	26
3.0	SCREENING BENCHMARKS.....	26
3.1	HRS Benchmarks.....	26
3.2	Human Health and Environment Screening Benchmarks	27
4.0	WASTE/SOURCE SAMPLING.....	29
4.1	Adit Drainage.....	29
4.1.1	Sample Locations.....	29
4.1.2	Analytical Results Summary.....	29
4.2	Waste Piles.....	31
4.2.1	Sample Locations.....	31
4.2.2	Analytical Results Summary.....	31
4.3	Conclusions.....	35
5.0	GROUNDWATER PATHWAY.....	36
5.1	Geologic and Hydrogeologic Setting.....	36
5.1.1.1	Groundwater Levels.....	36

TDD 0004/1807-06

5.2	Groundwater Pathway Targets.....	36
5.3	Groundwater Sample Locations and Analytical Results	37
5.4	Groundwater Pathway Conclusions.....	37
6.0	SURFACE WATER PATHWAY.....	38
6.1	Hydrology	38
6.2	Surface Water Pathway Targets.....	38
	6.2.1.1 Fisheries.....	40
	6.2.1.2 Sensitive Environments	40
6.3	Sample Locations.....	41
6.4	Analytical Results and Benchmark Screening Evaluation Summary	41
	6.4.1 Surface Water Analytical Results Summary.....	42
	6.4.1.1 Elkhorn Creek	42
	6.4.1.2 Slaughterhouse Gulch.....	43
	6.4.1.3 Greyback Gulch	43
	6.4.1.4 Turnley Creek.....	44
	6.4.1.5 Queen Gulch	44
	6.4.1.6 South Fork Queen Gulch	45
	6.4.2 Sediment Analytical Results Summary	46
	6.4.2.1 Elkhorn Creek	46
	6.4.2.2 Slaughterhouse Gulch.....	47
	6.4.2.3 Greyback Gulch	48
	6.4.2.4 Turnley Creek.....	48
	6.4.2.5 Queen Gulch	49
	6.4.2.6 South Fork Queen Gulch	50
6.5	Surface Water Pathway Conclusions	50
	6.5.1 Elkhorn Creek	51
	6.5.2 Slaughterhouse Gulch	52
	6.5.3 Turnley Creek	52
	6.5.4 Queen Gulch	53
	6.5.5 South Fork Queen Gulch	53
7.0	SOIL EXPOSURE AND AIR PATHWAY	55
7.1	Physical Conditions	55
7.2	Soil Exposure and Air Pathway Targets	55
	7.2.1.1 Sensitive Environments	56
7.3	Sample Locations.....	56
7.4	Analytical Results and Benchmark Screening Evaluation Summary	57
	7.4.1 Elkhorn Creek	57
	7.4.2 Slaughterhouse Gulch	58
	7.4.3 Turnley Creek	59
	7.4.4 Queen Gulch	59
	7.4.5 South Fork Queen Gulch	61
7.5	Air Sampling Locations and Analytical Results.....	61
7.6	Soil Exposure and Air Pathway Conclusions	61

8.0	SUMMARY OF CONCLUSIONS	63
9.0	REFERENCES.....	67

LIST OF EMBEDDED TABLES

Table 2-1 – Site Summary	4
Table 2-2 – Previous Investigations and Regulatory Involvement.....	15
Table 4-1 – Source Area Summary.....	35
Table 5-1 – Wells within 4-Mile Radius and Population Served	37
Table 6-1 – TDL Summary.....	39
Table 6-2 – Wetland Summary	41
Table 6-3 – Surface Water Observed Release Summary.....	50
Table 7-1 – Population within 4-Mile Radius.....	55
Table 8-1 – Summary of Conclusions	64

LIST OF ATTACHED TABLES

Table 1	Sample Location, Description, and Information
Table 2	Field Water Quality Parameters and Conditions
Table 3a	Source Surface Water - HRS Benchmarks Analytical Results Summary
Table 3b	Source Surface Water - Ecological Benchmarks Analytical Results Summary
Table 4a	Source Sediment - HRS Benchmarks Analytical Results Summary
Table 4b	Source Sediment - Ecological Benchmarks Analytical Results Summary
Table 5a	Source Waste Material - HRS Benchmarks Analytical Results Summary
Table 5b	Source Waste Material - Human Health Benchmarks Analytical Results Summary
Table 6a	Surface Water - HRS Benchmarks Analytical Results Summary
Table 6b	Surface Water – Human Health and Ecological Benchmarks Analytical Results Summary
Table 7a	Sediment - HRS Benchmarks Analytical Results Summary
Table 7b	Sediment - Ecological Benchmarks Analytical Results Summary
Table 8a	XRF Field Screening Results Summary – C & D Mine
Table 8b	XRF Field Screening Results Summary – Elkhorn Creek Tailings
Table 8c	XRF Field Screening Results Summary – Union Elkhorn
Table 8d	XRF Field Screening Results Summary – Trumley Heap Leach
Table 8e	XRF Field Screening Results Summary – Boulaway Mine
Table 8f	XRF Field Screening Results Summary – Elkhorn Queen Mine
Table 8g	XRF Field Screening Results Summary – Skyline Mine
Table 9	Field Quality Control Analytical Results Summary

TDD 0004/1807-06

LIST OF FIGURES

Figure 1	Investigation Area Location Map
Figure 2	Investigation Area Vicinity Map
Figure 3	Groundwater Pathway 4-Mile Radius Map
Figure 4	Surface Water Pathway 15-Mile Target Distance Limit Map
Figure 5	C & D Mine Sample Location Map
Figure 6	Elkhorn Creek Tailings Sample Location Map
Figure 7	Union Elkhorn Mine Sample Location Map
Figure 8	Greyback Gulch Sample Location Map
Figure 9	Trumley Heap Leach Sample Location Map
Figure 10	Skyline Mine Sample Location Map
Figure 11	Boulaway Mine Sample Location Map
Figure 12	Elkhorn Queen Mine Sample Location Map

LIST OF APPENDICES

Appendix A	Photograph Log
Appendix B	Laboratory and Data Validation Reports
Appendix C	Sampling Activities Report

LIST OF ACRONYMS

bgs	below ground surface
BLM	Bureau of Land Management
BTAG	Biological Technical Assistance Group
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
COC	Contaminants of Concern
CY	cubic yard
DEQ	Department of Environmental Quality
EA	Environmental Assessment
EPA	U.S. Environmental Protection Agency
ft	feet
FWP	Fish, Wildlife & Parks
GWIC	Ground Water Information Center
HRS	Hazard Ranking System Scoring
HUC	hydrologic unit code
IPAC	Information, Planning, and Conservation
MCL	Maximum Contaminant Limit
MDSL	Montana Department of State Lands
MBMG	Montana Bureau of Mines and Geology
MDEQ	Montana Department of Environmental Quality
mg/kg	milligram per kilogram
MSL	Montana State Library
MSP	Montana State Parks
MT	Montana
NPL	National Priorities List
OSMRE	U.S Office of Surface Mining Reclamation and Enforcement
PCS	Pre-CERCLA Screening
PEC	Probable Effect Concentration
PPE	probable point of entry
QAPP	Quality Assurance Project Plan
RSL	Regional Screening Level
SAM	Site Assessment Manager
SAP	Sampling and Analysis Plan
SCDM	Superfund Chemical Data Matrix

TDD 0004/1807-06

LIST OF ACRONYMS, continued

SCDM	Superfund Chemical Data Matrix
SI	Site Inspection
SOP	Standard Operating Procedure
START	Superfund Technical Assessment and Response Team
SDWIS	Safe Drinking Water Information System
TDD	Technical Direction Document
TDL	Target Distance Limit
TEC	Threshold Effect Concentration
TMDL	total maximum daily load
USFS	U.S. Department of Agriculture, Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UTV	Utility Terrain Vehicle
WESTECH	Western Technology and Engineering, Inc.
WESTON	Weston [®] Solutions, Inc.
WRCC	Western Regional Climate Center
XRF	X-ray fluorescence

TDD 0004/1807-06

1.0 INTRODUCTION

This Site Inspection (SI) for eight sites potentially impacted by historic mining related activities, which are located in the Beaverhead-Deerlodge National Forest, Jefferson County, Montana (MT) (Figure 1), has been prepared to partially satisfy the requirements of Technical Direction Document (TDD) No. 1807-06 issued to Weston Solutions, Inc. (WESTON®) under the U.S. Environmental Protection Agency (EPA) Region 8 Superfund Technical Assessment and Response Team (START) Contract No. EP-S8-13-01.

The sites that are the focus of this SI were identified as needing further assessment during a Pre-Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Screening (PCS) conducted in the investigation area in 2017 and 2018 (WESTON, 2018). This SI evaluates the C & D Mine, Elkhorn Creek Tailings, Union Elkhorn Mine, Trumley Heap Leach, Skyline Mine, Boulaway Mine, Elkhorn Queen Mine sites, a mill site, and cumulative discharges from the Sourdough and Golden Curry mines in Greyback Gulch (Figure 2) and surrounding vicinity, to determine whether mining related sources pose a threat to human health and the environment, and if further investigation under CERCLA is warranted.

This report has been prepared in accordance with the EPA, “Guidance for Performing Site Inspections under CERCLA,” Interim Final, September 1992, and the, “Region 8 Supplement to Guidance for Performing Site Inspections under CERCLA” (EPA, 1992; EPA, 1993). This report provides an evaluation of field sampling results from activities conducted in June 2019 and September 2019 in the Elkhorn Creek watershed. Field activities followed the “Guidance for Performing Site Inspections Under CERCLA (EPA, 1992), applicable START Standard Operating Procedures (SOPs), the approved Elkhorn Mining District Sampling and Analysis Plan (SAP) (WESTON, 2019a), and the Quality Assurance Project Plan (QAPP) for EPA Region 8 Comprehensive Environmental Response, Compensation, and Liability Act Site Assessment in Colorado, Utah, Wyoming, Montana, North Dakota, and South Dakota (Program QAPP) (WESTON, 2019b).

1.1 PROJECT OBJECTIVES

The purpose of this SI is to:

- Assess current conditions in surface water, sediment, and waste material for comparison against background, and human health-based and aquatic life benchmarks and standards.
- Collect samples and associated analytical data to identify if there is a potential threat of a release of a hazardous substance to the environment.
- Identify if sufficient data exists to support EPA decision making as determined by project managers.

1.2 PROJECT SCOPE

The assessment included reviewing readily available site information and data collected during the 2017-2019 field activities in the Elkhorn Mining District. Sampling activities included field screening of water quality parameters in surface waters, X-ray fluorescence (XRF) screening of

TDD 0004/1807-06

waste material, photo documentation, and multi-media sample collection at the sites. Surface water, sediment, soil, and waste material samples were submitted for laboratory analysis to verify the nature and extent of potential contamination.

Sample collection at the sites was conducted to provide information to: 1) document if a contaminant release has occurred, 2) evaluate through the Hazard Ranking System (HRS) scoring if the site is eligible for the National Priorities List (NPL) as a result of historical mining activities at the site, 3) assess the relative risk to human health and the environment, and 4) determine the need for additional investigation or action.

Field sampling activities were conducted at eight sites - seven mining related sites and upstream and downstream of mines and a mill site in Greyback Gulch from June 3, 2019 through June 5, 2019 by START (WESTON) and EPA personnel, and from September 9, 2019 through September 12, 2019 by START personnel. START and EPA personnel (June sampling event) conducted a reconnaissance of the site features and took photographs documenting general conditions. The EPA representative was present for oversight and to ensure that access was obtained and granted for each sampling point. A U.S. Department of Agriculture, Forest Service (USFS) and a U.S. Fish and Wildlife Service (USFWS) representative were also present for oversight during the June sampling event.

2.0 SITE BACKGROUND

2.1 LOCATION

The mine and mill sites are located in the Elkhorn Creek watershed within the Elkhorn Mining District and in the Elkhorn Mountains of the Beaverhead-Deerlodge National Forest (Figures 1 and 2). The district is situated in the center of Jefferson County. The geographical coordinates of Elkhorn, MT, and the approximate center of the watershed are 46.275097° North latitude and 111.946030° West longitude. The closest permanent residences are located in Elkhorn, approximately 30 feet (ft) from Elkhorn Creek with the town of Boulder, MT located 18.5 miles to the southwest.

The specific mine and mill sites within the Elkhorn Mining District that are the focus of this SI are described in the following subsections and are presented by drainage, as follows:

Elkhorn Creek – C & D mine and Elkhorn Creek Tailings

Slaughterhouse Gulch – Union Elkhorn mine

Greyback Gulch – Downstream contributions from Sourdough and Golden Curry mines and an un-named Mill site*

Turnley Creek – Trumley Heap Leach

Queen Gulch – Skyline and Boulaway mines

South Fork Queen Gulch – Elkhorn Queen mine

*The Sourdough and Golden Curry mines were identified as needing further assessment in the PCS Report (WESTON, 2018), however, were not accessible for sampling during this SI. Therefore, Greyback Gulch was sampled to assess whether any notable impacts could be identified as potentially attributable to the mines of concern.

Locations, ownership, and site access information for each individual mine and mill site is presented in Table 2-1 by drainage.

Table 2-1 – Site Summary

Site Name	Latitude/Longitude	Ownership	Access Directions
Elkhorn Creek			
C&D Mine	46.2893° North / 111.9348° West	Private	Travel east from Boulder via Highway 69, to White Bridge Road. Turn north on White Bridge Road, then east on Lower Valley Road for 2 miles to the town of Elkhorn. Travel north from Elkhorn via Diego Town Road for 0.85 miles, then east on an unnamed high-clearance dirt road for 0.3 miles.
Elkhorn Creek Tailings	46.2657° North / 111.95646 ° West	Private/ USFS	Travel east from Boulder via Highway 69, to White Bridge Road. Turn north on White Bridge Road, then east on Lower Valley Road for 2 miles. Turn east on Elkhorn Road (USFS Road 258) for approximately 8 miles.
Slaughterhouse Gulch			
Union Elkhorn Mine	46.291241° North / 111.942602° West	USFS	Travel east from Boulder via Highway 69, to White Bridge Road. Turn north on White Bridge Road, then east on Lower Valley Road for 2 miles to the town of Elkhorn. Travel north from Elkhorn via Diego Town Road for 0.95 mile, then head northwest on an unnamed high-clearance dirt road for 0.3 miles.
Greyback Gulch			
Sourdough and Golden Curry Mines*	46.284477° North / 111.960427° West	Private	Travel east from Boulder via Highway 69, to White Bridge Road. Turn north on White Bridge Road, then east on Lower Valley Road for 2 miles to the town of Elkhorn. Travel northwest from Elkhorn via Slaughter House Road for 1.65 miles.
Mill (unnamed)	46.279650° North / 111.967631° West	USFS	Travel east from Boulder via Highway 69, to White Bridge Road. Turn north on White Bridge Road, then east on Lower Valley Road for 2 miles. Turn east on Elkhorn Road (USFS Road 258) for 7.6 miles, then north-northwest on high - clearance Tramway Road (USFS Road 9365) for approximately 0.9 mile. Take a right, crossing Turnley Creek, on an unnamed road, and follow approximately 170 ft to cattle fencing with an unlocked gate. Continue through gate and follow the road north-northwest approximately 0.9 mile to the vicinity of the site. The site is located approximately 500 ft upslope and east of the road
Turnley Creek			
Trumley Heap Leach	46.2703° North / 111.971° West	USFS	Travel east from Boulder via Highway 69 to White Bridge Road. Turn north on White Bridge Road, then east on Lower Valley Road for 2 miles. Turn east on

TDD 0004/1807-06

Site Name	Latitude/Longitude	Ownership	Access Directions
			Elkhorn Road (USFS Road 258) for 7.6 miles, then north-northwest on high clearance Tramway Road (USFS Road 9365) for 1 mile
Queen Gulch			
Skyline Mine	46.290311° North / 111.889213° West	USFS	Travel east from Boulder via Highway 69, to White Bridge Road. Turn north on White Bridge Road, then east on Lower Valley Road for 2 miles. Turn east on Elkhorn Road (USFS Road 258) for 7.1 miles, then northeast for 2.3 miles on Queen Gulch Road (USFS Road 8546) to the intersection with Tramway Road and the Queen Gulch Road trailhead (USFS Road 8578). Follow the road on foot for 1.23 miles to the Leslie Lake trailhead (Trail 7075) and travel north for 1.35 miles.
Boulaway Mine	46.260219° North / 111.948131° West	USFS	Travel east from Boulder via Highway 69 to White Bridge Road, then north on White Bridge Road, then east on Lower Valley Road for 2 miles. Turn east on Elkhorn Road (USFS Road 258) for 7.1 miles, then northeast on Queen Gulch Road (USFS Road 8578) for 1.07 miles.
South Fork Queen Gulch			
Elkhorn Queen Mine	46.291241° North / 111.942602° West	Private	Travel east from Boulder via Highway 69, to White Bridge Road. Turn north on White Bridge Road, then east on Lower Valley Road for 2 miles. Turn east on Elkhorn Road (USFS Road 258) for 7.1 miles, then northeast for ½-mile on Queen Gulch Road (USFS Road 8578), then southeast on an unnamed dirt road for 1.06 miles, then head west on an unnamed high-clearance dirt road for 0.36 miles.

**These mines were not assessed during the SI due to access issues. However, locations downstream of the Sourdough and Golden Curry mine sites were sampled to capture conditions in Greyback Gulch as discussed below*

2.2 SITE DESCRIPTION

2.2.1 Elkhorn Mining District

The Elkhorn Mining District contains numerous abandoned mines with adits, shafts, prospect pits, waste rock and tailings piles, and historic mining structures. For the purposes of this investigation, eight sites were assessed within the approximate boundaries of the Elkhorn Creek subwatershed (hydrologic unit code [HUC] 100200060503), which is approximately 22,658.33 acres (Figure 2). The northern and northeastern edges of the Elkhorn subwatershed are bordered by the Helena-Lewis and Clark National Forest. The south and west sides of the watershed are bordered by private property. Regionally, the Elkhorn Creek subwatershed is bounded to the south and west by the Boulder River and Boulder Valley, and to the north and northeast by the Continental Divide. The eight sites and features in their immediate vicinities are presented on Figures 5 through 12.

The properties within and surrounding the Elkhorn Mining District are comprised of a mix of private and USFS-administered lands. The majority of residences are located near the center of the district in Elkhorn, MT. Recreational use in the district includes hunting, fishing, sightseeing, hiking, biking, snowmobiling, four-wheeling and other recreational driving, and cross-country skiing. Elkhorn State Park is located in the center of Elkhorn and Elkhorn is a historic mining town that attracts tourists and sightseers. Evidence of heavy recreational use (utility task vehicle [UTV] usage, camping, fishing, and hunting) was observed throughout the investigation area. Campfire rings were observed on the waste piles at Boulaway (Appendix A, Photo 85) and Union Elkhorn mines. Children's footprints were observed in the tailings pile at Elkhorn Creek Tailings and shooting targets and firing points were observed at Trumley Heap Leach (Appendix A, Photo 71). During the September 2019 sampling event, two gentlemen were encountered camping in the cabin at Skyline mine and were reportedly bow hunting for grouse.

According to the Bureau of Land Management's (BLM) Land & Mineral System Reports database, the Golden Curry, Sourdough and Skyline mines are the only sites with active mining claims associated with the sites assessed in this SI. The Golden Curry and Sourdough claims are located within Township 6 North, Range 3 West, and Section 10 on private lands. There are four active lode claims within this section identified as Sourdough Fraction, South Sourdough, South Golden Curry, and South Golden Curry #2. Private property access was not obtained for these two mines and they were not sampled as part of this SI. Access was obtained via USFS-administered land and co-located surface water/sediment samples were collected downstream of these mines. The Skyline mine is associated with the Elkhorn Skyline lode claim, which is located within Township 6 North, Range 2 West, Section 8, NW SW, and is on USFS-administered land (BLM, 2020; Montana State Library [MSL], 2019).

2.2.1.1 Climate

There is no meteorological data specific to the Site, but monthly data collected from a meteorological data station (#241008) in Boulder, MT, just west of Elkhorn Mining District, is available from July 23, 1880 through June 10, 2016. Average winter temperatures in the Boulder area range from 9.6 °F to 38.5 °F and average summer temperatures range from 42.6°F to 82.7°F. The average annual high temperature is 56.8 °F. Average annual precipitation is 10.97 inches.

TDD 0004/1807-06

Precipitation is mainly consistent throughout the year with slightly more in May and June. Prevailing winds in the investigation area are generally south. (Western Regional Climate Center [WRCC], 2020).

2.2.1.2 Vegetation and Wildlife

Vegetation in the higher elevations is predominantly coniferous forest with Douglas fir, Engelmann spruce, or lodgepole pine in the forested areas. Deciduous forest, primarily cottonwood or aspen, is found along drainages at lower elevations with sedge- and willow-dominated wetland areas. Open grasslands and shrub communities occur upland of the drainages at the lower elevations. In general, all streambeds sampled exhibited a gravelly, rocky streambed with sediment-filled depositional zones and clear water. Stream banks at all locations were observed to be thickly vegetated with grasses and shrubs characteristic of the Rocky Mountains with small non-vegetated areas at Elkhorn Creek Tailings due to recreational use. No evidence of stressed vegetation was observed at any of the sites or any locations visited downstream of the sites.

The Elkhorn Mountains offer unique opportunities for viewing wildlife in their natural habitat. Although the mountains are often touted for their spectacular elk population, many other animals such as bighorn sheep, mule and white-tailed deer, black bear, moose, and a variety of birds are commonly seen. Other animals such as badger, wolverine, mountain lions, and lynx are more reclusive and seldom seen (USFS, no date). Evidence of wildlife (scat) from large game animals such as deer were observed at numerous locations throughout the subwatershed during sampling activities. During the September 2019 sampling activities, a black bear (at Elkhorn Queen), a moose (off the side of USFS Road 8578 to the Skyline Mine), deer, and cattle were observed by START.

According to the Environmental Assessment (EA) conducted by the MDEQ for the Golden Dream Mine Project, a wildlife baseline study of 3,360 acres was conducted in 1995 by Western Technology and Engineering, Inc. (WESTECH) (MDEQ, 2008; WESTECH, 1995). The area surveyed included the areas surrounding the Sourdough mine, Golden Curry mine, Carmody mine and mill, and Elkhorn Creek Tailings (MDEQ, 2008; WESTECH, 1995). According to the report, elk, moose, mule deer, blue grouse, and ruffed grouse were recorded on or near the aforementioned mine sites (MDEQ, 2008; WESTECH, 1995). The report stated that these areas were not used by elk for “key summer” or “key winter” range habitat (MDEQ, 2008; WESTECH, 1995).

An update of the area wildlife inventories was performed by WESTECH in June 2006 and included: Fisheries and Species of Concern, Aquatic Biological Resources and Species of Concern, Wildlife Habitats, and Bats and Terrestrial Vertebrate Species of Concern (WESTECH, 2006). The abovementioned mine areas were examined for suitable habitat and presence of bats; however, no evidence of bats or roosts was found and subsequent studies have not observed bats at similar elevations of these mines (MDEQ, 2008; WESTECH, 2006). Potential habitat for the gray wolf, grizzly bear, Townsend’s big-eared bat, western toad, and the olive-sided flycatcher exists within 10 miles of the investigation area; however, none of these species were observed in the 1995 or 2006 studies (MDEQ, 2008; WESTECH, 1995; 2006). As of 2006, grizzly bear and gray wolf were likely only to occur as transients in the area; no known sightings of wolves or grizzly bears had been recorded in the area by the Montana Natural Heritage Program (MDEQ, 2008). It is

TDD 0004/1807-06

possible that Canada lynx are present at least as transients in the Elkhorn Mountains but the habitats in and adjacent to the aforementioned mines were not preferred. The probability of lynx use of the sites was considered to be low. As of 2006, no threatened or endangered species had been found on or near the aforementioned mine sites (MDEQ, 2008; WESTECH, 2006).

A fisheries and aquatic resources survey was performed by WESTECH in 1993 and was reevaluated in 2006. The survey indicated that brook trout is the primary fishery with the most fish inhabiting Turnley (57 %) and Elkhorn creeks (both classified as third order streams). One mottled sculpin was collected in the study area. No fish were collected or observed in certain reaches due to shallow stream depth and low flow. Length frequency distribution data showed that all age classes were present in Elkhorn and Turnley creeks (MDEQ, 2008; WESTECH 1993).

2.2.1.2.1 Threatened and Endangered Species

A search of the USFWS Information, Planning, and Conservation (IPaC) System and the Montana Department of Fish, Wildlife & Parks (FWP) Threatened Species list indicates six different species (one flowering plant, one conifer, one bird, and three mammals) that are potentially present in the basin and surrounding area (study area) and are considered federally listed as threatened or endangered, proposed threatened, or candidate species (USFWS, 2020; Montana State Parks [MSP], 2020a). The following species are potentially associated with the study area:

- Ute Ladies'-tresses (*Spiranthes diluvialis*) (Threatened)
- Whitebark Pine (*Pinus albicaulis*) (Candidate)
- Whooping Crane (*Grus Americana*) (Endangered)
- Grizzly Bear (*Ursus arctos horribilis*) (Threatened)
- Canada Lynx (*Lynx Canadensis*) (Threatened)
- North American Wolverine (*Gulo gulo luscus*) (Proposed Threatened)

As discussed in Section 2.2.1.2 above, wildlife, fisheries and aquatic inventories conducted in 1994, 1995 and 2006 indicated the possibility of transient populations of Canada lynx to be present in the Elkhorn Mountains; however, as of 2006, no threatened or endangered species had been found on or near the sites surveyed (MDEQ, 2008; WESTECH, 2006). According to the FWP, the Westslope cutthroat trout is a State designated “Species of Concern” and is known or presumed to be present in Leslie Lake (MSP, 2020a). Previous inventories conducted in 1993 and 2006 did not report observing Westslope cutthroat trout in any of the reaches surveyed. According to the USFWS IPaC, none of the aforementioned species have critical habitat within the study area, now were they specifically surveyed or observed during the SI investigation.

2.3 OPERATIONAL HISTORY

2.3.1 Elkhorn Mining District Operational History

The Elkhorn Historic Mining District operated from approximately 1870 to 1951. The period of significance for the district runs from 1879 to 1938 when the district was most productive (MDEQ, 1998). The district was prospected before 1870, but Peter Wys, considered the founder of Elkhorn's

riches, located a claim to the area in the early 1870s. Anton Holter, a prominent Helena banker, acquired the claims from Wys and in 1872 organized the Elkhorn Mining Company (MDEQ, 1998). The area first came to prominence when the Holter mine (later known as the Elkhorn and now the Elkhorn Creek Tailings site) began producing silver ore in 1875 (MDEQ, no date). The camp was relatively quiet until 1879 when the first 5-stamp mill was brought in to work the ore from the Holter mine (a.k.a Elkhorn) (MDEQ, 1998). The Elkhorn mine, the most productive mine in the area, produced ore from 1875-1951, reaching a peak of production in the 1890s (MDEQ, 1998). A series of mills evolved at Elkhorn to handle the increasingly complex ores with the first one being built in 1884 (MDEQ, no date; MDEQ, 1998). That same year, the Elkhorn townsite was laid out (MDEQ, 1998) (MDEQ, 1998). Approximately twenty lodes and mill sites were located in the Elkhorn Mining District between 1880 and 1890 and produced silver, gold, lead, zinc, and copper with some iron for flux (MDEQ, 1998).

Historically, the Elkhorn Mining District was connected to the Northern Pacific Railway by a spurline from Boulder that was constructed in 1887 (arrived in May of 1890) (MDEQ, no date). After the arrival of the railroad, the Elkhorn and other mines such as the C & D, Elkhorn, Queen, and Dunstone, shipped 20 - 25 carloads of their ore and concentrates each week to East Helena returning about \$20,000 (MDEQ, no date). In 1891 the District was producing at a rate of \$1 million a year (MDEQ, no date). The population of the town of Elkhorn rose and fell with the demands of the Elkhorn mine operation, reaching a peak of 900 in 1890, then gradually dropping down until the 1940s when only a small group remained (MDEQ, 1998). Several smaller mines (Elkhorn Queen, Golden Curry [Sourdough Complex], East Butte mill [Carmody]) were explored and the tailings processed intermittently during periods when the Elkhorn was inactive.

In 1918, tailings production was expanded until nearly all of the District's output came from the processed tailings. In 1919, a reported 4,183 tons of tailings were processed (MDEQ, 1998). From 1917 to 1919, a total of 10,200 tons were shipped (MDEQ, 1998). The last commercial enterprise in the Elkhorn townsite, "Joe-By-Golly" Biasatton's saloon closed its doors in 1938 (MDEQ, 1998). The Holter [Elkhorn] mine produced ore continuously until 1900, but ultimately closed in 1951 (MDEQ, no date). Several subsequent exploration efforts did not result in any production (MDEQ, no date).

2.3.2 Investigation Sites

Current mining related site conditions are based on observations made during the 2017 and 2018 PCS site reconnaissance and the June 3-5, 2019 and September 9-12, 2019 sampling events. All sites were sampled during June and September except:

- Skyline Mine and mines located in Greyback Gulch were not observed during the June 2019 sampling event due to access issues.
- Sourdough and Golden Curry mines in Greyback Gulch were also not visited or sampled during either event because of an active mine claim at these properties, although no current mining operations were observed during the 2017 and 2018 site reconnaissance events. Alternatively, Greyback Gulch areas on USFS-administered land upstream and downstream of the Mill site were sampled to assess potential contributions from that site

TDD 0004/1807-06

and capture conditions in Greyback Gulch downstream of the Sourdough and Golden Curry mines.

Observations during the PCS site reconnaissance and sampling events conducted during this investigation were made from public roads, USFS property, and private lands in which access was permissible, included waste source piles, draining adits, and a former leach pad.

The mines investigated in this SI and observed potential source areas are shown in photographs presented in Appendix A, identified on Figures 5 through 12, and described in the following subsections, presented by drainage.

2.3.2.1 Elkhorn Creek

- **C & D Mine:** The mine is one of the oldest mines in the district and may have been located and worked as early as 1875. However, the C & D lode was formally located by W. Dunston and Frank Crann in 1884 and the location officially recorded on April 15, 1885. The mine and a mill site below Elkhorn received a mineral survey for a patent in 1885. A small smelter was erected in 1886 to treat C & D ore, although the smelter was said to have operated only a short time. By August 1888, the mine and mill were idle. From 1875 to 1888, the C & D mine was reported to have produced \$37,727 from 1,860 tons of ore (MDEQ, 1998).
- **Elkhorn Creek Tailings:** Early operators of the Elkhorn mill apparently dumped tailings from the mill directly into Elkhorn Creek (now the Elkhorn Creek Tailings site). In the mid-to-late 1880s to 1890s, ranch irrigators complained about the fouling of the creek. This led to the development of an impoundment site where the tailings could be settled out of the water. The new site lay about 0.75 mile downstream from the Elkhorn mill and initially at least, seemed to have been confined to MS #1348, a patented placer claim on both sides of the Elkhorn Creek. When U.S. Geological Survey (USGS) staff visited the Elkhorn in the late 1890s, they found three tailings dams on Elkhorn Creek. Each dam was made of sacks, formerly for holding salt for the chloridizing process, filled with tailings sand, and stacked into barriers. The tailings and water left the mill in flumes to the dams, where the tailings remained behind the barriers while the water seeped through. As old tailings remained by the Elkhorn mill, the dams were sometimes called the lower tailings (MDEQ, 1998).

In 1908, the Elkhorn Electro Metal Company erected a testing plant (referred to herein as the King Mill, part of the Elkhorn Creek Tailings site) to re-treat the tailings from the Elkhorn mill using the Baker-Burwell process. The plant was completed the next year and treated the tailings successfully. The operation was reported to be treating 100 tons per day in early 1909. The new process allowed the operator to pull good gold and silver values out of the tailings, filling a series of five impoundment dams in the valley above and below the town of Elkhorn. This plant is thought to have been located at the King Mill. If so, it was salvaged by D. C. Walker and company. In the summer of 1916, the Elkhorn complex was sold to Henningson, Stackpole (Morrill D.), and Walker (David C.) for \$25,000. This included the three large tailings piles above Elkhorn Creek. Taking advantage of war time silver prices, the new owners shipped about 6,000 tons of tailings

TDD 0004/1807-06

to the East Helena smelter. This resumption of tailings production may have taken advantage of a surplus of manpower from the East Butte mill (later part of the Carmody mine). Workers there went on strike in January 1917 and did not return until 1920. In 1918, tailings production was expanded until nearly all of the district's output came from the processed tailings. In 1919, a reported 4,183 tons of tailings was processed. From 1917 to 1919, a total of 10,200 tons were shipped. However, in 1920, the year the East Butte strike ended, no production from tailings was reported (MDEQ, 1998).

While the lack of tailings production may have been due to resumption of work at the East Butte, it may also have been due to a diversion of effort to the construction of a 100-ton cyanide/electrochemical plant in 1921 by the Western Metallurgical Company. The company began to process the tailings in the plant, recovering silver and a little gold. The process placed tailings in large vats where solutions of cyanide in varying strengths were allowed to percolate for 84 hours. After this time, the gold and silver carried in the cyanide was precipitated on zinc shavings. Tails were dumped in an impoundment just below the plant. Cyanide precipitates were shipped to Bradly, Idaho, and rich silver concentrates were shipped to East Helena, Montana. Using this process, the company was initially able to recover 4 ounces of silver and a trace of gold per ton of tailings. The next year, 7 ounces of silver were reported to be recovered from each ton of tailings. A reported 150,000 tons of tailings remained to be processed (MDEQ, 1998).

In 1923, the Western Metallurgical Company ran the mill until May when low silver prices forced the closure of the plant. It has been estimated that in the first 16 months of production, the operation produced 332,112 ounces of silver from the tailings. The plant reopened for a time in 1924 and reported to be recovering 4 ounces of silver per ton with 125,000 tons remaining to be worked. The mill next worked the tailings from April 20, 1925 to December 18, 1925. With values holding constant at 4 ounces per ton, it was noted that the plant had a stockpile of 100,000 tons of tailings. Although their lease allowed Western Metallurgical to work on the upper tailings after July 1926, by the end of 1926 the operation was closed for the last time (MDEQ, 1998).

From 1933 to 1935 the tailings were again worked. The Western Metallurgical Cyanide mill was remodeled into a 200-ton flotation mill known as the King Mill. The mill treated 68,500 tons of tailings and is credited with 16,237 ounces of silver and 2,496 tons of concentrates that averaged 53 ounces of silver per ton. A mandatory drop of silver prices in 1937 shut down operations. The flotation tanks were removed as was all evidence of the cyanide mill. Equipment such as the ball mill, flotation equipment, and clarifier were sold to other operators and the carbon rods from the mill stored in the blacksmith shop of the Elkhorn mill (MDEQ, 1998).

Sometime after 1944, the usable tailings supply was reported to be nearly exhausted, but some tailings continued to be shipped to the East Helena smelter until 1952. The combined tailings production from the district from 1944 to 1952 totaled only 17,000 tons (Mineral Resources, 1951 and 1952; Roby, R.N. et al., 1960). In the late 1960s or early 1970s, a portion of the tailings below the plant were hauled up to Sourdough Park for a heap leach pad liner. This heap leach process was one of the first heap leach operations of its kind (Walker, 1995).

TDD 0004/1807-06

2.3.2.2 Slaughterhouse Gulch

The Union Elkhorn mine was owned by Hahn and Jamieson. Ore yielded from the mine assayed from 80 to 350 ounces per ton (Leeson, 1885). No additional operational history information was identified for the Union Elkhorn mine.

2.3.2.3 Greyback Gulch

The Sourdough and Golden Curry mines are located in the Greyback Gulch drainage and were identified in the PCS as qualifying for further assessment. However, these mines were not assessed during the SI due to access issues. Locations downstream of the Sourdough and Golden Curry mine sites were sampled to capture conditions in Greyback Gulch below these mines and included areas upstream and downstream of the Mill site to rule out any potential contributions from that site. Although not directly evaluated in this SI, the history and current conditions for the Sourdough and Golden Curry mine sites are presented below for reference in relation to information and data collected as part of this SI.

- **Sourdough Mine:** The Sourdough mine (also known as Sourdough Complex) consists of the Sourdough and Golden Curry mines. The Sourdough mine was worked during the 1890s and again intermittently between 1904 and 1940 and produced silver, gold, copper, and iron. From 1904 to 1951, the mine produced 98,445 tons of ore yielding 23,868 ounces of gold, 11,542 ounces of silver, and 650,549 pounds of copper. The Sourdough Complex also reportedly produced iron for flux (MDEQ, 1998). The property, as well as the immediate area, became known as Sourdough because the miners had a diet of sourdough pancakes and sourdough bread (Munson, 1989).

The site is located within a partially fenced permitted (Operating Permit #00173) mine complex owned and operated by Elkhorn Goldfields, Inc./Eastern Resources, Inc. (MDEQ, 2020). According to the BLM, there are four active lode claims within this section identified as Sourdough Fraction, South Sourdough, South Golden Curry, and South Golden Curry#2 (BLM, 2020). Based on a review of Google Earth aerial imagery, it appears the mine has seen some mining activity between approximately 2009 and 2014. No active mining was observed during the July 2017 PCS site reconnaissance and the mine was not observed during field activities for this SI.

- **Golden Curry Mine:** The Golden Curry mine (also known as Sourdough Complex) consists of the Sourdough and Golden Curry mines. The Golden Curry mine was discovered by John Rothfus in the late 1890s (Munson, 1989). The site lies within an area covered by seven claims called the Golden Curry No. 1, Golden Curry No. 2, Golden Curry No. 3, East Golden Curry, Golden Curry Mill Site, South Golden Curry No. 1, and South Golden Curry No. 2. Golden Curry Numbers 1, 2, and 3 are patented. They were patented in 1905 by John Rothfus, Charles B. Jacquemin, and Mathias L. Jacquemin. The Patent numbers are 42212, 42213 and 42214. The property, as well as the immediate area, became known as Sourdough because the miners had a diet of sourdough pancakes and sourdough bread (Munson, 1989). W.H. Weed of the USGS referred to the mines on the Golden Curry claims as the Jacquemin mines (Weed, 1901).

TDD 0004/1807-06

Weed reported that the Golden Curry mines were quite active in 1898, but were closed down by 1899 (Weed, 1901). The mines produced silver, gold, copper, and iron and were shipping iron ores to the East Helena smelter for flux. However, a closer and cheaper source of iron ore caused the mines to shut down. By 1910, the mine tunnels had caved and mining was done by open pit. The mine was shipping 20 tons of iron ore daily to the East Helena smelter for flux. The ore also averaged \$35 per ton in gold and 2.5% copper. Evidently, the shift to open pit mining made the mine competitive once again. The mine was still supplying flux to the East Helena smelter in 1913 and had produced 50,000 tons of ore. From 1904 to 1951, the Golden Curry property (Sourdough Complex) produced 98,445 tons of ore that yielded 23,868 ounces of gold, 11,542 ounces of silver, and 650,549 pounds of copper (Munson, 1989).

According to the BLM, there are four active lode claims within this section identified as Sourdough Fraction, South Sourdough, South Golden Curry, and South Golden Curry#2 (BLM, 2020). Records indicate the mine has not been actively mined since 1910, with the exception of mining activity in the complex ending in 1951, and this mine was not actively being mined as of the 2018 PCS and was not observed during field activities for this SI.

- **Mill:** The mill was constructed and never used (U.S Office of Surface Mining Reclamation and Enforcement [OSMRE] and Montana Department of State Lands [MDSL], 1993). No additional information regarding the operational history of the mill was identified.

2.3.2.4 Turnley Creek

The Trumley Heap Leach (aka Falcon Heap Leach) was constructed in 1978 and 1979 by Falcon Exploration Company. Construction involved clearing trees, grading the site, constructing a diversion ditch to route water around the site, hauling 26,500 cubic yards (CYs) of ore to the site, and placing ore on a synthetic liner. A lined pond was constructed at the downhill side of the pad to collect leachate solution. A cyanide leaching process was initiated in 1980, and in 1981 the pad was expanded to allow capacity for an additional 9,000 CYs of ore. The ore was placed in a 10-foot deep layer over an area of about 2 acres. In 1983, the heap leach pad was decommissioned by the mining company using sodium hypochlorite. In 1984, water remaining in the pond was land applied in the surrounding forest. In 1987, the USFS contracted for disposal of 1,000,000 gallons of solution that remained in the ponds using land application methods. Following land application of the solution, the ponds were buried and the site was reclaimed by re-grading the leach pad so it could drain, covering the pad and buried ponds with topsoil, and seeding the site. Several groundwater wells were installed to monitor water quality. No further remedial work has been conducted at the site since 1987 (USFS, 2005).

2.3.2.5 Queen Gulch

- **Skyline Mine (Elkhorn Skyline):** No information regarding the operational history of the Elkhorn mine has been identified. There is one active lode claim within this section

TDD 0004/1807-06

identified as Elkhorn Skyline (BLM, 2020); however, the mine is not currently being actively mined.

- **Boulaway Mine (Bulwer; Elkhorn-Bulwer):** The Boulaway (a.k.a. Bulwer) mine operated from 1913-1920 and produced 587 tons of ore with 53.6 tons of copper (USFS, 1977a).

2.3.2.6 South Fork Queen Gulch

The Elkhorn Queen mine was located in approximately 1880 and intensively worked until 1900. It was inactive until 1942 when it was reopened. The mine produced silver, gold, lead, zinc, and copper. A total of 11,820 tons of ore was mined from Elkhorn Queen between 1905 and 1956 (USFS, 1985). From this, 1,852 ounces of gold, 149,794 ounces of silver, 13,138 pounds of copper, 1,940,063 pounds of lead, and 56,163 pounds of zinc were recovered (USFS, 1977b). The mining method was through a main shaft and drifts.

2.4 PREVIOUS INVESTIGATIONS AND REGULATORY INVOLVEMENT

Inventories of abandoned mines in the district have been ongoing since 1988 with some mines undergoing investigations. In 2017 and 2018, EPA conducted a PCS that included a site reconnaissance and field data collection (water quality parameters, XRF screening, and physical hazards inventories) at the sites (WESTON, 2018). Descriptions of features inventoried, and summaries of screening and investigations conducted, by site, are presented in Table 2-1. A complete compilation of historical data for the sites included in this SI is presented in Appendix A of the *Pre-CERCLA Screening Report for Elkhorn Mining District, Jefferson County, Montana* (May, 2018).

Table 2-2 – Previous Investigations and Regulatory Involvement

Mine Site	Inventory/ Investigation Date(s)	Conducted By	Summary
Elkhorn Creek			
C & D mine	Inventory: 9/14/1988, 6/11/1996	OSMRE and MDSL, MDEQ	Site consists of four adits, five collapsed/collapsing buildings, one ore mill, one ore shoot, and a large tailings pile.
	PCS: 7/26/2017	EPA	Site consists of tailings with some waste rock piles, three adits (not draining), a stope, four collapsed/collapsing buildings, a powder storage room dug into the hillside, an ore mill, a large waste rock pile, and numerous exploratory trenches. PCS indicated elevated metals concentrations in tailings with a potential for recreational and airborne exposures.
Elkhorn Creek Tailings (King Mill)	Inventory: 8/8/1994	OSMRE and MDSL	Volume of the tailings estimated to be 51,635 CYs; concentrations of silver, arsenic, cadmium, copper, mercury, lead, antimony, and zinc were reported above three times background. Elkhorn Creek flows through site. Observed release was documented for lead and zinc. Exceedances were reported for cadmium above maximum contaminant limit (MCL), and cadmium and zinc above acute and chronic aquatic life standards.
	Cultural Resources Inventory and Assessment: 5/28/1998	MDEQ Mine Waste Cleanup Bureau	Site consists of King Mill and Elkhorn Creek Tailings. Site features include concrete remains of a tailings processing mill, several large tailings dumps, a flume, a cistern, and two impoundment dams. The King Mill was recommended to be eligible for the National Register of Historic Places as a site and as a historic mining landscape; however, to date it has not been added

TDD 0004/1807-06

This document was prepared by WESTON START for the identified user(s) and the EPA, as tasked by the EPA. It shall not be released or disclosed in whole or in part without the express written permission of the identified user(s) or the EPA.

Mine Site	Inventory/ Investigation Date(s)	Conducted By	Summary
	Site Investigation Report: September 2003	USFS	The north half of the site consists of vegetated bottomland underlain by tailings. The south half of the Elkhorn Creek tailings site consists of a pile of non-vegetated tailings. Tailings at the site cover ~6.6 acres. The total volume of tailings is estimated at 46,064 CY; concentrations of lead, antimony, and mercury exceeded respective risk-based clean-up guidelines. Concentrations in leachate of cadmium, copper, lead, and zinc exceeded respective acute aquatic life standards.
Elkhorn Creek Tailings (King Mill)	PCS: 7/26/2017	EPA	Site consists of King Mill and Elkhorn Creek Tailings located approximately 1,300 ft apart. Site features include the remains of the tailings processing mill, several large tailings piles, a dried tailings pond, and two impoundment dams. Tailings in the southernmost pile encompass approximately 2 acres of surface area and contain an estimated 51,000 CYs of tailings. The tailings material is generally unvegetated and comprised of fine white sand. The vegetated, dry tailings pond was approximately 200 yards X 100 yards and varied from approximately 5 to 10 ft deep. Exposed tailings were light reddish brown, fine sand. PCS indicated elevated metals concentrations in tailings present adjacent to Elkhorn Creek that were observed in the creek during the July 2017 site reconnaissance, close proximity of human receptors, wetlands, and a fishery are present on-site and within 15 downstream miles, and historic exceedances of chronic aquatic life standards documented in Elkhorn Creek. The site was highly used for recreation. Minor additional sampling could document an Observed Release to surface water using EPA Hazard Ranking System criteria.
Slaughterhouse Gulch			
Union Elkhorn	Inventory: 6/18/1985, 6/11/1996	OSMRE and MDSL, MDEQ	Site consists of one building and other broken wooden structures, one adit, two shafts, and waste rock piles; water observed coming from drainpipe at adit.
	Maintenance Site Inspection: 9/19/1989	MDEQ	Fencing on two shafts and door on adit reported in good condition, not in need of maintenance.

TDD 0004/1807-06

This document was prepared by WESTON START for the identified user(s) and the EPA, as tasked by the EPA. It shall not be released or disclosed in whole or in part without the express written permission of the identified user(s) or the EPA.

Mine Site	Inventory/ Investigation Date(s)	Conducted By	Summary
	PCS: 7/26/2017	EPA	Site consists of two shafts, one adit (not draining), and associated waste rock piles. Remnants of a former wooden and iron hoist in the vicinity of the main shaft, and a pipe coming out of the adit, were present. PCS indicated elevated metals concentrations in waste rock present adjacent to Slaughterhouse Gulch that was observed in the creek during the July 2017 site reconnaissance, and sensitive environments (wetlands and a fishery) are present within 15 miles downstream of the site.
Greyback Gulch			
Mill	Inventory: 8/20/1993	OSMRE and MDSL	The mill was constructed and never used.
	PCS: 6/12/2018	EPA	Site consists of three collapsed structures, milling equipment, and wood debris. The collapsed mill building is approximately 100 ft X 55 ft. The building is multiple levels with ore bins located in the upslope section. The downslope portion of the building is collapsed while the upslope portion has retained its walls. The downslope portion of the building has three ore chutes that are partially collapsed. There is a stone building that is approximately 30 ft X 30 ft with a collapsed roof. A third collapsed building is adjacent to the stone building and is approximately 20 ft X 40 ft. No potential hazardous containing sources were observed on the site during the June 2018 PCS site reconnaissance.
Turnley Creek			
Trumley Heap Leach (aka Falcon Heap Leach)	Inventory: 7/1/1994	OSMRE and MDSL	Volume of tailings undetermined. Site previously reclaimed, total depth of reclaimed tailings unknown. Reclamation effort consisted of application of cover soil and revegetation. Tailings were observed at the surface in isolated pockets. Concentrations of silver, arsenic, cadmium, copper, mercury, lead, antimony, and zinc were reported above three times the background. Turnley Creek flows adjacent to the site. No observed releases to Turnley Creek were documented; no MCLs or aquatic life criteria were exceeded. Four monitoring wells are located at the site, downgradient from the reclaimed tailings pond; no MCLs were exceeded in one sample that was collected.

TDD 0004/1807-06

This document was prepared by WESTON START for the identified user(s) and the EPA, as tasked by the EPA. It shall not be released or disclosed in whole or in part without the express written permission of the identified user(s) or the EPA.

Mine Site	Inventory/ Investigation Date(s)	Conducted By	Summary
	Site Investigation: 11/8/2004, Report Dated: January 2005	USFS	Five soil test pits and three water samples were collected. Analysis of samples indicate that the reclaimed spent ore contains total arsenic concentrations above human health cleanup guidelines used by the State of Montana at abandoned mine sites. Leachable concentrations of zinc were also of concern if leachate migrated from the lined former leach pad area. Manganese concentration exceeded human health guideline in shallow groundwater.
	PCS: 7/25/2017	EPA	Site consists of an open field that is partially vegetated with grasses and bare ground intermixed with apparent iron-stained spent ore. PCS indicated elevated metals concentrations in tailings with historic arsenic concentrations above the MDEQ Risk-Based Cleanup Guidelines for Abandoned Mine Sites, historic exceedance of manganese above the human health guideline in shallow groundwater, wetlands present adjacent to the site, and a fishery present within 15 miles downstream of the site. The site was accessible and highly utilized for recreating.
Queen Gulch			
Skyline	Inventory: 7/18/1988, 6/12/1996	OSMRE and MDSL, MDEQ	Site consists of three structures, one shaft, two adits, ore cart tracks, and waste rock. Site actively used by cross-country skiers.
	PCS:7/25/2017	EPA	Site consists of a cabin, a shed, an outhouse, one shaft, two adits (one draining) and associated waste rock and tailings, and rail lines. Recreational uses were evident at the site including sleeping bags, dishes, and other items inside the cabin. PCS indicated elevated metals concentrations in waste rock and tailings, slightly low pH in the adit drainage, both observed to be releasing into the head waters of Queen Creek, sensitive environments (wetlands and a fishery) are present within 15 miles downstream of the site. The site was accessible and highly used for recreating.
Boulaway	Inventory: 7/18/1988, 6/12/1996	OSMRE and MDSL, MDEQ	Site consists of three collapsed buildings, three shafts, one adit (with unlocked door), and waste rock.

TDD 0004/1807-06

This document was prepared by WESTON START for the identified user(s) and the EPA, as tasked by the EPA. It shall not be released or disclosed in whole or in part without the express written permission of the identified user(s) or the EPA.

Mine Site	Inventory/ Investigation Date(s)	Conducted By	Summary
	Cultural Site Record: 5/8/1985	USFS	Site consists of the remains of nine features (estimated as): shed, hoist house, ore bin located over and collapsed into a shaft area, an area where a structure likely once was, remains of a structure, a collapsed adit portal, root cellar or small adit, pile of lumber, some tin cans, and a stove pipe. Trenches located between the site and ridgeline are the result of mineral exploration, probably during the 1950s. There are no mineral surveys, General Land Office plat information, production figures, or references for this property. Structural remains suggest it may date to the 1930s or even as late as the 1950s. The site does not contribute to the significance of Elkhorn Historic District.
	PCS:7/24/2017	EPA	Site consists of a collapsed shaft, an adit (not draining), waste rock piles, numerous trenches and prospect pits, and other wooden debris of the former structure. PCS indicated elevated metals concentrations in waste rock with the potential to impact wetlands that are present on-site and a fishery within 15 downstream miles.
South Fork Queen Gulch			
Elkhorn Queen	Cultural Site Record: 5/7/1985	USFS	Site consists of seven structures and an outhouse. There are also three portals, an open pit, and a shaft. The site is located adjacent to the Elkhorn Historic District and should probably be included in the District boundary. It is not eligible for National Historic Preservation listing due to lack of setting integrity from early period but should be re-evaluated in the 1990s.
	Inventory: 9/12/1988	OSMRE and MDSL	Site consists of 5 buildings, a loading chute, shaft with headframe, two adits, one stope, and waste rock pile.
	Site Investigation: 8/16/1993	OSMRE and MDSL	The site consists of four buildings, one open, headframed shaft, one open, timbered adit, and one open stope. Volume of waste rock estimated at 23,000 CY. Elevated concentrations of zinc, iron, arsenic, lead, and cadmium were reported from waste rock samples.

TDD 0004/1807-06

This document was prepared by WESTON START for the identified user(s) and the EPA, as tasked by the EPA. It shall not be released or disclosed in whole or in part without the express written permission of the identified user(s) or the EPA.

Mine Site	Inventory/ Investigation Date(s)	Conducted By	Summary
	PCS:7/24/2017	EPA	Site consists of numerous intact structures including a mill building, hoist house, ore bin, cabins, one shaft with headframe, two adits (not draining), tailings, waste rock piles, and numerous trenches and prospect pits. PCS indicated elevated metals concentrations in waste rock and tailings, and sensitive environments (wetlands and a fishery) present within 15 miles downstream of the site. The site was accessible and highly used for recreation.

TDD 0004/1807-06

This document was prepared by WESTON START for the identified user(s) and the EPA, as tasked by the EPA. It shall not be released or disclosed in whole or in part without the express written permission of the identified user(s) or the EPA.

2.5 CURRENT CONDITIONS AND WASTE CHARACTERISTICS

2.5.1.1 Elkhorn Creek

- **C & D Mine:** The mine is comprised of three (3) adits (not draining), a stope, four collapsed/collapsing buildings, a powder storage room dug into the hillside, an ore mill, waste rock, and numerous exploratory trenches. A mining claim marker was observed near the background soil sample location for CD-SO-BK01/02 but the claim number was illegible (Appendix A, Photo 19). The mine is located on private property that is unfenced, undeveloped, and potentially utilized by owner, recreators, and/or trespassers and is accessible by hiking or high-clearance 4-wheel drive vehicles.

There is one waste rock pile (approximately 50 ft X 50 ft, unknown depth). XRF screening conducted on the pile during the July 2017 PCS site reconnaissance indicated levels of arsenic, copper, lead, and zinc exceeding three times the background concentration with concentrations of copper and lead exceeding over 10 times and arsenic at over 500 times background.

- **Elkhorn Creek Tailings:** The site consists of two separate areas, approximately 1,300 feet apart. The northernmost area consists of a large mill (sometimes historically referred to as the King Mill) and tailings pile on the east side of Elkhorn Road (USFS Road 258) and the southernmost area consists of a tailings pile and dried tailings pond on the west side of Elkhorn Road (USFS Road 258). There are no mining-related features such as adits or shafts associated with this site. Elkhorn Creek runs through both portions of the site.

There are tailings located both upstream and downstream of the former mill. This could be due to the fact that tailings were flumed downhill from the Elkhorn mine and mill to the mill, or the upstream tailings are attributable to the Carmody mine and mill. Since it is unknown, a lower portion of the upstream tailings have been attributed to the site while the northernmost tailings were attributed to Carmody mine. The tailings occur on both sides of the creek, are sparsely vegetated, and encompass approximately one-tenth of an acre. A large consolidated pile of tailings is immediately adjacent to the mill to the south, encompasses almost an acre of surface area, and contains an estimated 6,000 CYs which was estimated based on observations and professional judgement. The pile shows signs of erosion, and tailings are interspersed throughout the creek side downgradient of the main pile.

Tailings in the southernmost pile encompass approximately 2 acres of surface area and contain an estimated 51,000 CYs of tailings which was estimated based on observations and professional judgement. The tailings material is generally unvegetated and comprised of fine white sand. The pile is adjacent to Elkhorn Road (USFS Road 258), immediately adjacent to Elkhorn Creek, and extends over 100 feet up the hillside. In several locations, the pile is discharging material into the creek. A fishery is present on-site in Elkhorn Creek adjacent to the tailings that were observed in the creek; wetlands are present on-

TDD 0004/1807-06

site; and historic exceedances of cadmium, copper, lead, and zinc chronic aquatic life standards have been documented in Elkhorn Creek (WESTON, 2018).

A vegetated, dry tailings pond is located north of the southernmost tailings. The pond is approximately 200 yards X 100 yards and varies from approximately 5 to 10 feet deep. Exposed tailings were light reddish brown, fine sand.

During site reconnaissance activities on July 26, 2017 for the PCS conducted at the Site, XRF preliminary screening readings were collected from the multiple tailings locations from the northern and southern piles as well as a background sample taken in an area that was clearly identified outside of the influence of mining activities. The XRF screening results collected during the July 2017 PCS site reconnaissance activities indicated levels of arsenic, cadmium, lead, and zinc that exceeded three times background levels, with significantly elevated lead levels greater than 50,000 milligrams per kilogram (mg/kg) (WESTON, 2018).

The majority of the tailings/mill site is located on private property with a small portion of the southern tailings on USFS-administered public land. The site is unfenced, highly accessible, and utilized by UTVs, campers, visitors, and trespassers.

2.5.1.2 Slaughterhouse Gulch

The Union Elkhorn mine has two fenced, open shafts (one that is 80 ft deep) and a 240-foot tunnel (adit, not draining), both well timbered. The mine is located uphill from Slaughterhouse Creek with an approximate 50,000 CY (300 ft X 150 ft X 30 ft) benched waste rock pile located adjacent to the adit with the lowest bench located immediately adjacent to the creek. Waste rock was observed in the creek. Remnants of a former wooden and iron hoist were present in the vicinity of the first shaft and a 25,000 CY (150 ft X 150 ft X 30 ft) waste rock pile is located downhill of the shaft and hoist structure. A pipe coming out of the adit was observed to be seeping water (flow <1 gallon per minute) during the June 2019 sampling event (Appendix A, Photo 45), but was not observed to be draining during the September 2019 sampling event. The drainage absorbed into the waste rock pile within a few feet of discharge from the pipe.

The site is located on private property and is unfenced, undeveloped, potentially utilized by the owner, recreators, and/or trespassers, and accessible by hiking or high clearance, 4-wheel drive vehicles.

2.5.1.3 Greyback Gulch

The Sourdough and Golden Curry mines are located in the Greyback Gulch drainage and were identified during the PCS as qualifying for further assessment. However, these mines were not assessed during the SI due to access issues. Locations downstream of the Sourdough and Golden Curry mine sites were sampled to capture conditions in Greyback Gulch below these mines and included areas upstream and downstream of the Mill site to rule out any potential contributions from that site. Although not directly evaluated in this SI, the current conditions for the Sourdough and Golden Curry mine sites are presented below for reference in relation to information and data collected as part of this SI.

TDD 0004/1807-06

- **Sourdough Mine:** The site is located within a partially fenced permitted (Operating Permit #00173) mine complex owned and operated by Elkhorn Goldfields, Inc./Eastern Resources, Inc. (MDEQ, 2020). According to the BLM, there are four active lode claims within this section identified as Sourdough Fraction, South Sourdough, South Golden Curry, and South Golden Curry#2 (BLM, 2020); however, these mines were not actively being mined as of the 2018 PCS and were not observed during field activities for this SI.

The site consists of six closed adits (not draining), one open portal, one collapsed adit (not draining), numerous collapsed structures, prospect pits, tailings/waste rock piles, and one groundwater well. There are approximately 14,000 CY of tailings present on the site which was estimated based on observations and professional judgement during the PCS. XRF screening conducted on the tailings piles during the July 2017 PCS site reconnaissance indicated levels of arsenic, lead, copper, and zinc that exceeded three times background levels with concentrations of arsenic and copper at over 70 and 50 times background, respectively. Historical sampling of the sediment in Greyback Gulch below the confluence with the adit drainage indicated concentrations of arsenic, barium, cobalt, chromium, copper, iron, manganese, nickel, lead, and zinc that exceeded three times the upstream sample concentration. Historical samples collected from the on-site groundwater wells from 1989-1992 did not indicate elevated concentrations of metals. Greyback Gulch flows adjacent to the site with wetlands present on-site, and a fishery present on Elkhorn Creek within approximately 2.5 miles downstream of the site.

The site is on private property, is partially fenced with a gate at the entrance to the Goldfields Mining Complex, developed for mining, utilized by maintenance workers and trespassers, and easily accessible by vehicle past the gate or by all-terrain vehicles. The mine was not visited during the 2019 sampling events due to access issues.

- **Golden Curry Mine:** The site is located within a partially fenced permitted (Operating Permit #00173) mine complex owned and operated by Elkhorn Goldfields, Inc./Eastern Resources, Inc. (MDEQ, 2020). According to the BLM, there are four active lode claims within this section identified as Sourdough Fraction, South Sourdough, South Golden Curry, and South Golden Curry#2 (BLM, 2020); however, these mines were not actively being mined as of the 2018 PCS and were not observed during field activities for this SI.

Greyback Gulch flows through the site and adjacent to the Golden Curry waste rock/tailings pile before it discharges into Turnley Creek. The site consists of one collapsed adit (approximately 1 ft X 1 ft opening) (not draining) with a wood frame opening and associated waste rock/tailings pile (approximately 250ft X 150 ft X 10 ft) which was estimated based on observations and professional judgement during the 2017 PCS site reconnaissance. A partially collapsed wood framed wall was present between the adit and Greyback Gulch. No evidence of recent draining from the adit was observed during the PCS but historical sampling of adit drainage was conducted but did not exceed background. Sediment was observed in Greyback Gulch adjacent to the pile. Historic sediment samples indicated concentrations of arsenic, barium, cobalt, copper, chromium, iron, lead, manganese, nickel, and zinc above three times background. XRF screening conducted during the PCS indicated levels of arsenic and copper that exceeded three

TDD 0004/1807-06

times background levels with arsenic at over 10 times background and copper at over 15 times background levels, respectively. The site consists of three waste piles that are approximately 1,800 CY, (55 ft X 45 ft X 20 ft), 2,200 CY (45 ft X 55 ft X 25 ft), and 36 CY (20 ft X 8 ft X 6 ft) totaling approximately 13,900 CY. Waste piles were observed adjacent to Queen Gulch, but it is unknown if they are migrating to the creek. Queen Gulch is located approximately 10 ft downgradient of the most downgradient waste pile and wetlands are present on-site and adjacent to the waste rock. XRF readings from the waste rock associated with the trench and prospect pit exceeded the three times background levels for lead, copper, and zinc with the most significant levels detected in the waste rock associated with the prospect pit. XRF levels of copper and zinc in this waste rock were over 150 and 400 times the background levels, respectively. The site is on private property, is partially fenced with a gate at the entrance to the Goldfields Mining Complex, developed for mining, utilized by maintenance workers and trespassers, and easily accessible by vehicle past the gate or by all-terrain vehicles. There is the potential for worker exposure to elevated levels of copper above three times background in the waste rock/tailings present. The mine was not visited during the 2019 sampling events due to access issues.

- **Mill:** The site consists of three collapsed structures, milling equipment, and wood debris. The multi-level mill building is approximately 100 ft X 55 ft with ore bins located in the upslope section. The downslope portion of the building is collapsed while the upslope portion has retained its walls. The downslope portion of the building has three ore chutes that are partially collapsed. The stone building is approximately 30 ft X 30 ft with a collapsed roof. A third, collapsed building adjacent to the stone building is approximately 20 ft X 40 ft. No wastes were observed on the site. Other field observations included an outhouse and camping area with fire pit located downslope and west of the site on Greyback Gulch (approximate location 46.280690° North latitude and -111.969785° West longitude). A stream gauge was also observed in the creek near this location. Greyback Gulch is located approximately 600-ft downslope of the site with wetlands present adjacent to the creek.

The site is located on USFS-administered land, near the currently permitted (Operating Permit #00173) mine complex owned and operated by Elkhorn Goldfields, Inc./Eastern Resources, Inc. (MDEQ, 2020), and is accessible by hiking.

2.5.1.4 Turnley Creek

The Trumley Heap Leach site consists of an open field that is partially vegetated with grasses and bare ground intermixed with an apparent iron-stained spent ore pocket located approximately 200-ft from Turnley Creek across Tramway Road. Wetlands are present on Turnley Creek on the east side of Tramway Road and less than 50 ft from the site. XRF screening of the possible spent ore pockets indicated levels of lead, arsenic, and zinc exceeding three times the background concentrations with arsenic exceeding at nearly 10 times at one location. The most recent sampling of soil and water samples collected from the site in 2004 indicated that the reclaimed spent ore contained total arsenic concentrations that were above the human health cleanup guidelines used

TDD 0004/1807-06

at the time (MDEQ Risk-Based Cleanup Guidelines for Abandoned Mine Sites) (MDEQ, 1996), and that shallow groundwater was impacted with a reported exceedance of manganese above the human health guideline.

The site is on USFS-administered land that is unfenced, undeveloped, utilized by recreators, and easily accessible by vehicle. During the June 2019 sampling activities, shooting targets and firing points were observed on the western portion of the site.

2.5.1.5 Queen Gulch

- **Skyline Mine:** There is one active lode claim within this section identified as Elkhorn Skyline (BLM, 2020); however, the mine is not currently actively being mined.

The site is comprised of a cabin, a shed, an outhouse, one shaft, two collapsed adits (one draining), waste rock (approximately 250 CY) and tailings (approximately 150 CY) piles, and rail lines. XRF screening conducted on the piles during the July 2017 PCS site reconnaissance indicated levels of arsenic, copper, lead, and zinc that exceeded three times background levels with concentrations of arsenic, lead, and zinc exceeding 10 times the background levels. Queen Creek originates at the site and flows through the waste rock, and a fishery (Leslie Lake) is present approximately 0.3 miles downstream of the site. The draining adit on the site drains through the waste rock pile and into the creek.

The site is located on USFS-administered land that is unfenced, highly utilized by recreators, and accessible by 4-wheel drive vehicle and hiking. Recreational uses were evident at the site including sleeping bags, dishes, and other items inside the cabin on the site. During the September 2019 sampling activities, two gentlemen were also encountered camping in the cabin at the mine and were reportedly bow hunting for grouse.

- **Boulaway Mine (Bulwer; Elkhorn-Bulwer):** The mine is located on a steep slope adjacent to Queen Gulch. One upper waste pile is located immediately adjacent and downhill of the shaft and is approximately 1,800 CY (55 ft X 45 ft X 20 ft). A second upper waste pile is adjacent to the collapsed wooden structure on the site, north of the shaft, and is approximately 2,200 CY (45 ft X 55 ft X 25 ft). The third waste rock pile is approximately 36 CY (20 ft X 8 ft X 6 ft) and is located immediately uphill of Queen Gulch creek. XRF readings from the waste rock pile adjacent to the shaft significantly exceeded background levels for lead, copper, and zinc with concentrations exceeding over 10, 200, and 100 times background, respectively. XRF readings from the waste rock associated with the trench and prospect pit exceeded the three times background levels for lead, copper and zinc with the most significant levels detected in the waste rock associated with the prospect pit. XRF levels of copper, and zinc in this waste rock were over 150 and 400 times the background levels, respectively. Waste piles were observed adjacent to Queen Gulch, but it is unknown if they are migrating to the creek. Queen Gulch is located approximately 10 ft. downgradient of the most downgradient waste pile and wetlands are present on-site and adjacent to the waste rock.

TDD 0004/1807-06

The site is on USFS-administered land that is unfenced, utilized by recreators, and easily accessible by vehicle, as Queen Gulch Road (USFS Road 8578) runs through the site.

2.5.1.6 South Fork Queen Gulch

The Elkhorn Queen mine has numerous intact structures including a mill building, hoist house, ore bin, cabins, one shaft with headframe, two adits (not draining), tailings, waste rock piles, and numerous trenches and prospect pits. There is approximately 23,000 CY of waste rock and tailings present. The Elkhorn Queen mine is located approximately 650 ft south and upgradient of the South Fork of Queen Gulch, which did not show evidence of surface water conveyance during either the PCS site reconnaissance or the 2019 SI field work. Two other adits (not draining) are present in the surrounding area and are being included as part of the Elkhorn Queen mine.

3.0 SCREENING BENCHMARKS

The surface water, sediment, and waste material sample data collected during the SI investigation were reviewed and compared to potentially applicable regulatory benchmarks and other risk-based criteria. It should be noted that the benchmarks are used as a conservative screening tool and exceedances of these benchmarks do not automatically indicate a risk or that a response action is warranted but may indicate additional data or evaluation is needed. There are different types of available benchmarks that are used to assess analytical results and provide a relative understanding of the site conditions. Analytical results were compiled and evaluated using several different types of benchmarks in order to:

- Document if a contaminant release has occurred as defined by HRS criteria
- Evaluate through the HRS scoring process if the site is eligible for the NPL as a result of historical mining activities at the site
- Assess the relative risk to human health and the environment

Screening benchmarks are described in the following subsections.

3.1 HRS BENCHMARKS

- Comparison to Three Times mine/mill site-specific Background Results
- Superfund Chemical Data Matrix (SCDM) Hazardous Substance Benchmarks, Surface Water Pathway – Environmental and Drinking Water and Soil Exposure Benchmarks (EPA, 2018)

Data were evaluated for use in documenting an Observed Release using HRS criteria for each pathway (i.e., groundwater, surface water, soil, and air), as applicable, in accordance with EPA guidance for “Establishing an Observed Release” (September 1995). An Observed Release is based on evidence that contaminants have migrated from a site through a pathway or medium (EPA, 1995b). The HRS establishes two general criteria to document an observed release: 1) there must be evidence of a hazardous substance in the medium of concern at a concentration significantly (three times) above the mine site-specific background level, and 2) the release of the

TDD 0004/1807-06

hazardous substance must be at least partially attributable to the site under investigation (Hazard Ranking System, Final Rule, 40 CFR Part 300, App. A) (EPA, 1995b). An observed release can be determined either by chemical analysis of samples, or by directly observing the release of the hazardous substance (to be documented) into the medium of concern (EPA, 1995b).

Documenting an Observed Release is a prerequisite for evaluating actual contamination at human and environmental targets, which indicates a high likelihood of exposure to hazardous substances (EPA, 1995b). The level of actual contamination is determined by comparing concentrations in release samples (for example a surface water sample downstream of a source of contamination) to SCDM health-based or environmental benchmark values, where available (EPA, 1995b).

Per EPA “Guidance for Performing Site Inspections Under CERCLA” (EPA, 1992a), background data were compared against mine site-specific analytical results. Surface water sample locations were compared to downstream samples in order to assess metals concentrations that could be attributed to mine adit drainages and/or waste piles. Background sample locations were selected from upstream of each mine site (potential source) and presumably outside of the influence of any other mining activities associated with each mine site.

As required by EPA HRS guidance, the three times background concentration was calculated for each analyte using the detected laboratory result for surface water background samples. An Observed Release is documented when a hazardous substance is detected at a concentration equal to or greater than three times the detected background concentration and is attributable to the site. If a background concentration is not detected, then an Observed Release is documented when the sample concentration equals or exceeds the sample quantitation limit of the background sample (EPA, 1995b).

3.2 HUMAN HEALTH AND ENVIRONMENT SCREENING BENCHMARKS

The human health and environment evaluation involved comparison to relevant benchmarks or standards, where available.

Surface Water

- EPA Maximum Contaminant Levels (MCLs), National Primary Drinking Water Regulations (EPA, 2009)

Surface water samples were compared to EPA MCLs which are established through the National Primary Drinking Water Regulations (NPDWR) and are legally enforceable primary standards that apply to public water systems. Primary standards protect public health by limiting the levels of contaminants in drinking water. MCLs comparisons are presented for informational purposes based on state designation for Elkhorn Creek and the Boulder River for protection of drinking water use classifications, though there are currently no surface water intakes used for potable drinking water within the basin, on Elkhorn Creek or Boulder River within 15 miles downstream of the sites, or anywhere on the Boulder River downstream of the sites (MDEQ, 2018; EPA, 2020a; Montana Tech of the University of Montana, 2020).

- MT Numeric Water Quality Standards, Aquatic Life (MDEQ, 2019)

TDD 0004/1807-06

Surface water samples were compared to the numeric criteria for aquatic wildlife and human health in the MT Numeric Water Quality Standards (June 2019). The standards are protective of the designated beneficial uses of state waters, such as growth and propagation of fishes and associated wildlife, waterfowl and furbearers, drinking water, culinary and food processing purposes, recreation, agriculture, and industry and other commercial purposes (MDEQ, 2019). These criteria were compared to dissolved sample concentrations for select metals for which the State has developed criteria, and include aluminum, arsenic, cadmium, copper, lead, mercury, nickel, selenium, silver, and zinc. Of these metals, cadmium, chromium III, copper, lead, nickel, silver, and zinc are hardness-dependent criteria which require calculations of the standard based on sample-specific hardness values. Calculations are presented on Table 6b.

Sediment

- Threshold Effect Concentration (TEC): EPA Region III BTAG - Freshwater Sediment Screening Benchmarks, August 2006 (EPA, 2006), which are based on Consensus-based Sediment Quality Guidelines for Freshwater Ecosystems (MacDonald et al., 2000)
- Probable Effect Concentration (PEC): Prediction of sediment toxicity using consensus-based freshwater sediment quality guidelines (EPA, 2000)

NOTE: Consensus-Based sediment benchmarks are not promulgated standards and are considered in screening for potential impacts to aquatic benthic invertebrates only. Comparisons to the sediment benchmarks are provided for informational purposes only. The benchmarks were established by a national workgroup of sediment experts who completed review and compilation of available sediment toxicity studies found in peer-reviewed ecotoxicological literature related to a variety of benthic macroinvertebrate species and determined to meet quality control criteria related to the study design and performance. The studies used to derive the benchmarks are from a pool of sites located in various parts of the country in different types of sediment.

The effects that occurred in the peer-reviewed studies and reflected in the benchmarks may not be indicative of potential effects occurring in Elkhorn Mining District. Exceedances of a benchmark are presented for relative assessment of the potential for impacts to benthic invertebrates, however, impacts are dependent on site-specific sediment characteristics which would require additional site-specific characterization. The results of this sediment benchmark screening are considered in context with mine/mill waste characterization as well as other standards and benchmarks for a determination of potential for impacts and need for additional assessment or actions.

Soil

- EPA Regional Screening Levels (RSLs), Industrial Soils (EPA, 2020b)

Soil samples were compared to EPA Industrial Soil RSLs. The EPA RSLs are included to provide comparison to the most conservative (i.e., most protective) risk-based benchmarks and to provide a baseline level of comparative risk. The primary use of the risk-based benchmarks is to identify analytes that are detected at concentrations that are below these conservative benchmarks, thus,

TDD 0004/1807-06

the analytes detected below these benchmarks can safely be eliminated from further assessment and the evaluation can focus on other analytes that may be of concern. Analytes that are detected above a screening benchmark do not necessarily indicate a risk, but rather that additional evaluation may be needed.

4.0 WASTE/SOURCE SAMPLING

Using EPA HRS criteria (40 Code of Federal Regulations [CFR] Part 300, App. A, 1997), a contaminant source is defined as an area where a hazardous substance has been deposited, stored, disposed, or placed, plus those soils that have become contaminated from migration of a hazardous substance. In general, however, the volumes of air, groundwater, surface water, and surface water sediments that may have become contaminated through migration are not considered sources (EPA, 1992b). Known and potential sources in the investigation area include heavy metals contaminated waste rock, tailings, and groundwater discharging from mine adits and expressed as surface water drainage associated with former mining and milling processes. There may be other sources present within the subwatershed that have not been sampled and/or evaluated in this SI.

Samples were collected from the source areas described for the individual sites described in Section 2.5 to document contaminants of concern (COCs) in source surface water and waste material/soil samples as required by the HRS. HRS evaluation merely documents presence/absence of a hazardous substance in an environmental media (source samples) in order to affirm contribution of that contaminant from a specific source to the surrounding environment (release samples). HRS source samples evaluated in this SI are presented in Tables 3a, 4a, and 5a, while source samples evaluated for human health and the environment are presented in Tables 3b, 4b, and 5b.

4.1 ADIT DRAINAGE

4.1.1 Sample Locations

Samples were collected from adit drainage at two locations: Union Elkhorn mine and Skyline mine. Drainage from Union Elkhorn mine is in the Slaughterhouse Gulch drainage and Skyline mine is located at the headwaters of Queen Gulch. Sample locations are described in Table 1 and presented in Figure 7 and Figure 10.

4.1.2 Analytical Results Summary

Slaughterhouse Gulch

Union Elkhorn Mine

One sample was collected from pipe drainage exiting the adit (UE-SW-04) during the June 2019 sampling event. No drainage was observed during the September 2019 sampling event. A complete analytical data summary is presented in Table 3a and Table 3b, laboratory analytical data and data validation reports are included in Appendix B. The adit drainage sample analytical results were compared against the MT Numeric Water Quality Standards, Aquatic Life (MDEQ, 2019), see

TDD 0004/1807-06

Section 3.2 for a more detailed description of this screening benchmark. A summary of the analytical results exceeding screening benchmarks is as follows:

- Dissolved cadmium and zinc were detected at concentrations that exceed their respective acute and chronic Aquatic Life Standards.
- Dissolved copper and lead were detected at concentrations that exceed their respective chronic Aquatic Life Standards.

Queen Gulch

Skyline Mine

Two samples, including a duplicate, were collected from adit drainage (SM-SW-02 and SM-SW-05 [duplicate]) and adit drainage sediments (SM-SD-02 and SM-SD-05 [duplicate]) during the September 2019 sampling event. A complete analytical data summary is presented in Tables 3a, 3b, 4a, and 4b; laboratory analytical data and data validation reports are included in Appendix B. The adit drainage sample analytical results were compared against the MT Numeric Water Quality Standards, Aquatic Life (MDEQ, 2019) and the sediment samples were compared against TEC and PEC values, see Section 3.2 for a more detailed description of these screening benchmarks. A summary of the analytical results exceeding screening benchmarks is as follows:

- Dissolved cadmium was detected at concentrations exceeding the acute Aquatic Life Standards from sample SM-SW-02 and chronic Aquatic Life Standards from the SM-sample SW-05.
- Dissolved zinc was detected at a concentration exceeding the acute and chronic Aquatic Life Standards from both samples.
- Arsenic, cadmium, nickel, and zinc were detected at concentrations exceeding both TEC and PEC values in both sediment samples.
- Lead and manganese were detected at concentrations exceeding both TEC and PEC values for these analytes in sediment sample SM-SD-05.
- Chromium and copper were detected at concentrations exceeding the TEC values for these analytes in both sediment samples.
- Antimony and silver were detected at concentrations exceeding the TEC values for these analytes in sediment sample SM-SD-05.
- Lead was detected at a concentration exceeding the TEC value in sediment sample SM-SD-02.
- Manganese was detected at a concentration exceeding the PEC value in sediment sample SM-SD-02.

TDD 0004/1807-06

4.2 WASTE PILES

4.2.1 Sample Locations

Waste material samples were collected from a total of 59 locations (14 from C & D mine, 7 from Elkhorn Creek Tailings, 8 from Union Elkhorn mine, 2 from Trumley Heap Leach, 8 from Skyline mine, 12 from Boulaway mine, and 8 from Elkhorn Queen mine). These sampled areas meet the definition of “pile” described in HRS Table 2-5, indicating they could also be evaluated as potential sources of contamination for HRS scoring purposes (EPA, 1990).

In-situ XRF field screening was conducted to assist in identifying ranges of key metals concentrations (e.g., arsenic and lead) for use in selecting representative areas of the waste pile with the highest reading(s) for sample collection for laboratory analysis. The XRF results are presented by site in Table 8a through Table 8g.

Additional samples included three opportunity samples: one 5-point composite (BM-WR-OP-01) waste rock sample and one grab (BM-WR-OP-02) waste rock sample collected from a waste pile at Boulaway mine that was visually different blue rock material than the piles adjacent to it (locations BM-WR-13/14 and BM-WR-17/18) and one discrete soil grab sample (ECT-SO-OP-01) collected from the east side of Elkhorn Road (USFS Road 258) from the tailings impoundment (location ECT-WR-03/04).

Sample locations are described in Table 1 and presented on Figure 5 through Figure 12.

4.2.2 Analytical Results Summary

Elkhorn Creek

C & D Mine

Seven grab waste material samples, including a duplicate, were collected from the C & D mine during the June 2019 sampling event, as follows: tailings material (CD-WR-02, CD-WR-06, CD-WR-8, CD-WR-10) and waste material (CD-WR-04, CR-WR-12, CD-WR-14). A background grab soil sample was collected from a geologically similar area representative of the waste pile area, but outside the influence of mining activities (CD-SO-BK02). The complete analytical data summaries are presented in Table 5a, laboratory analytical data and data validation reports are included in Appendix B. The following summary includes the ranges of COCs detected in the C & D mine waste pile samples that were generally considered during the HRS evaluation:

Analyte	Concentration Range
Arsenic	14.8 mg/kg to 315 mg/kg
Cadmium	3.8 mg/kg to 246 mg/kg
Chromium	5.3 mg/kg to 45.6 mg/kg
Copper	784 mg/kg to 11,000 mg/kg
Lead	1,720 mg/kg to 38,200 mg/kg
Manganese	246 mg/kg to 2,310 mg/kg

TDD 0004/1807-06

Mercury	0.12 mg/kg to 0.98 mg/kg
Zinc	252 mg/kg to 15,400 mg/kg

Elkhorn Creek Tailings

Three grab waste material samples (tailing material) were collected from Elkhorn Creek Tailings during the June 2019 sampling event (ECT-WR-02, ECT-WR-04, ECT-WR-06). The complete analytical data summaries are presented in Table 5a; laboratory analytical data and data validation reports are included in Appendix B. The following summary includes the ranges of concentrations of COCs detected in Elkhorn Creek Tailings mine waste pile samples that were generally considered during the HRS evaluation:

Analyte	Concentration Range
Antimony	188 mg/kg to 667 mg/kg
Arsenic	230 mg/kg to 797J mg/kg
Cadmium	115 mg/kg to 231 mg/kg
Chromium	1.4 mg/kg to 4.7 mg/kg
Copper	331 mg/kg to 1,460 mg/kg
Lead	4,140 mg/kg to 15,400 mg/kg
Manganese	1,220 mg/kg to 3,590 mg/kg
Mercury	2.8 mg/kg to 126 mg/kg
Nickel	3.8 mg/kg to 9.4 mg/kg
Zinc	12,100 mg/kg to 37,500 mg/kg

Slaughterhouse Gulch

Union Elkhorn Mine

Four grab waste material samples, including a duplicate, were collected from the Union Elkhorn mine during the June 2019 sampling event (UE-WR-02, UE-WR-04, UE-WR-06, and UE-WR-08). The complete analytical data summaries are presented in Table 5a; laboratory analytical data and data validation reports are included in Appendix B. The following summary includes the ranges of concentrations of COCs detected in the Union Elkhorn mine waste pile samples that were generally considered during the HRS evaluation:

Analyte	Concentration Range
Arsenic	97.9 mg/kg to 468 mg/kg
Cadmium	33.2 mg/kg to 463 mg/kg
Chromium	0.74 mg/kg to 22.9 mg/kg
Copper	582 mg/kg to 1,020 mg/kg
Lead	15,500 mg/kg to 33,700 mg/kg
Manganese	463 mg/kg to 3,790 mg/kg

TDD 0004/1807-06

Analyte	Concentration Range
Mercury	1.5 mg/kg to 3.8 mg/kg
Silver	10.7 mg/kg to 350 mg/kg
Zinc	5,580 mg/kg to 17,100 mg/kg

Turnley Creek

Trumley Heap Leach

One grab waste material sample (THL-WR-02) was collected from the Trumley Heap Leach site during the June 2019 sampling event. One grab soil sample was collected from a geologically similar area representative of the waste material area, but outside the influence of mining activities (THL-SO-BK-02). The complete analytical data summaries are presented in Table 5a; laboratory analytical data and data validation reports are included in Appendix B. The following summary includes the ranges of concentrations of COCs detected in the Trumley Heap Leach sample that were generally considered during the HRS evaluation:

Analyte	Concentration
Arsenic	260 mg/kg
Cadmium	2.2 mg/kg
Chromium	13 mg/kg
Copper	21.6 mg/kg
Lead	66.1 mg/kg
Manganese	652 mg/kg
Mercury	0.039 mg/kg
Zinc	219 mg/kg

Queen Gulch

Skyline Mine

Four grab waste material samples, including a duplicate, were collected from the Skyline mine during the September 2019 sampling event (SM-WR-04, SM-WR-06, SM-WR-08, and SM-WR-09). A background grab soil sample was collected from a geologically similar area representative of the waste pile area, but outside the influence of mining activities (SM-SO-BK02). The complete analytical data summaries are presented in Table 5a; laboratory analytical data and data validation reports are included in Appendix B. The following summary includes the ranges of concentrations of COCs detected in the Skyline mine waste pile samples that were generally considered during the HRS evaluation:

Analyte	Concentration Range
Arsenic	2,270 mg/kg to 10,900 mg/kg
Cadmium	19.9 mg/kg to 191 mg/kg

TDD 0004/1807-06

Analyte	Concentration Range
Chromium	20.6 mg/kg to 159 mg/kg
Copper	149 mg/kg to 834 mg/kg
Lead	418 mg/kg to 27,000 mg/kg
Manganese	939 mg/kg to 1,730 mg/kg
Mercury	0.0065 mg/kg to 0.14 mg/kg
Zinc	407 mg/kg to 4,880 mg/kg

Boulaway Mine

Six grab waste material samples, including a duplicate, were collected from the Boulaway mine during the June 2019 sampling event (BM-WR-06, BM-WR-14, BM-WR-16, BM-WR-18, BM-WR-20, and BM-WR-OP-02). A background grab soil sample was collected from a geologically similar area representative of the waste pile area, but outside the influence of mining activities (BM-SO-BK02). The complete analytical data summaries are presented in Table 5a; laboratory analytical data and data validation reports are included in Appendix B. The following summary includes the ranges of concentrations of COCs detected in the Boulaway mine waste pile samples that were generally considered during the HRS evaluation:

Analyte	Concentration Range
Arsenic	162 mg/kg to 2,900 mg/kg
Cadmium	34.6 mg/kg to 178 mg/kg
Chromium	1.3 mg/kg to 30.7 mg/kg
Copper	1,170 mg/kg to 16,000 mg/kg
Lead	44 mg/kg to 582 mg/kg
Manganese	1,380 mg/kg to 12,400 mg/kg
Mercury	0.039 mg/kg to 0.79 mg/kg
Zinc	5,840 mg/kg to 47,800 mg/kg

South Fork Queen Gulch

Elkhorn Queen Mine

Four grab waste material samples were collected from the Elkhorn Queen mine during the June 2019 sampling event (EQ-WR-02, EQ-WR-04, EQ-WR-06, and EQ-WR-08). A background grab soil sample was collected from a geologically similar area representative of the waste pile area, but outside the influence of mining activities (EQ-SO-BK02). The complete analytical data summaries are presented in Table 5a; laboratory analytical data and data validation reports are included in Appendix B. The following summary includes the ranges of concentrations of COCs detected in the Elkhorn Queen mine waste pile samples that were generally considered during the HRS evaluation:

TDD 0004/1807-06

Analyte	Concentration Range
Aluminum	4,170 mg/kg to 14,800 mg/kg
Arsenic	654 mg/kg to 4,790 mg/kg
Cadmium	4.7 mg/kg to 89.4 mg/kg
Chromium	1.8 mg/kg to 4.8 mg/kg
Copper	34.5 mg/kg to 69.1 mg/kg
Lead	1,270 mg/kg to 25,500 mg/kg
Manganese	431 mg/kg to 4,360 mg/kg
Mercury	0.14 mg/kg to 0.36 mg/kg
Zinc	847 mg/kg to 9,420 mg/kg

4.3 CONCLUSIONS

Based on the sources of known or suspected hazardous waste, historic uses, and SI data collection and analytical results, the associated COCs in the investigation area are heavy metals (aluminum, antimony, arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, silver, and zinc). The sources of these COCs are summarized by drainage and the individual mine or mill site in Table 4-1.

Table 4-1 – Source Area Summary

Site	Source ¹
Elkhorn Creek	
C & D Mine	15,000 CY tailings and waste rock piles
Elkhorn Creek Tailings	44,346 CY tailings piles (USFS, 2003) 7,718 CY dried tailings impoundment (USFS, 2003)
Slaughterhouse Gulch	
Union Elkhorn	75,000 CY waste rock piles Adit drainage
Turnley Creek	
Trumley Heap Leach	2-acre reclaimed former heap leach pad, approximately 26,500 CY ore (USFS, 2005)
Queen Gulch	
Skyline Mine	400 CY tailings and waste rock piles Adit drainage
Boulaway Mine	4,000 CY waste rock piles
South Fork Queen Gulch	
Elkhorn Queen Mine	23,000 CY waste rock piles

¹ Feature dimensions were estimated based on Google Earth, observations and professional judgement, except where cited

5.0 GROUNDWATER PATHWAY

The groundwater migration pathway evaluates: 1) the likelihood that sources at a site actually have released, or potentially could release, hazardous substances to groundwater; 2) the characteristics of the hazardous substances that are available for a release (i.e., toxicity, mobility, and quantity); and 3) the receptors (targets) who actually have been, or potentially could be, impacted by the release. These factors are applied to potable groundwater wells within a 4-mile radius of a potential source.

5.1 GEOLOGIC AND HYDROGEOLOGIC SETTING

The southern Elkhorn Mountains are a thick sequence of sedimentary and layered volcanic rocks, which have been folded, faulted and cut by a variety of intrusive rocks. The oldest rocks are mudstones, shale, and sandstone in the Belt series of the upper Precambrian. These rocks are covered by a thin layer of Flathead quartzite of the Middle Cambrian. This in turn is covered by marine carbonate rocks, shale, and sandstone of the Cambrian, Devonian, Carboniferous, and Permian ages. A thin layer of Upper Jurassic marine sandstone is succeeded by nonmarine Upper Jurassic and Lower Cretaceous sandstone and shale. These rocks are overlain by thick deposits of nonmarine and marine sandstone, mudstone, and shale of the Colorado group that grade upward into sandstone and volcanic tuff. In some localities these rocks grade upward into andesitic volcanic rocks of the Late Cretaceous age. Most of the mineral deposits are in either sedimentary rocks or the andesite, or at the contact zone with the quartz monzonite. Gold, silver, lead and copper occur in Paleozoic sediments cut by diorite, gabbro, and quartz monzonite (MDEQ, no date).

Hydrogeologic information for the area indicates that groundwater movement through skarn, sedimentary argillite, and quartz monzonite rocks is primarily through secondary fracture openings, many of which occur along structural and lithologic contact zones. Shallow groundwater is present in unconsolidated alluvium along the drainage bottoms. Direction of groundwater flow in bedrock generally follows topography (MDEQ, 2008).

5.1.1.1 Groundwater Levels

According to the Montana Bureau of Mines and Geology (MBMG) Ground Water Information Center (GWIC) database, depth to groundwater measured in wells along Elkhorn Creek, Slaughterhouse Gulch, and Greyback Gulch near the town of Elkhorn varies from 15 ft to over 170 ft below ground surface (bgs) (Montana Tech of the University of Montana, 2020). Additional information on groundwater levels in the vicinity of the sites is provided in the following section.

5.2 GROUNDWATER PATHWAY TARGETS

Groundwater is used as the primary source of drinking water in the CDP of Elkhorn. According to the 2010 Census, the total population of Elkhorn is 10 and the average number of persons per household in Jefferson County, Montana, is 2.51 (U.S. Census Bureau, 2010). According to a query of all wells in the GWIC and the EPA Safe Drinking Water Information System (SDWIS), there are one fire protection, eight industrial, four irrigation, six stock watering, one research, three

TDD 0004/1807-06

others, one unknown, one public supply, and 31 domestic wells within an approximate 4-mile radius and within the basin (EPA, 2020a; Montana Tech of the University of Montana, 2020). Of the 31 domestic wells present within a 4-mile radius of the mine and mill sites and within the basin, depths ranged from 18 ft bgs to 420 ft bgs and had an average depth of approximately 158 ft bgs. Depth to water ranged from zero ft bgs to 170 ft bgs and had an average depth to water of approximately 42 ft bgs (Montana Tech of the University of Montana, 2020). The public supply well is reportedly privately owned and therefore, is unlikely used as a potable source to a community population. The reported public supply well is 105 ft deep with a depth to water of 12 ft bgs (Montana Tech of the University of Montana, 2020). The well is located in Watertank Gulch approximately 1.75 miles west of the southern-most mine in the basin (Elkhorn Queen), approximately 1-mile upgradient of Elkhorn Creek, or outside of the affected drainage (Figure 3).

Domestic wells within 4 miles of the site (Figure 3) and the population served are listed in Table 5-1.

Table 5-1 – Wells within 4-Mile Radius and Population Served

Radius	Number of Domestic Wells	Domestic Population
0 - 0.25	0	1
0.25 - 0.50	2	1
0.50 - 1.0	11	7
1.0 - 2.0	4	2
2.0 - 3.0	1	9
3.0 - 4.0	13	24
Total	31	44

5.3 GROUNDWATER SAMPLE LOCATIONS AND ANALYTICAL RESULTS

Groundwater sampling was not performed as part of this investigation and no additional groundwater sampling data was identified other than that presented in Table 2-2 for Trumley Heap Leach.

5.4 GROUNDWATER PATHWAY CONCLUSIONS

Groundwater sampling was not performed as part of this investigation; therefore, the groundwater pathway cannot be evaluated based on analytical groundwater results. The sites are located in a rural area where groundwater is the primary source of drinking water. There are no drinking water wells present on any of the sites, but there are 11 reported domestic wells within a 4-mile radius of the investigation area, within the basin and located downgradient of the sites that are potentially used for drinking water. Reported well depths for these wells ranged from 27 ft to 200 ft bgs, averaging at 153.5 ft bgs, with depth to water ranging from 15 ft to 120 ft bgs and averaging at 49.4 ft bgs (Montana Tech of the University of Montana, 2020). Based on readily available information regarding current potential receptors, there is the potential that contaminants from the sites could impact groundwater.

TDD 0004/1807-06

6.0 SURFACE WATER PATHWAY

The surface water migration pathway evaluates: 1) the likelihood that sources at a site actually have released, or potentially could release, by overland flow or by flooding to surface water; 2) the characteristics of the hazardous substances that are available for a release (i.e., toxicity, persistence, bioaccumulation, and quantity); and 3) the targets who actually have been, or potentially could be, impacted by the release. These factors are applied to surface water within a 15-mile downstream Target Distance Limit of a potential source.

6.1 HYDROLOGY

The average annual precipitation in Boulder, MT (located approximately 8.75 miles southwest of Elkhorn, Figure 1) is 10.97 inches. Precipitation is fairly consistent throughout the year with slightly more in May and June. The mine and mill sites in the investigation area lie within the Elkhorn Creek subwatershed (HUC 100200060502). Tributaries to Elkhorn Creek include Slaughterhouse Gulch, Turnley Creek, Queen Gulch, Tacoma Gulch, and Greyback Gulch (Figure 2). Elkhorn Creek flows southward from the Elkhorn Mountains to Boulder River. Elkhorn Creek from its headwaters to Boulder River is approximately 12.18 miles. There are numerous tributaries to the Boulder River with significant eligible wetlands frontage present along the highly braided portion of the river present within 15 miles downstream of Elkhorn Queen mine (most downstream mine site in the basin included in this SI).

Flow recorded in Elkhorn Creek by MBMG (GWIC ID 266397) during various times between June and October 2012, April 2013 and June 2013 averaged 3.93 cubic ft per second (cfs) (Montana Tech of the University of Montana, 2020). The mean annual discharge from 1996 to 2016 recorded from the USGS gauging station (#06033000) located just south of Boulder on the Boulder River, and upstream of the confluence with Elkhorn Creek, is approximately 125 cfs (USGS, 2017a).

6.2 SURFACE WATER PATHWAY TARGETS

For the targets component of this evaluation, the focus is on drinking water intakes, fisheries, wetlands, and other sensitive environments associated with surface water bodies within 15 miles downstream of a source. The emphasis is on drinking water intakes over other consumptive uses (e.g., food crop irrigation and livestock watering) because, as a screening tool, it is designed to give the greatest weight to the most direct and extensively studied route of exposure.

The 15-mile in-water segment, referred to as a Surface Water Target Distance Limit (TDL), defines the maximum distance over which surface water targets are evaluated in the EPA Site Assessment process. The start of the TDL is defined by the probable point of entry (PPE) or the point at which entry of the hazardous substance(s) to surface water is most likely (EPA, 1992b). The potential sources for this SI (C & D mine, Elkhorn Creek Tailings, Union Elkhorn mine, Greyback Gulch mine and mill sites, Trumley Heap Leach, Skyline mine, Boulaway mine, and Elkhorn Queen) and their PPEs and associated TDLs are identified in Figure 4.

TDD 0004/1807-06

Table 6-1 identifies the PPE for each TDL, overland flow distance to surface water body, and distance to the confluence with the receiving water body(s). The 15-mile TDL for all in-water segments of the surface water pathway ends in the Boulder River.

Table 6-1 – TDL Summary

Site	PPE	Overland Flow Distance	Distance to Confluence
C & D mine	Sample location: CD-SW/SD-01	4,300 ft to Elkhorn Creek	12.18 miles / Boulder River
Elkhorn Creek Tailings	Sample location: ECT-SW/SD-01	33 ft to Elkhorn Creek	10.72 miles / Boulder River
Union Elkhorn	Sample location: UE-SW/SD-01	0 ft to Slaughterhouse Gulch	7,647 ft / Elkhorn Creek 11.62 miles / Boulder River
Greyback Gulch (Mill)	Sample location: GG-SW/SD-03	925 ft to Greyback Gulch	2,645 ft / Turnley Creek 7,535 ft / Elkhorn Creek 10.28 miles / Boulder River
Trumley Heap Leach	Sample location: THL-SW/SD-04	200 ft to Turnley Creek	554 ft / Elkhorn Creek 10.28 miles / Boulder River
Skyline Mine	Sample location: SM-SM/SW-03	0 ft to Queen Gulch	5 miles / Elkhorn Creek 10 miles / Boulder River
Boulaway Mine	Sample location: BM-SW/SD-01	75 ft to Queen Gulch	6,333 ft / Elkhorn Creek 10 miles / Boulder River
Elkhorn Queen	Sample location: EQ-SW/SD-03	3,500 ft to Queen Gulch	2,434 ft / Elkhorn Creek 10 miles / Boulder River

Although Elkhorn Creek and Boulder River are state designated for protection of aquatic life and drinking water use classifications, there are currently no surface water intakes used for potable drinking water within the basin, on Elkhorn Creek or Boulder River within 15 miles downstream of the sites, or anywhere on the Boulder River downstream of the sites (MDEQ, 2018; EPA, 2020a; Montana Tech of the University of Montana, 2020).

Elkhorn Creek from its headwaters to Wood Gulch (Figure 2; approximately 8 miles), which is approximately 4 miles downstream of the town of Elkhorn, is listed as impaired under Section 303(d) of the Clean Water Act for aquatic life, cold water fishery, and drinking water uses due to

TDD 0004/1807-06

arsenic, cadmium, copper, iron, and lead concentrations from historic mining activities (acid mine drainage, mine tailings, and dredge/placer mining) (MDEQ, 2019; MDEQ, 2008). The impairment is also caused by sedimentation/siltation, low flow alterations, and alteration in stream-side vegetative covers due to a variety of sources. Total maximum daily loads (TMDLs) for this stream reach were established for arsenic, cadmium, copper, iron, lead, and sediment. The lower reach of Elkhorn Creek from Wood Gulch to the mouth is also listed as impaired for arsenic, cadmium, and lead for similar causes and sources. TMDLs for this reach include arsenic, cadmium, lead, and sediment (MDEQ, 2019).

The Boulder River is listed as impaired for aquatic life and drinking water uses due to metals, and has TMDLs for arsenic, cadmium, copper, iron, lead, and zinc (Figure 2) (MDEQ, 2019).

Recreational surface water use occurs primarily along Boulder River (e.g., fishing, floating, and camping); however, there is a picnic area present in Elkhorn, the cabin at Skyline mine (located on Queen Gulch, a tributary to Elkhorn Creek) is highly used by cross-country skiers, hunters, and recreationists, and Leslie Lake, downstream of Skyline mine, is a popular spot for fishing (Figure 2).

6.2.1.1 Fisheries

Native fish species potentially present within 15 miles downstream of the most downstream mine site (Elkhorn Queen) include: Westslope cutthroat trout, mountain whitefish, mottled sculpin, longnose dace, and longnose sucker (MSP, 2018b). Westslope cutthroat trout are a designated “Species of Concern” by FWP (MSP, 2018a). Introduced species are also present in streams, including: brook, rainbow, brown, and Yellowstone cutthroat trout (MSP, 2018b). Recreational fishing occurs throughout the basin but primarily along Elkhorn Creek and the Boulder River. The fishing season begins the third weekend in May for Elkhorn Creek. Westslope cutthroat are catch and release while Yellowstone cutthroat in Leslie Lake may be kept (USFS, no date). According to the Montana FWP, brook trout are present in Elkhorn Creek and the creek was last stocked in 1937 with Cutthroat Trout (MSP, 2018b). According to survey data collected in 2015 by FWP, species present in the Boulder River at the location surveyed (approximately 9 miles west and upstream from the town of Boulder) include Brook Trout, Longnose Sucker, Rainbow Trout, and Rocky Mountain Sculpin (MSP, 2018b). The Boulder River was last stocked in 1973 with Rainbow Trout (MSP, 2018b).

6.2.1.2 Sensitive Environments

The USFWS National Wetlands Inventory identified freshwater emergent and freshwater forested/shrub wetlands present along the majority of Greyback Gulch, Turnley Creek, Elkhorn Creek from below the confluence with Turnley Creek downstream to the Boulder River, and in the Boulder River (Figure 2). Freshwater emergent wetlands are scattered along Slaughterhouse Gulch and Elkhorn Creek between the confluence with Slaughterhouse Gulch and Turnley Creek. Scattered sections are also present along Queen Gulch (USFWS, 2019).

Table 6-2 identifies the wetland areas for each TDL, starting at the most upstream PPE.

TDD 0004/1807-06

Table 6-2 – Wetland Summary

Most Upstream PPE	Water Segments	Contiguous Wetland Frontage (miles)
C & D Mine	Elkhorn Creek → Boulder River	8.24
Union Elkhorn Mine	Slaughterhouse Gulch → Elkhorn Creek → Boulder River	8.27
Greyback Gulch	Greyback Gulch → Turnley Creek → Elkhorn Creek → Boulder River	10.70
Trumley Heap Leach	Turnley Creek → Elkhorn Creek → Boulder River	10.53
Skyline Mine	Queen Gulch → Elkhorn Creek → Boulder River	9.38

6.3 SAMPLE LOCATIONS

Surface water samples, co-located with sediment samples, were collected from a total of 23 locations (6 from Elkhorn Creek, 2 from Slaughterhouse Gulch, 2 from Greyback Gulch, 4 from Turnley Creek, and 9 from Queen Gulch) as shown in Figures 5 through 12. Surface water samples were collected from upstream of the most upstream probable points of entry and downstream of the most downstream probable points of entry (the migration pathway from the waste pile or contaminated soil or adit drainage into a receiving water body) to identify if an observed release has occurred using HRS criteria.

A total of five (5) source area-specific background surface water/sediment samples (ECT-SW/SD-BK01, THL-SW/SD-BK01, BM-SW/SD-BK01, CD-SW/SD-BK01, and UE-SW/SD-BK01) were collected for comparison against site-specific analytical results (Figures 5 through 12). One background sample location (EQ-SW/SD-BK01), could not be collected as there was no observable creek bed, surface water or sediment present in South Fork Queen Gulch; therefore, samples EQ-SW/SD-01 were used to be representative of background conditions associated with the Elkhorn Queen mine.

Surface water and sediment samples were collected in June 2019 and September 2019 to evaluate seasonal variability in metals concentrations between expected higher flow and lower flow conditions in the respective drainages. Minimal differences between the two sampling events were noted in the analyte concentrations that were detected but results in the following subsections note whether analytes were detected in one event or both.

Locations specific to each mine and mill site are further described in the analytical results summary section for each respective site.

6.4 ANALYTICAL RESULTS AND BENCHMARK SCREENING EVALUATION SUMMARY

Complete analytical data summaries for surface water samples are presented in Tables 6a and 6b (surface water) and Tables 7a and 7b (sediment), laboratory analytical data and data validation reports are included in Appendix B. A summary of the analytical results and evaluation against

TDD 0004/1807-06

screening benchmarks described in Section 3.0 is presented in the following subsections by drainage and individual mine and mill site.

6.4.1 Surface Water Analytical Results Summary

6.4.1.1 Elkhorn Creek

C & D Mine

Two surface water samples associated with C & D mine were collected from Elkhorn Creek during the June 2019 sampling event, as follows: one from below the confluence with the overland flow PPE (CD-SW-01) and one above the confluence with the overland flow PPE (background sample: CD-SW-BK01). Complete analytical data summaries and benchmark screening evaluations are presented in Table 6a (HRS Benchmarks) and Table 6b (Human Health and Ecological Benchmarks), laboratory analytical data and data validation reports are included in Appendix B. Concentrations of total and dissolved metals were detected; however, none of the analytes were detected at concentrations exceeding either HRS or human health and ecological screening benchmarks. Based on the analytical results from the surface water samples, concentrations of analytes detected in samples collected from both above and below the overland flow PPE from C & D mine generally showed a negligible increase in surface water downstream of the overland flow pathway PPE, therefore, indicating no notable contributions from the mine site.

Elkhorn Creek Tailings

Five surface water samples associated with Elkhorn Creek tailings were collected from Elkhorn Creek during the June 2019 and September 2019 sampling events, as follows: one at the most downstream PPE (below the waste pile) (ECT-SW-01), two at the most downstream points within the wetland area (ECT-SW-03 and ECT-SW-05 [duplicate]), one at 1/10th of a mile within the wetland area (ECT-SW-04), and one from a source-area specific background location (ECT-SW-BK01). Complete analytical data summaries and benchmark screening evaluations are presented in Table 6a (HRS Benchmarks) and Table 6b (Human Health and Ecological Benchmarks); laboratory analytical data and data validation reports are included in Appendix B. Concentrations of total and dissolved metals were detected, and the following exceedances of HRS screening benchmarks were reported:

- Dissolved chromium and nickel were detected at concentrations greater than three times background during the June 2019 sampling event.
- Total and dissolved antimony and cadmium were detected at concentrations greater than three times background during the September 2019 sampling event.
- Dissolved lead was detected at concentrations greater than three times background and exceeding acute and chronic SCDMs during the September 2019 sampling event.
- Dissolved manganese was detected at concentrations greater than three times background during both sampling events.

TDD 0004/1807-06

- Dissolved zinc was detected at concentrations greater than three times background and acute and chronic SCDMs during both sampling events.

The following exceedances of human health and ecological screening benchmarks were reported:

- Dissolved cadmium was detected at concentrations exceeding acute and chronic Aquatic Life Standards and the EPA MCL in all samples (including background) during both sampling events. Though exceedances were reported from the background sample, downstream concentrations were higher than the background concentration.
- Dissolved lead was detected at concentrations exceeding the chronic Aquatic Life Standard in all samples (including background) except sample ECT-SW-01 during both sampling events. Though exceedances were reported from the background sample, downstream concentrations were higher than the background concentration.
- Dissolved zinc was detected at concentrations that exceed the acute and chronic Aquatic Life Standard from samples ECT-SW-03, ECT-SW-04, and ECT-SW-05 during both sampling events.
- Dissolved antimony was detected at concentrations that exceed the EPA MCL from samples ECT-SW-03 and ECT-SW-05 during the June 2019 sampling event and ECT-SW-04 during both sampling events.

6.4.1.2 Slaughterhouse Gulch

Union Elkhorn Mine

Three surface water samples associated with Union Elkhorn mine were collected from Slaughterhouse Gulch during the June 2019 and September 2019 sampling events, as follows: two at the most downstream PPE (below the waste pile and adit drainage) (UE-SW-01 and UE-SW-03 [duplicate]) and one from a source-area specific background location (UE-SW-BK01). One sample was collected from pipe drainage exiting the adit (UE-SW-04) during the June 2019 sampling event. Complete analytical data summaries and benchmark screening evaluations are presented in Table 6a (HRS Benchmarks) and Table 6b (Human Health and Ecological Benchmarks), laboratory analytical data and data validation reports are included in Appendix B. Concentrations of total and dissolved metals were detected above Aquatic Life Standards in the adit drainage; however, none of the analytes were detected in Slaughterhouse Gulch at concentrations exceeding either HRS or human health and ecological screening benchmarks.

6.4.1.3 Greyback Gulch

Three surface water samples were collected from Greyback Gulch during the September 2019 sampling event, as follows: one from an unnamed creek just above confluence with Greyback Gulch (GG-SW-02), one from Greyback Gulch downstream of mill site and confluence with the unnamed creek (GG-SW-03), and one from a source-area specific background location (GG-SW-01). Complete analytical data summaries and benchmark screening evaluations are presented in Table 6a (HRS Benchmarks) and Table 6b (Human Health and Ecological Benchmarks),

TDD 0004/1807-06

laboratory analytical data and data validation reports are included in Appendix B. Concentrations of total and dissolved metals were detected; however, none of the analytes were detected at concentrations exceeding either HRS or human health and ecological screening benchmarks.

6.4.1.4 Turnley Creek

Trumley Heap Leach

Five surface water samples associated with Trumley Heap Leach were collected from Turnley Creek during the June 2019 and September 2019 sampling events, as follows: two from the most downstream PPE (THL-SW-01 and THL-SW-04 [duplicate]), one at 1/10 of a mile within the wetland area (THL-SW-02), one from just above the confluence with Elkhorn Creek (THL-SW-03), and one from a source-area specific background location (THL-SW-BK01). Complete analytical data summaries and benchmark screening evaluations are presented in Table 6a (HRS Benchmarks) and Table 6b (Human Health and Ecological Benchmarks), laboratory analytical data and data validation reports are included in Appendix B. Concentrations of total and dissolved metals were detected; however, none of the analytes were detected at concentrations exceeding human health and ecological screening benchmarks; however, the following exceedances of HRS screening benchmarks were reported:

- Dissolved copper was detected at concentrations greater than three times background and acute and chronic SCDMs during the September 2019 sampling event.

6.4.1.5 Queen Gulch

Skyline Mine

Four surface water samples associated with Skyline mine were collected from Queen Gulch during the September 2019 sampling event, as follows: one just above confluence with adit drainage (SM-SW-01), one at the most downstream PPE (below the adit drainage and waste piles) (SM-SW-03), one at the inlet to Leslie Lake (SM-SW-04), and one at a background location in the headwaters of Queen Gulch (SM-SW-BK01). Complete analytical data summaries and benchmark screening evaluations are presented in Table 6a (HRS Benchmarks) and Table 6b (Human Health and Ecological Benchmarks), laboratory analytical data and data validation reports are included in Appendix B. Concentrations of total and dissolved metals were detected. Although there were many exceedances of Aquatic Life Standards in the adit discharge, none of the analytes were detected at concentrations exceeding the human health and ecological screening benchmarks in Queen Gulch or Leslie Lake water samples; however, the following exceedances of HRS screening benchmarks were reported:

- Total arsenic and manganese were detected at concentrations greater than three times background during the September 2019 sampling event.
- Dissolved arsenic was detected at concentrations greater than three times background during the September 2019 sampling event.

Boulaway Mine

TDD 0004/1807-06

Three surface water samples associated with Boulaway mine were collected from Queen Gulch during the June 2019 and September 2019, as follows: one at the most downstream PPE (below of the waste piles) (BM-SW-01), one at 1/10 of a mile within the wetland area (BM-SW-02), and one from a source-area specific background location (BM-SW-BK01) sampling events. Complete analytical data summaries and benchmark screening evaluations are presented in Table 6a (HRS Benchmarks) and Table 6b (Human Health and Ecological Benchmarks), laboratory analytical data and data validation reports are included in Appendix B. Concentrations of total and dissolved metals were detected. None of the analytes were detected at concentrations exceeding the human health and ecological screening benchmarks or the three times background concentration and that could also be attributed to the site.

6.4.1.6 South Fork Queen Gulch

Elkhorn Queen

Two surface water samples associated with the Elkhorn Queen mine were collected from Queen Gulch during the June 2019 and September 2019 sampling events, as follows: one from just above confluence with South Fork Queen Gulch (EQ-SW-01), used as the background location, and one from just below the confluence with South Fork Queen Gulch (EQ-SW-03). Complete analytical data summaries and benchmark screening evaluations are presented in Table 6a (HRS Benchmarks) and Table 6b (Human Health and Ecological Benchmarks), laboratory analytical data and data validation reports are included in Appendix B. Concentrations of total and dissolved metals were detected; however, no metals were detected at concentrations exceeding the three times background concentration and that could also be attributed to the site.

The following exceedances of environmental screening benchmarks were reported:

- Dissolved antimony and cadmium were detected at concentrations that exceed their respective EPA MCLs from sample EQ-SW-01 (background sample) during the September 2019 sampling event.
- Dissolved cadmium and zinc were detected at concentrations that exceed their respective acute and chronic Aquatic Life Standards from sample EQ-SW-01 (background sample) during the September 2019 sampling event.
- Dissolved lead was detected at a concentration exceeding the chronic Aquatic Life Standard from sample EQ-SW-01 (background sample) during the September 2019 sampling event.

No exceedances of human health or environmental screening benchmarks were reported from the downstream sample (EQ-SW-03).

6.4.2 Sediment Analytical Results Summary

6.4.2.1 Elkhorn Creek

C & D Mine

Two sediment samples, co-located with the surface water samples, associated with C & D mine were collected from Elkhorn Creek during the June 2019 and September 2019 sampling event, as follows: one from below the confluence with the overland flow PPE (CD-SD-01) and one above the confluence with the overland flow PPE (background sample: CD-SD-BK01). Complete analytical data summaries and benchmark screening evaluations are presented in Table 7a (HRS) and Table 7b (Ecological), laboratory analytical data and data validation reports are included in Appendix B. Concentrations of total metals were detected at concentrations exceeding available environmental screening benchmarks; however, none of the analytes were detected at concentrations significantly above site-specific background or exceeding HRS screening benchmarks. Based on the analytical results from the sediment samples, concentrations of analytes detected in samples collected from both above and below the overland flow PPE from C & D mine generally showed a decrease in sediment downstream of the PPE, therefore, indicating no notable contributions from the mine site. As a result, exceedances of environmental screening benchmarks (TEC and PEC) may not be directly attributable to this site.

Elkhorn Creek Tailings

Five sediment samples, co-located with the surface water samples, associated with Elkhorn Creek tailings were collected from Elkhorn Creek during the June 2019 and September 2019 sampling events, as follows: one at the most downstream PPE (below the waste piles) (ECT-SD-01), two at the most downstream points within the wetland area (ECT-SD-03 and ECT-SD-05 [duplicate]), one at 1/10 of a mile within the wetland area (ECT-SD-04), and one from a source-area specific background location (ECT-SD-BK01). Complete analytical data summaries and benchmark screening evaluations are presented in Table 7a (HRS) and Table 7b (Ecological), laboratory analytical data and data validation reports are included in Appendix B. Concentrations of total metals were detected, and the following exceedances of HRS screening benchmarks were reported:

- Cadmium was detected at concentrations greater than three times background during the both sampling events.
- Antimony, lead, manganese, mercury, silver, and zinc were detected at concentrations greater than three times background during the September 2019 sampling event.

The following exceedances of available environmental screening benchmarks were reported:

- Antimony, arsenic, cadmium, copper, lead, manganese, mercury, silver, and zinc were detected at concentrations that exceed one or both of their respective TEC and PEC screening benchmarks as well as exceeding the background concentrations for these analytes from samples collected during both sampling events. However, because these analytes exceeded the sediment screening benchmarks in both the background and the downstream samples, additional site-specific evaluation would be needed to determine if

TDD 0004/1807-06

there are actual impacts to aquatic invertebrates. In addition to the downstream sediment concentrations being greater than three times background, exceedances of both acute and chronic Aquatic Life Standards for cadmium and zinc and the chronic Aquatic Life Standards for lead were detected in the co-located surface water samples. Therefore, there is a higher likelihood that the sediment concentrations for these analytes may be impacting aquatic resources.

- Iron was detected at concentrations that exceed the TEC screening benchmarks and slightly exceeded the background concentration from sample ECT-SD-01 during the September 2019 sampling event (37,200 mg/kg background versus 39,100 mg/kg). However, the detected concentrations from all other downstream samples were lower than the background concentrations. Therefore, the exceedance of TEC ecological screening benchmark may not be directly attributable to this site.

6.4.2.2 Slaughterhouse Gulch

Union Elkhorn Mine

Three sediment samples, co-located with surface water samples, associated with Union Elkhorn mine were collected from Slaughterhouse Gulch during the June 2019 and September 2019 sampling events, as follows: two at the most downstream probable points of entry of the waste pile (UE-SD-01 and UE-SD-03 [duplicate]) and one from a source-area specific background location (UE-SD-BK01). Complete analytical data summaries and benchmark screening evaluations are presented in Table 7a (HRS) and Table 7b (Ecological), laboratory analytical data and data validation reports are included in Appendix B. Concentrations of total metals were detected, and the following exceedances of HRS screening benchmarks were reported:

- Lead was detected at a concentration greater than three times background during the both sampling events.
- Silver and zinc were detected at concentrations greater than three times background during the September 2019 sampling event.

The following exceedances of available environmental screening benchmarks were reported:

- Arsenic and manganese were detected at concentrations that exceed one or both of their respective TEC and PEC screening benchmarks from all samples (including background) during both sampling events. The downstream concentrations were consistent with the background concentrations. Therefore, exceedances of the ecological screening benchmarks may not be directly attributable to this site.
- Antimony, cadmium, lead, silver, and zinc were detected at concentrations that exceed one or both of their respective TEC and PEC screening benchmarks. Downstream sediment concentrations of lead, silver, and zinc were also greater than three times background. Therefore, there is a higher likelihood that the sediment concentrations for these analytes may be impacting aquatic resources.

TDD 0004/1807-06

6.4.2.3 Greyback Gulch

Three sediment samples, co-located with the surface water samples, were collected from Greyback Gulch during the September 2019 sampling event, as follows: one from an unnamed creek just above the confluence with Greyback Gulch (GG-SD-02), one from Greyback Gulch downstream of mill site and confluence with an unnamed creek (GG-SD-03), and one from a source-area specific background location (GG-SD-01). Complete analytical data summaries and benchmark screening evaluations are presented in Table 7a (HRS) and Table 7b (Ecological), laboratory analytical data and data validation reports are included in Appendix B. Concentrations of total metals were detected at concentrations exceeding available environmental screening benchmarks; however, none of the analytes were detected at concentrations significantly above background or exceeding HRS screening benchmarks. Therefore, exceedances of environmental screening benchmarks (TEC and PEC) may not be directly attributable to this site.

6.4.2.4 Turnley Creek

Trumley Heap Leach

Five sediment samples, co-located with the surface water samples, associated with Trumley Heap Leach were collected from Turnley Creek during the June and September 2019 sampling events, as follows: two from the most downstream PPE (THL-SD-01 and THL-SD-04 [duplicate]), one at 1/10 of a mile within the wetland area (THL-SD-02), one from just above the confluence with Elkhorn Creek (THL-SD-03), and one from a source-area specific background location (THL-SD-BK01). Complete analytical data summaries and benchmark screening evaluations are presented in Table 7a (HRS) and Table 7b (Ecological), laboratory analytical data and data validation reports are included in Appendix B. Concentrations of total metals were detected; the following exceedances of HRS screening benchmarks were reported:

- Arsenic was detected at a concentration greater than three times background during the September 2019 sampling event.

The following exceedances of available environmental screening benchmarks were reported:

- Arsenic was detected at a concentration exceeding the PEC screening benchmark from samples THL-SD-01 and THL-SD-03 during the September 2019 sampling event. The downstream concentration of arsenic was also greater than three times background. Therefore, there is a higher likelihood that the sediment concentration for this analyte may be impacting aquatic resources.
- Manganese was detected at concentrations exceeding one or both of the TEC and PEC screening benchmark as well as the background concentration from multiple downstream locations. While the concentration of manganese was not greater than three times the background, there is still a likelihood that the sediment concentration for this analyte is impacting aquatic resources.

TDD 0004/1807-06

6.4.2.5 Queen Gulch

Skyline Mine

Three sediment samples, co-located with the surface water samples, associated with Skyline Mine were collected from Queen Gulch during the September 2019 sampling event, as follows: one just above confluence with adit drainage (SM-SD-01), one at the most downstream PPE (below the adit drainage and waste piles) (SM-SD-03), and one at the inlet to Leslie Lake (SM-SD-04). Note, no background location in the headwaters of Queen Gulch could be collected as the headwaters begin at a spring above the mine and no sediments were present where the spring exits the hillside. Additionally, two sediment samples, co-located with the surface water samples, were collected from adit drainage (SM-SD-02 and SM-SD-05). Complete analytical data summaries and benchmark screening evaluations are presented in Table 7a (HRS) and Table 7b (Ecological), laboratory analytical data and data validation reports are included in Appendix B. Due to the lack of an available background sampling location, no HRS evaluation could be conducted; however, the following exceedances of available environmental screening benchmarks were reported:

- Antimony, arsenic, cadmium, chromium, copper, iron, lead, manganese, nickel, silver, and zinc were detected at concentrations that exceed one or both of their respective TEC and PEC screening benchmarks from all samples. Because there is no background data to compare the concentrations against, additional site-specific evaluation would be needed to determine if there are actual impacts to aquatic invertebrates. In addition to the sediment concentration exceedances, concentrations of total and dissolved arsenic and total manganese were reported in co-located surface water samples that were greater than three times the background. Therefore, there is a higher likelihood that the sediment concentrations for these analytes may be impacting aquatic resources.

Boulaway Mine

Three sediment samples, co-located with surface water samples, associated with Boulaway mine were collected from Queen Gulch during the June 2019 and September 2019, as follows: one at the most downstream PPE (below the waste piles) (BM-SD-01), one at 1/10 of a mile within the wetland area (BM-SD-02), and one from a source-area specific background location (BM-SD-BK01) sampling events. Complete analytical data summaries and benchmark screening evaluations are presented in Table 7a (HRS) and Table 7b (Ecological), laboratory analytical data and data validation reports are included in Appendix B. Concentrations of total metals were detected and the following exceedances of HRS screening benchmarks were reported:

- Arsenic, cadmium, copper, and zinc were detected at concentrations greater than three times background during the September 2019 sampling event.

The following exceedances of available environmental screening benchmarks were reported:

- Arsenic, copper, lead, manganese, and zinc was detected at concentrations exceeding one or both TEC and PEC screening benchmarks as well as exceeding the background concentrations for these analytes from samples collected during both sampling events. Though concentrations of arsenic, iron, manganese, and silver in background samples

TDD 0004/1807-06

also exceeded the respective ecological screening benchmarks, the concentrations of these analytes were higher in downstream sediment samples. Therefore, there is a higher likelihood that the sediment concentrations for these analytes may be impacting aquatic resources.

6.4.2.6 South Fork Queen Gulch

Elkhorn Queen

Two sediment samples, co-located with surface water samples, associated with the Elkhorn Queen were collected from Queen Gulch during the June and September 2019 sampling events, as follows: one from just above the confluence with South Fork Queen Gulch (EQ-SD-01, used as the background location, and one from just below the confluence with South Fork Queen Gulch (EQ-SD-03). Complete analytical data summaries and benchmark screening evaluations are presented in Table 7a (HRS) and Table 7b (Ecological), laboratory analytical data and data validation reports are included in Appendix B. Concentrations of total metals were detected; however, none of the analytes were detected at concentrations exceeding HRS screening benchmarks. The following exceedances of available environmental screening benchmarks were reported:

- Arsenic, iron, lead, manganese, nickel, and silver were reported at concentrations that exceed one or both of their respective TEC and PEC screening benchmarks as well as exceeding the background concentrations for these analytes from samples collected during the June 2019 sampling event. Though concentrations of these analytes in background samples also exceeded the respective ecological screening benchmarks, the concentrations of iron, lead, and nickel were higher in downstream sediment samples. Therefore, there is a higher likelihood that the sediment concentrations for these analytes may be impacting aquatic resources.

6.5 SURFACE WATER PATHWAY CONCLUSIONS

Table 6-3 presents a brief summary of Observed Release documentation. The detailed surface water pathway conclusions are provided in the following subsections by drainage and individual mine and mill site.

Table 6-3 – Surface Water Observed Release Summary

Drainage	Site	Observed Release (Yes/No)
Elkhorn Creek	C & D Mine	No
	Elkhorn Creek Tailings	Yes
Slaughterhouse Gulch	Union Elkhorn Mine	Yes
Greyback Gulch	Greyback Gulch	No
Turnley Creek	Trumley Heap Leach	Yes

TDD 0004/1807-06

Drainage	Site	Observed Release (Yes/No)
Queen Gulch	Skyline Mine	Yes
	Boulaway Mine	Yes
South Fork Queen Gulch	Elkhorn Queen Mine	No

6.5.1 Elkhorn Creek

C & D Mine

Two co-located surface water and sediment samples were collected from Elkhorn Creek, one above and one below the overland flow PPE from the C & D mine. Based on the analytical results from the surface water and sediment samples, the HRS evaluation did not document an Observed Release to the surface water pathway from C & D mine.

The surface water and sediment data were also evaluated against benchmarks to determine potential environmental impacts. Based on the analytical results from the surface water and sediment samples, concentrations of analytes detected in samples collected from both above and below the overland flow PPE from C & D mine generally showed a negligible increase in surface water and a decrease in sediment downstream of the PPE, therefore, indicating no notable contributions from the mine site.

Elkhorn Creek Tailings

Four co-located surface water and sediment samples were collected from Elkhorn Creek and evaluated against the HRS screening benchmarks. Based on the analytical results from the surface water samples, an Observed Release to surface water has been documented for total and dissolved metals: antimony, cadmium and dissolved metals: chromium, nickel, lead, manganese, and zinc. Additionally, concentrations of dissolved cadmium and zinc exceeded one or both SCMD benchmarks. Based on the analytical results from sediment samples, an Observed Release to sediment has been documented for antimony, cadmium, lead, mercury, silver, and zinc. The most downstream Observed Release was documented from samples ECT-SW/SD-04, which is located in a wetland area at least 1/10 of a mile below the PPE and the start of the wetland.

The surface water and sediment data were also evaluated against benchmarks to determine potential environmental impacts. Based on the analytical results from the surface water and sediment samples, dissolved metals: cadmium, lead, and zinc in surface water and antimony, arsenic, barium, beryllium, cadmium, copper, iron, lead, manganese, mercury, silver, and zinc in sediment samples were detected at concentrations exceeding their respective screening benchmarks. These exceedances indicate that the Elkhorn Creek Tailings site is impacting surface water quality downstream of the site.

TDD 0004/1807-06

6.5.2 Slaughterhouse Gulch

Union Elkhorn Mine

Two co-located surface water and sediment samples were collected from Slaughterhouse Gulch and evaluated against the HRS screening benchmarks. Based on the analytical results from the sediment samples, an Observed Release to surface water has been documented for lead, silver, and zinc. The most downstream Observed Release was documented from sample UE-SD-01, which is located at the most downstream PPE from the site.

The surface water and sediment data were also evaluated against benchmarks to determine potential environmental impacts. Although concentrations of cadmium and zinc exceeded screening benchmarks in the sample collected from the adit drainage, no exceedances were noted from downstream surface water sample collected from Elkhorn Creek. However, analytical results from sediment samples indicated concentrations of lead, silver, and zinc that exceed their respective screening benchmarks as well as background concentrations. These exceedances indicate that the Union Elkhorn mine is impacting sediment downstream of the site.

Greyback Gulch

Three co-located surface water and sediment samples were collected from Greyback Gulch, one from an unnamed creek just above confluence with Greyback Gulch, one from Greyback Gulch downstream of mill site, and one from Greyback Gulch above the mill site and confluence with the unnamed creek. Based on the analytical results from the surface water and sediment samples, the HRS evaluation did not document an Observed Release to the surface water pathway associated with the mill site.

The surface water and sediment data were also evaluated against benchmarks to determine potential environmental impacts. Based on the analytical results from the surface water and sediment samples, concentrations of analytes were detected in samples collected from both above and below the PPE from the mill site indicating that they cannot be attributed to the mill.

6.5.3 Turnley Creek

Trumley Heap Leach

Four co-located surface water and sediment samples were collected from Turnley Creek and evaluated against the HRS screening benchmarks. Based on the analytical results from the surface water samples, an Observed Release to surface water has been documented for copper. Based on the analytical results from the sediment samples, an Observed Release to sediment has been documented for arsenic. The most downstream Observed Release was documented from sample THL-SD-03, which is located above the confluence of Elkhorn Creek and at least 1 mile downstream of the most downstream PPE from the site.

The surface water and sediment data were also evaluated against benchmarks to determine potential environmental impacts. No exceedances of screening benchmarks were noted from surface water samples. However, analytical results from sediment samples indicated

TDD 0004/1807-06

concentrations of arsenic and manganese that exceed their respective screening benchmarks. These exceedances indicate that the Trumley Heap Leach is impacting sediment downstream of the site.

6.5.4 Queen Gulch

Skyline Mine

Three co-located surface water and sediment samples were collected from Queen Gulch and evaluated against the HRS screening benchmarks. Based on the analytical results from the surface water samples, an Observed Release to surface water has been documented for total and dissolved arsenic and total manganese. The most downstream Observed Release was documented from sample SM-SW-04, which is located at the inlet to Lake Leslie, a popular fishery approximately 2,000 ft downstream from the most downstream PPE from the site.

The surface water and sediment data were also evaluated against benchmarks to determine potential environmental impacts. No exceedances of the screening benchmarks were noted from surface water samples. However, analytical results from sediment samples indicated concentrations of arsenic, manganese, nickel, silver, and zinc that exceed their respective screening benchmarks. These exceedances indicate that waste rock and adit drainage from Skyline mine may be impacting sediment downstream of the site.

Boulaway Mine

Two co-located surface water and sediment samples were collected from Queen Gulch and evaluated against the HRS screening benchmarks. Based on the analytical results from sediment samples, an Observed Release to sediment has been documented for arsenic, cadmium, copper, and zinc. The most downstream Observed Release was documented from samples BM-SW/SD-02, which is located in a wetland area at least 1/10 of a mile from the site.

The surface water and sediment data were also evaluated against benchmarks to determine potential environmental impacts. No exceedances of the screening benchmarks were noted from surface water samples. However, analytical results from sediment samples indicated concentrations of arsenic, iron, manganese, and silver that exceeded their respective screening benchmarks as well as the background concentrations of these analytes. These exceedances indicate that Boulaway mine is potentially impacting sediment quality downstream of the site.

6.5.5 South Fork Queen Gulch

Elkhorn Queen Mine

Two co-located surface water and sediment samples were collected from Queen Gulch, one above and below the overland flow PPE from the Elkhorn Queen mine. Based on the analytical results from the surface water and sediment samples, the HRS evaluation did not document an Observed Release to the surface water pathway from Elkhorn Queen mine.

The surface water and sediment data were also evaluated against benchmarks to determine potential environmental impacts. No exceedances of the screening benchmarks were noted from

TDD 0004/1807-06

the downstream surface water samples. However, analytical results from sediment samples indicated concentrations of iron, lead, and nickel that exceeded their respective screening benchmarks as well as the background concentrations of these analytes. These exceedances indicate that Elkhorn Queen mine is impacting sediment quality downstream of the site.

TDD 0004/1807-06

This document was prepared by Weston Solutions, Inc., expressly for U.S. EPA. It shall not be released or disclosed in whole or in part without the express written permission of U.S. EPA.

7.0 SOIL EXPOSURE AND AIR PATHWAY

For the targets component of the soil and air pathways evaluation, the principal threat is related to populations that are regularly present on and within 200 ft of surficial soil contamination. Nearby populations are also evaluated and include populations that are regularly present within 1 mile for soil exposure, or 4 miles for the air pathway. The four populations that receive the most weight are residents, students and daycare attendees, workers, and terrestrial sensitive environments. Terrestrial sensitive environments are areas that are established or protected by State or Federal Law (examples include, but are not limited to, National Parks, threatened or endangered species habitat, wilderness areas, and wildlife refuges). The attractiveness and accessibility of the site for recreational purposes is considered in the soil pathway threat, but it is not weighted as heavily as the other non-transient uses, such as residents and workers.

The principal threat under the air pathway is the threat of airborne releases of hazardous substances. The targets evaluation is primarily concerned with identifying and evaluating the human population, as well as terrestrial and sensitive environments, within 4 miles of the source.

7.1 PHYSICAL CONDITIONS

The physical conditions of the individual mine and mill sites are described in Section 2.5. Generally, the areas are on a mix of privately owned and USFS-administered lands, do not have access restrictions, and are frequently used by recreators. Waste material piles on the sites (tailings and waste rock) are generally unvegetated and susceptible to wind and soil erosion.

7.2 SOIL EXPOSURE AND AIR PATHWAY TARGETS

The total population of Elkhorn is 10 (U.S. Census Bureau, 2010). There is one potential resident within 150 ft of the Elkhorn Creek Tailings (King Mill) tailings pile adjacent to the former mill; however, the tailings are not present on their property and based on property records, the property owner lives in Oregon (MSL, 2017). Therefore, it is unknown whether or not there is a permanent resident there. The closest permanent resident, based on a review of Google Earth aerial imagery, appears to be approximately 1,800 ft from the Elkhorn Creek Tailings. There are no schools or daycare centers present within 200 ft of a potential source. The estimated population of full-time residents based on 2010 census data is listed in the Table 7-1 below (U.S. Census Bureau, 2010).

Table 7-1 – Population within 4-Mile Radius

Radius	Population
0 - 0.25	5
0.25 - 0.50	1
0.50 - 1.0	2
1.0 - 2.0	5
2.0 - 3.0	5
3.0 - 4.0	5

TDD 0004/1807-06

Radius	Population
Total Population	23

The Elkhorn basin contains abandoned mines located on both private and public lands with many potential source areas of waste material located in accessible and highly recreated areas of the Deerlodge National Forest. Elkhorn State Park is located in the center of Elkhorn and Elkhorn is a historic mining town that attracts tourists and sightseers. There are several popular hiking and UTV trails throughout the basin: one campground is located in Elkhorn, Leslie Lake and the trail to the cabin at Skyline mine is highly utilized by recreationists (including cross-country skiers, hunters, fishermen, and UTV users), as demonstrated by the presence of hunters using the cabin when the Skyline mine sampling was conducted in September 2019. The basin provides multiple recreational activities, including picnicking, sightseeing, camping, hiking trails, cross-country skiing, and UTV use.

Although some sites are remote, the potential source areas are not fenced and do not provide adequate restriction to recreationists, trespassers, and wildlife. The primary targets are property owners, workers, recreationists, trespassers, and wildlife. The potential source areas are bound by Slaughterhouse Gulch, Greyback Gulch, Turnley Creek, Elkhorn Creek, Queen and Gulch canyons, and ultimately by the Elkhorn Creek subwatershed and basin boundaries.

7.2.1.1 Sensitive Environments

The USFWS IPaC species list includes five different species (one flowering plant, one conifer, and three mammals) that may be present in the study area that are considered federal or state listed threatened, endangered, or sensitive species; however, none of the species listed have a federally designated Critical Habitat within or overlapping the basin boundary or would potentially be impacted by conditions at any of the mine sites (USFWS, 2020). The species potentially associated with the study area include the Ute Ladies'-tresses, whitebark pine (Candidate), Canada lynx, grizzly bear, and North American wolverine (USFWS, 2020). A wildlife survey was conducted near the area surrounding Elkhorn Creek Tailings (MDEQ, 2008; WESTECH, 1995 and no threatened or endangered species had been found on or near the area (MDEQ, 2008; WESTECH, 2006). None of the aforementioned species were surveyed or observed during the site inspection activities.

Freshwater emergent and freshwater forested/shrub wetlands have been identified along the majority of the creeks within the watershed and wetlands have been identified adjacent to potential waste sources at Elkhorn Creek Tailings, Trumley Heap Leach, and Boulaway mine (Figures 2 and 4).

7.3 SAMPLE LOCATIONS

As described in Section 4.2, waste material samples were collected from a total of 59 locations (14 from C & D mine, 7 from Elkhorn Creek Tailings, 8 from Union Elkhorn mine, 2 from Trumley Heap Leach, 8 from Skyline mine, 12 from Boulaway mine, and 8 from Elkhorn Queen mine) as shown in Figures 5 through 12. These sampled areas meet the definition of “pile” described in

TDD 0004/1807-06

HRS Table 2-5, indicating they could also be evaluated as potential sources of contamination for HRS scoring purposes (EPA, 1990).

Additional samples included three opportunity samples: one 5-point composite (BM-WR-OP-01) waste rock sample, one grab (BM-WR-OP-02) waste rock sample collected from a waste pile at Boulaway mine that was visually different blue rock material than the piles adjacent to it (locations BM-WR-13/14 and BM-WR-17/18) and one discrete soil grab sample (ECT-SO-OP-01) collected from the east side of Elkhorn Road (USFS Road 258) from the tailings impoundment (location ECT-WR-03/04).

5-point composite and discrete background soil samples were collected in a geologically similar area representative of the waste pile areas, but outside the influence of mining activities (Figures 5 through 12).

Sample locations are described in Table 1 and analytical results are presented in Tables 5a and 5b. Laboratory data and validation reports are presented in Appendix B.

7.4 ANALYTICAL RESULTS AND BENCHMARK SCREENING EVALUATION SUMMARY

Complete analytical data summaries for waste material samples are presented in Tables 5a and 5b, laboratory analytical data and data validation reports are included in Appendix B. A summary of the analytical results and evaluation against screening benchmarks described in Section 3.0 is presented in the following subsections by drainage and individual mine and mill site.

7.4.1 Elkhorn Creek

C & D Mine

As described in Section 4.2.1, seven grab waste material samples, including a duplicate, were collected from the C & D mine during the June 2019 sampling event as well as one background grab soil sample. The complete analytical data summary is presented in Table 5a, and laboratory analytical data and data validation reports are included in Appendix B. The following exceedances of HRS screening benchmarks were reported:

- Antimony, arsenic, cadmium, chromium, copper, iron, thallium, and vanadium were detected at concentrations greater than three times background and SCDM benchmarks.
- Beryllium, lead, mercury, nickel, silver, and zinc were detected at concentrations greater than three times background.

Seven composite samples, including a duplicate, were collected from the C & D mine during the June 2019 sampling event, as follows: tailings material (CD-WR-01, CD-WR-07, CD-WR-09) and waste material (CD-WR-03, CD-WR-05, CD-11, CD-WR-13). A background composite soil sample was collected from a geologically similar area representative of the waste pile area, but outside the influence of mining activities (CD-SO-BK01). The complete analytical data summary is presented in Table 5b; laboratory analytical data and data validation reports are included in

TDD 0004/1807-06

Appendix B. The following exceedances of the Human Health and Environment screening benchmarks were reported:

- Arsenic was detected at concentrations up to 26,000 times greater than the EPA industrial RSL and lead was detected at concentrations up to 20 times greater than EPA industrial RSL.

Elkhorn Creek Tailings

As described in Section 4.2.1, three grab waste material samples were collected from Elkhorn Creek Tailings during the June 2019 sampling event. A site-specific background grab sample was not collected so the HRS evaluation to three times background screening benchmark was conducted using the background sample from the C & D mine which is in a hydrogeologically similar area. The complete analytical data summary is presented in Table 5a, and laboratory analytical data and data validation reports are included in Appendix B. The following exceedances of HRS screening benchmarks were reported:

- Antimony, arsenic, cadmium, copper, mercury, silver, and zinc were detected at concentrations greater than three times background and SCDM benchmarks
- Lead was detected at concentrations greater than three times background.

Three composite tailings material samples were collected from Elkhorn Creek Tailings during the June 2019 sampling event (ECT-WR-01, ECT-WR-03, ECT-WR-05 [duplicate]). One opportunity sample was also collected (ECT-SO-OP-01). One background composite soil sample was collected from a geologically similar area representative of the waste pile area, but outside the influence of mining activities (ECT-SO-BK01). The complete analytical data summary is presented in Table 5b, laboratory analytical data and data validation reports are included in Appendix B. The following exceedances of the Human Health and Environment screening benchmarks were reported:

- Arsenic was detected at concentrations up to 100 times greater than the EPA industrial RSL, lead was detected at concentrations up to 10 times greater than the EPA industrial RSL, and mercury was detected at concentrations exceeding the EPA industrial RSL.

7.4.2 Slaughterhouse Gulch

Union Elkhorn Mine

As described in Section 4.2.1, four grab waste material samples, including a duplicate, were collected from the Union Elkhorn mine during the June 2019 sampling event. A site-specific background grab sample was not collected so the HRS evaluation to three times background screening benchmark was conducted using the background sample from the C & D mine which is a hydrogeologically similar area. The complete analytical data summary is presented in Table 5a, and laboratory analytical data and data validation reports are included in Appendix B. The following exceedances of HRS screening benchmarks were reported:

- Antimony, arsenic, cadmium, copper, silver, thallium, and vanadium were detected at concentrations greater than three times background and SCDM benchmarks.

TDD 0004/1807-06

- Beryllium, chromium, lead, mercury, nickel, selenium, and zinc were detected at concentrations greater than three times background.

Four composite waste material samples, including a duplicate, were collected from the Union Elkhorn mine during the June 2019 sampling event (UE-WR-01, UE-WR-03, UE-WR-05, UE-WR-07). One background composite soil sample was collected from a geologically similar area representative of the waste pile area, but outside the influence of mining activities (UE-SO-BK01). The complete analytical data summary is presented in Table 5b; laboratory analytical data and data validation reports are included in Appendix B. The following exceedances of the Human Health screening benchmark were reported:

- Arsenic was detected at concentrations up to 200 times greater than the EPA industrial RSL and lead was detected at concentrations up to 30 times greater than the EPA industrial RSL.

7.4.3 Turnley Creek

Trumley Heap Leach

As described in Section 4.2.1, one grab waste material sample was collected from the Trumley Heap Leach site during the June 2019 sampling event as well as one background grab soil sample. The complete analytical data summary is presented in Table 5a; laboratory analytical data and data validation reports are included in Appendix B. The following exceedance of an HRS screening benchmark was reported:

- Arsenic was detected at concentrations greater than three times background and SCDM benchmarks.

One composite sample (THL-WR-01) was collected from the Trumley Heap Leach site during the June 2019 sampling event. One composite soil sample was collected from a geologically similar area representative of the waste material area, but outside the influence of mining activities (THL-SO-BK-02). The complete analytical data summary is presented in Table 5b; laboratory analytical data and data validation reports are included in Appendix B. The following exceedance of the Human Health and Environment screening benchmark was reported:

- Arsenic was detected at a concentration 40 times greater than the EPA industrial RSL.

7.4.4 Queen Gulch

Skyline Mine

As described in Section 4.2.1, four grab waste material samples, including a duplicate, were collected from the Skyline mine during the September 2019 sampling event as well as a background grab soil sample. The complete analytical data summary is presented in Table 5a;

laboratory analytical data and data validation reports are included in Appendix B. The following exceedances of HRS screening benchmarks were reported:

- Arsenic, cadmium, and copper were detected at concentrations greater than three times background and SCDM benchmarks.
- Chromium, lead, silver, and zinc were detected at concentrations greater than three times background.

Four composite waste material samples, including a duplicate, were collected from the Skyline mine during the September 2019 sampling event (SM-WR-03, SM-WR-05, SM-WR-07, SM-WR-10). A background composite soil sample was collected from a geologically similar area representative of the waste pile area, but outside the influence of mining activities (SM-SO-BK01). The complete analytical data summary is presented in Table 5b; laboratory analytical data and data validation reports are included in Appendix B. The following exceedance of the Human Health and Environment screening benchmarks were reported:

- Lead was detected at concentrations up to 10 times greater than the EPA industrial RSL.

Boulaway Mine

As described in Section 4.2.1, six grab waste material samples, including a duplicate, were collected from the Boulaway mine during the June 2019 sampling event as well as a background grab soil sample. The complete analytical data summary is presented in Table 5a; laboratory analytical data and data validation reports are included in Appendix B. The following exceedances of HRS screening benchmarks were reported:

- Antimony, arsenic, cadmium, cobalt, copper, iron, manganese, mercury, thallium, and zinc were detected at concentrations greater than three times background and SCDM benchmarks.
- Beryllium, lead, nickel, and silver were detected at concentrations greater than three times background.

Six composite waste material samples, including a duplicate, were collected from the Boulaway mine during the June 2019 sampling event (BM-WR-05, BM-WR-13, BM-WR-15, BM-WR-17, BM-WR-19, BM-WR-OP-01). A background composite soil sample was collected from a geologically similar area representative of the waste pile area, but outside the influence of mining activities (BM-SO-BK01). The complete analytical data summary is presented in Table 5b; laboratory analytical data and data validation reports are included in Appendix B. The following exceedance of the Human Health and Environment screening benchmarks were reported:

- Arsenic was detected at concentrations up to 800 times greater than the EPA industrial RSL and cobalt was detected at concentrations that exceed the EPA industrial RSL.

TDD 0004/1807-06

7.4.5 South Fork Queen Gulch

Elkhorn Queen Mine

As described in Section 4.2.1, four grab waste material samples were collected from the Elkhorn Queen mine during the June 2019 sampling event as well as a background grab soil sample. The complete analytical data summary is presented in Table 5a, laboratory analytical data and data validation reports are included in Appendix B. The following exceedances of HRS screening benchmarks were reported:

- Antimony, arsenic, cadmium, cobalt, iron, and thallium were detected at concentrations greater than three times background and SCDM benchmarks.
- Copper, lead, manganese, mercury, silver, and zinc were detected at concentrations greater than three times background.

Four composite waste material samples were collected from the Elkhorn Queen mine during the June 2019 sampling event (EQ-WR-01, EQ-WR-03, EQ-WR-05, EQ-WR-07). A background composite soil sample was collected from a geologically similar area representative of the waste pile area, but outside the influence of mining activities (EQ-SO-BK02). The complete analytical data summary is presented in Table 5b; laboratory analytical data and data validation reports are included in Appendix B. The following exceedance of the Human Health and Environment screening benchmarks were reported:

- Arsenic was detected at concentrations up to 8,000 times greater than the EPA industrial RSL, lead was detected at concentrations up to 40 times greater than the EPA industrial RSL, and thallium was detected at concentrations that exceed the EPA industrial RSL.

7.5 AIR SAMPLING LOCATIONS AND ANALYTICAL RESULTS

Air sampling was not performed as part of this investigation, the air pathway is being evaluated indirectly through the evaluation of soil at the sites and the potential concern of soil particle migration downgradient and off-site through wind-blown dust, having an adverse effect on human or ecological targets.

7.6 SOIL EXPOSURE AND AIR PATHWAY CONCLUSIONS

An Observed Release to soils was documented for at least one metal for the seven mining related sites sampled as part of this SI. Based on readily available information regarding current potential targets, as defined by HRS (i.e., populations regularly present on and within 200 ft of surficial soil contamination; populations regularly present within 1 mile), the soils at the C & D, Union Elkhorn, Skyline, Boulaway, and Elkhorn Queen mines, and the Elkhorn Creek Tailing and Trumley Heap Leach sites have been impacted from waste materials present on those sites.

The sites are accessible from public and private property and are unfenced. Given the metals concentrations detected in waste pile samples, and availability for recreational use and to transients, the waste piles may pose a threat to human health via direct contact. Evidence of recreational use (UTV, camping, fishing, etc.), especially at Elkhorn Creek Tailings, was observed

TDD 0004/1807-06

throughout the investigation area. Campfire rings were observed on the waste piles at Boulaway and Union Elkhorn mines, children's footprints were observed in the tailings pile at Elkhorn Creek Tailings and shooting targets and firing points were observed at Trumley Heap Leach. During the September 2019 sampling event, two gentlemen were encountered camping in the cabin at Skyline mine and were reportedly grouse and bow hunting. In addition, on-site wetland areas, co-mingled with mine waste and significantly elevated metals concentrations, are an attraction to wildlife and likely result in higher use and exposures to wildlife receptors.

Air samples have not been collected as part of this or previous investigations; therefore, analytical data cannot be used to evaluate the air pathway. There is potential for soil particles to become airborne and migrate off-site from mine waste piles where elevated concentrations of metals were detected. Based on readily available information regarding current potential targets, as defined by HRS (i.e., populations regularly present on and within 200 feet of surficial soil contamination; populations regularly present within 4 miles), the air pathway is not likely to be significantly impacted from waste materials present on the sites.

The waste pile sample data were also evaluated against benchmarks to determine potential human health impacts. Arsenic and lead were detected in almost all waste material samples collected at concentrations exceeding the EPA industrial RSLs for arsenic by as much 26,000 times and lead by as much as 40 times. Though industrial uses are not currently present at the sites, the exceedances of the RSLs provide an initial screening benchmark and relative comparisons to gauge the potential for risks to human health if this use was to occur.

TDD 0004/1807-06

8.0 SUMMARY OF CONCLUSIONS

Table 8-1 presents a summary of the conclusions for each of the sites presented by drainage and individual mine or mill site. The information presented herein includes: property ownership; presence of adits and status (draining or no evidence of draining); size of waste material piles and/or impoundments; concentrations of COCs in waste material, adit drainage, surface water, and sediments; residential, recreational, and/or terrestrial use on-site or in the vicinity of each of the sites; sensitive environments on-site or in the vicinity of each of the sites; summary of HRS observed release; and the ease or difficulty of physically accessing a site.

TDD 0004/1807-06

Table 8-1 – Summary of Conclusions

Site Name	Ownership	Adits (Yes/No) / Draining (Yes/No)	Source Characteristics			Pathway Targets								HRS Observed Release	Overland Flow Distance From PPE	Accessibility / Proximity	Conclusion
			Waste Rock / Tailings		Adit Drainage ²	Human				Ecological							
			Cubic Yards	COCs ¹		Drinking Water ³	>MCL ⁴	Residential	Recreational	Terrestrial	Aquatic		Sensitive				
C & D Mine	Private	Yes / No	15,000	BKG mercury > 3X chromium, nickel >5X beryllium > 10X cadmium, iron, silver > 20X antimony, zinc > 50X copper, vanadium > 150X arsenic > 700X RSL Arsenic > 26,000X Lead > 20X	N/A	~1.2 miles	No exceedance	None	Medium; hiking, UTV	Potential	No exceedance	TEC/PEC Chromium, nickel >1X TEC	No critical habitat, potential T&E species include Ute ladies’-tresses, grizzly bear, and Canada lynx	Soil;	4,300 ft to Elkhorn Creek	Relatively easy to access; within 1 mile of Elkhorn	The site is relatively easy to access, metals concentrations in waste material are over 26,000X the Industrial RSL for arsenic and 20X the Industrial RSL for lead.
Elkhorn Creek Tailings	Private/ USFS	No / NA	57,000 (tailings) 0.50-acre dried tailings impoundment, 5-10 ft deep	BKG arsenic >5X cadmium >20X lead > 30X copper >40X antimony, silver, zinc >100X mercury >1000X RSL mercury >1X lead >10X arsenic >100X	N/A	900 ft (up- gradient)	antimony >1X cadmium >2X	150-ft west of northern pile (seasonal)	High; sightseeing, camping, UTV	Potential	BKG antimony, zinc >10X lead >30X cadmium, manganese >50X Chronic zinc >1X lead >2X cadmium >10X	On-site (waste material piles in creek) BKG cadmium, mercury >4X lead, manganese, silver, zinc >5X antimony >10X TEC/PEC mercury >3X PEC arsenic, manganese >10X copper >30X TEC lead, zinc >30X Cadmium >40X Antimony, silver >100X TEC	Wetlands on-site and adjacent downstream; no critical habitat, potential T&E species include Ute ladies’- tresses, grizzly bear, and Canada lynx	Surface water, sediment and soil	33 ft to Elkhorn Creek	Easily accessible; on roadside to Elkhorn	The site is easily accessible and there is evidence of high recreational use on the piles and in the vicinity; there are wetlands on the site; metals concentrations in waste material are 100X the Industrial RSL for arsenic and 10X the Industrial RSL for lead.
Slaughterhouse Gulch																	
Union Elkhorn Mine	USFS	Yes / Yes	75,000	BKG arsenic >3X mercury, copper >10X cadmium >40X zinc >60X antimony, lead, silver ≥80X RSL lead >30X arsenic >200X	Acute/ Chronic copper >1X zinc > 20X cadmium >50X Chronic lead >1X	~2 miles	No exceedance	None	Medium; hiking, fishing, camping, UTV	Potential	No exceedance	On-site (waste material piles in creek) BKG silver, zinc >3X lead >30X TEC/PEC arsenic, lead >1X	Wetlands ~0.35 miles downstream; no critical habitat, potential T&E species include Ute ladies’- tresses, grizzly bear, and Canada lynx	Sediment and soil	<5 ft to Slaughter- house Gulch	Moderately difficult to access; roadway to site obstructed by fallen trees during SI field work	The site is remote and moderately difficult to access, though evidence of recreational use has been observed; contains a seasonally draining adit, waste material is <10 ft from the creek bed, and metals concentrations are over 200X the Industrial RSL for arsenic and 80X the

Site Name	Ownership	Adits (Yes/No) / Draining (Yes/No)	Source Characteristics			Pathway Targets								HRS Observed Release	Overland Flow Distance From PPE	Accessibility / Proximity	Conclusion
			Waste Rock / Tailings		Adit Drainage ²	Human				Ecological							
			Cubic Yards	COCs ¹		Drinking Water ³	>MCL ⁴	Residential	Recreational	Terrestrial	Aquatic		Sensitive				
Greyback Gulch																	
Mill (unnamed) <i>Not sampled, samples collected from Greyback Gulch only</i>	USFS	No / NA	N/A	N/A	N/A	None within drainage	No exceedance	None	Low; hiking	Potential	No exceedance	<u>TEC/PEC</u> manganese >1X copper >2X TEC	No critical habitat, potential T&E species include Ute ladies’-tresses, grizzly bear, and Canada lynx	No	925 ft to Greyback Gulch	Relatively easy to access, within 1-mile of Elkhorn	The site is accessible but has no threat of a release or potential impacts to human health or the environment due to a lack of hazardous containing materials and limited targets.
Turnley Creek																	
Trumley Heap Leach	USFS	No / NA	2-acre reclaimed former heap leach	<u>BKG</u> arsenic >10X <u>RSL</u> arsenic >40X	N/A	None within 4 drainage	No exceedance	None	High; hiking and shooting	Potential	<u>BKG</u> Copper >3X	<u>BKG</u> arsenic >4X <u>TEC/PEC</u> arsenic >1X TEC manganese >1X	Wetlands immediately adjacent to the site; no critical habitat, potential T&E species include Ute ladies’-tresses, grizzly bear, and Canada lynx	Surface water, sediment, and soil	200 ft to Turnley Creek	Easily accessible, less than 1.5 miles from Elkhorn	The site is easily accessible and there is evidence of recreational use on the site; there are wetlands adjacent and downstream; the arsenic concentration in waste material is 40X the Industrial RSL for arsenic.
Queen Gulch																	
Skyline Mine	USFS	Yes / Yes	400	<u>BKG</u> copper, zinc >20X silver >60X arsenic, cadmium >150X lead > 900X <u>RSL</u> Lead ≥10X RSL	<u>Acute/ Chronic</u> cadmium, zinc >1X	None within drainage	No exceedance	None	High; hiking, UTV, hunting, cross-country skiing	Potential	<u>BKG</u> arsenic, manganese >5X	On-site (waste material piles in creek; adit drainage to creek)	Wetlands and a fishery ~0.3 miles; no critical habitat, potential T&E species include Ute ladies’-tresses, grizzly bear, and Canada lynx	Surface water and soil	0 ft to Queen Gulch	Difficult to access via ~2.5-mile hiking trail with a significant elevation gain; more than 2 miles from Elkhorn	This site is difficult to access though appears to be used frequently by recreators; adit discharge mixes with spring water to form the headwaters of Queen Gulch; there are wetlands and a fishery downstream; metals concentrations in waste material is 10X the Industrial RSL for lead and 900X the background concentration; concentrations of arsenic and cadmium are 150X the background.
												<u>TEC/PEC</u> chromium, copper, manganese, zinc >1X iron, nickel, silver >1X TEC cadmium, lead >2X arsenic >7X					

Site Name	Ownership	Adits (Yes/No) / Draining (Yes/No)	Source Characteristics			Pathway Targets								HRS Observed Release	Overland Flow Distance From PPE	Accessibility / Proximity	Conclusion
			Waste Rock / Tailings		Adit Drainage ²	Human				Ecological							
			Cubic Yards	COCs ¹		Drinking Water ³	>MCL ⁴	Residential	Recreational	Terrestrial	Aquatic		Sensitive				
											>WQS ⁵	Sediment ⁶					
Boulaway Mine	USFS	Yes / No	4,000	BKG thallium >2X antimony, mercury >3X iron, lead, silver ≥ 5X beryllium, manganese, nickel >10X arsenic, cadmium, cobalt >100X zinc >180X copper >300X RSL cobalt >1X arsenic >800X	N/A	None within drainage	No exceedance	None	High; hiking, camping, and UTV	Potential	No exceedance	BKG Arsenic, cadmium >3X copper, zinc >5X TEC/PEC Manganese >1X arsenic, copper, iron, silver, zinc >1X TEC	Wetlands are on-site and adjacent downstream; no critical habitat, potential T&E species include Ute ladies’-tresses, grizzly bear, and Canada lynx	Sediment and soil	75 ft to Queen Gulch	Easily accessible; less than 1 mile from Elkhorn	The site is easily accessible and there is evidence of recreational use on the site; wetlands are present on-site and adjacent downstream; metals concentrations in waste material is 800X the Industrial RSL for arsenic and 300X the background concentration for copper; 100X background concentrations for arsenic/
South Fork Queen Gulch																	
Elkhorn Queen Mine	Private	Yes / No	23,000	BKG antimony, cobalt, copper, manganese, mercury >3X thallium >10X arsenic, zinc >40X silver >70X cadmium >100X lead >200X RSL thallium >2X lead >40X arsenic >8000X	N/A	None within drainage	N/A – exceedance in BKG only	None	High; hiking, UTV	Potential	Chronic Exceedance in BKG only	TEC/PEC Manganese >1X Iron, nickel, silver, zine >1X TEC	No critical habitat, potential T&E species include Ute ladies’-tresses, grizzly bear, and Canada lynx	Soil	3,500 ft to Queen Gulch	Moderately difficult to access; within 2 miles of Elkhorn	The site is fairly remote and difficult to access; metals concentrations in waste material are 8000X the Industrial RSL for arsenic and 40X the Industrial RSL for lead.

Notes:
¹ Comparisons to background and EPA RSL for Industrial Soil (EPA, 2020b)
² Comparison to Montana Chronic Aquatic Life Standard (MTDEQ, 2019)
³ Distance to closest documented domestic drinking water well
⁴ Comparison of downstream samples to EPA MCLs (EPA, 2009); INFORMATIONAL ONLY: no surface water drinking water intakes are currently present on Elkhorn Creek or Boulder River
⁵Comparison of downstream samples to upstream/background and Montana Chronic Aquatic Life Standard (MTDEQ, 2019)
⁶ Comparison of downstream sediment samples to upstream/background sediment and TEC (EPA, 2006)/PEC (EPA, 2000)

BKG = background sample concentration
COC = contaminant of concern
HRS = Hazard Ranking System
MCL = Maximum Contaminant Level
PEC = Probable Effect Concentration
RSL = Regional Screening Level
T&E = Federally listed threatened and endangered species
TEC = Threshold Effect Concentration
WQS = Water Quality Standard

9.0 REFERENCES

Bureau of Land Management (BLM), 2020. LR200 Public Reports. Reporting Application. Accessed January 13 and 14, 2020. 6 pages.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Soundness	Evaluation and Review
BLM, 2020	Database	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

MacDonald, D.D., C.G. Ingersoll, and T.A. Berger, 2000. "Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems." *Archives of Environmental Contamination and Toxicology*, 39: 20-31.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
MacDonald, 2000	Journal Article	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

Montana Department of Environmental Quality (MDEQ), 2020. "MDEQ: Hard Rock Mining Environmental Documents for Operating Permits," Accessed January 15, 2020, <http://deq.mt.gov/Public/ea/hardrock>.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Soundness	Evaluation and Review
MDEQ, 2020	Website	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

MDEQ, 2018. Final 2018 Water Quality Integrated Report. Document number WQDIMTSIR-07f. November 27, 2018. Available at: <http://deq.mt.gov/Water/Resources/Report>

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
MDEQ, 2018	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

MDEQ, 2019. Circular DEQ-7, Montana Numeric Water Quality Standards. June 2019. <http://deq.mt.gov/Portals/112/Water/WQPB/Standards/PDF/DEQ7/DEQ-7.pdf>.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Soundness	Evaluation and Review
MDEQ, 2019	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

TDD 0004/1807-06

MDEQ, 2008. Environmental Assessment for Elkhorn Goldfields, Inc. Golden Dream Mine Project Operating Permit Application No. 173 Elkhorn, Montana. April 2008.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
MDEQ, 2008	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

MDEQ, 1998. Cultural Resource Inventory and Assessment for Elkhorn Tailings Piles. Prepared for MDEQ Mine Waste Cleanup Bureau. Prepared by Dale M. Gray GCM Services, Inc. May 1998.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
MDEQ, 1998	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

MDEQ, no date. MDEQ Elkhorn Mining District, Jefferson County, Montana. <http://deq.mt.gov/Land/abandonedmines/linkdocs/79tech>. Accessed May 31, 2017.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
MDEQ, no date	Website	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

Montana State Library (MSL), 2019. Montana Cadastral. Parcels Database. Last updated December 4, 2019. Available at: <http://svc.mt.gov/msl/mtcadastral/>

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
MSL, 2019	Database	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

Montana State Parks (MSP), 2020a. Montana Fish, Wildlife & Parks, Species of Interest. <http://fwp.mt.gov>. Accessed January 14, 2020.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
MSP, 2020a	Website	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

MSP, 2020b. Montana Fish, Wildlife & Parks, Montana Fisheries Information System (MFish). <http://fwp.mt.gov/fishing/mFish/>. January 14, 2020.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
MSP, 2020b	Website	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

TDD 0004/1807-06

Montana Technological University of Montana, 2020. Montana Bureau of Mines and Geology (MBMG). Groundwater Information Center (GWIC) web mapping application. <http://data.mbm.mtech.edu/mapper/mapper.asp>. Accessed January 10, 2020

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
Montana Technological University of Montana, 2020	Website	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

Munson, Gene, 1989. Montana Cultural Resource Inventory for Golden Curry Mine. October 9, 1989.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
Munson, 1989	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

U.S. Environmental Protection Agency (EPA), 2020a. Water System Details for Public Water System MT0000158. Safe Drinking Water Information System (SDWIS). Drinking Water Branch.

http://sdwisdww.mt.gov:8080/DWW/JSP/WaterSystemDetail.jsp?tinwsys_is_number=2576&tinwsys_st_code=MT&wsnumber=MT0000158. Accessed January 10, 2020

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
EPA, 2020a	Website	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

EPA, 2020b. Regional Screening Levels (RSL) – Generic Tables. May 2020. <https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables>.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
EPA, 2020	Website	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

EPA, 2009. EPA National Primary Drinking Water Regulations. May 2009. <https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations#seven>

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
EPA, 2009	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

TDD 0004/1807-06

EPA, 2006. EPA Region III BTAG, Freshwater Sediment Screening Benchmarks.
https://www.epa.gov/sites/production/files/2015-09/documents/r3_btag_fw_sediment_benchmarks_8-06.pdf

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
EPA, 2006	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

EPA, 2000. Prediction of sediment toxicity using consensus-based freshwater sediment quality guidelines. EPA 905/R-00/007. June 2000.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
EPA, 2000	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

EPA, 1993. Region 8 Supplement to Guidance for Performing Site Inspections under CERCLA. OSWER. February 1993.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
EPA, 1993	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

EPA, 1992. Guidance for Performing Site Inspections Under CERCLA, Interim Final. OSWER. Directive 9345.1-05. EPA540-R-92-021. September 1992.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
EPA, 1992	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

U.S. Forest Service (USFS), no date. Elkhorn Wildlife Management Unit – Wildlife. Elkhorn Home Page. Available at:
<https://www.fs.usda.gov/detailfull/helena/home/?cid=stelprdb5371113&width=full>.
Accessed February 4, 2020.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
USFS, no date	Website	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

USFS, 2003. Elkhorn Creek Tailings. Site Investigation Report. Prepared for USFS Northern Region. Prepared by Maxim Technologies Inc. September.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
USFS, 2003	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

TDD 0004/1807-06

USFS, 2005. Falcon Heap Leach Site Investigation Beaverhead-Deerlodge National Forest. Prepared for USFS Northern Region. Prepared by Maxim Technologies Inc. January.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
USFS, 2005	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

U.S. Fish and Wildlife Service (USFWS), 2020. Information, Planning, and Conservation System (IPaC). Accessed January 10, 2020. <http://ecos.fws.gov/ipac/>.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
USFWS, 2020	Website	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

USFWS, 2019. National Wetlands Inventory, Wetlands Mapper. Published May, 2014, Updated October 9, 2019. <http://www.fws.gov/wetlands/Data/Mapper.html>

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
USFWS, 2019	Website	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

Weed, W.H., 1901. Geology and ore deposits of the Elkhorn mining district, Jefferson County, Montana. USGS 22d Annual Report, pt. 2, p. 399-550. U.S. Government Printing Office, Washington.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
Weed, 1901	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

Western Regional Climate Center (WRCC), 2020. Boulder, Montana. <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?mt1008>. Accessed January 10, 2020.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
WRCC, 2020	Website	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

Western Technology and Engineering, Inc. (WESTECH), 1993. Elkhorn Project Fisheries Inventory. Helena, Montana. June.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
WESTECH, 1993	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

TDD 0004/1807-06

WESTECH, 1995. Wildlife Baseline Study. Helena, Montana. March.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
WESTECH, 1995	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

WESTECH, 2006. Biological Resources Update. Helena, Montana. June.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
WESTECH, 2006	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

Weston Solutions, Inc. (WESTON), 2019. Draft Sampling Activities Report for C & D Mine, Elkhorn Creek Tailings, Union Elkhorn Mine, Trumley Heap Leach, Skyline Mine, Boulaway Mine, Elkhorn Queen Mine, Jefferson County, Montana. August 2019.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
WESTON, 2019a	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

WESTON, 2019. Sampling and Analysis Plan for C & D Mine, Elkhorn Creek Tailings, Union Elkhorn Mine, Trumley Heap Leach, Skyline Mine, Boulaway Mine, Elkhorn Queen Mine, Jefferson County, Montana. May 2019.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
WESTON, 2019b	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

WESTON, 2019. Quality Assurance Project Plan for U.S. EPA Region 8 CERCLA Site Assessment, Revision 2. May 2019.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
WESTON, 2019b	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

WESTON, 2018. Pre-CERCLA Screening Report for Elkhorn Mining District, Jefferson County, Montana. May 2018.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
WESTON, 2018	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

TDD 0004/1807-06

TABLES

Sample Location, Description, and Information
Site Inspection
Elkhorn Mining District

Table 1

Sample ID	Geographical Coordinates UTM		Location Description	Matrix	Depth	Sample Type	Measurements/ Analyses
	Zone 12 (WGS 84)						
	Latitude	Longitude					
C&D Mine							
CD-SW-BK01	46.278616	-111.939645	Elkhorn Creek above confluence with the overland flow probable point of entry	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
CD-SD-BK01				Sediment	0-6 in.	Grab	
CD-SW-01	46.277302	-111.940962	Elkhorn Creek below confluence with the overland flow probable point of entry	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
CD-SD-01				Sediment	0-6 in.	Grab	
CD-SO-BK01	46.290125	-111.933542	Background soil	Surface Soil	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
CD-SO-BK02	46.290044	-111.933925	Background soil	Surface Soil	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
CD-WR-01	46.288632	-111.934086	Waste material pile	Tailings	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
CD-WR-02	46.288618	-111.933975	Waste material pile	Tailings	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
CD-WR-03	46.28856829	-111.9342211	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
CD-WR-04	46.288563	-111.93428	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
CD-WR-05	46.288527	-111.934102	Waste material pile	Tailings	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
CD-WR-06	46.28854448	-111.9340351	Waste material pile	Tailings	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
CD-WR-07	46.2885602	-111.9345337	Waste material pile	Tailings	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
CD-WR-08	46.288491	-111.93461	Waste material pile	Tailings	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
CD-WR-09	46.288408	-111.934194	Waste material pile	Tailings	0-6 in.	15-Point Composite	XRF field screening, TAL Metals and Mercury
CD-WR-10	46.28840952	-111.9341937	Waste material pile	Tailings	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
CD-WR-11	46.289162	-111.934497	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
CD-WR-12	46.28906	-111.934503	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
CD-WR-13	46.289162	-111.934497	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
CD-WR-14	46.28906	-111.934503	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
Elkhorn Creek Tailings							
ECT-SW-BK01	46.27018	-111.953128	Source area-specific background location in Elkhorn Creek	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, Mercury, and Cyanide
ECT-SD-BK01	46.270189	-111.953175		Sediment	0-6 in.		
ECT-SW-01	46.268601	-111.955016	Elkhorn Creek at most downstream probable point of entry of waste pile	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, Mercury, and Cyanide
ECT-SD-01	46.268727	-111.954819		Sediment	0-6 in.		
ECT-SW-02	46.264029	-111.956291	Elkhorn Creek at most downstream probable point of entry of waste pile	Surface Water	0-12 in.	Grab	Removed from Sampling
ECT-SD-02				Sediment	0-6 in.		
ECT-SW-03	46.263794	-111.956482	Elkhorn Creek at most downstream point within the wetland area	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, Mercury, and Cyanide
ECT-SD-03				Sediment	0-6 in.		
ECT-SW-04	46.261148	-111.957131	Elkhorn Creek at 1/10-mile inside of the wetland area	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, Mercury, and Cyanide
ECT-SD-04				Sediment	0-6 in.		
ECT-SW-05	46.263794	-111.956482	Elkhorn Creek at most downstream point within the wetland area	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, Mercury, and Cyanide
ECT-SD-05				Sediment	0-6 in.		
ECT-SO-BK01	46.267664	-111.95572	Background soil	Surface Soil	0-6 in.	5-Point Composite	XRF field screening, TAL Metals, Mercury and Cyanide
ECT-SO-OP-01	46.266639	-111.955519	East side of Elkhorn Creek Road across from Elkhorn Creek Tailings impoundment	Surface Soil	0-6 in.	Grab	XRF field screening, TAL Metals, Mercury and Cyanide
ECT-WR-01	46.269144	-111.954139	Waste material pile	Tailings	0-6 in.	30-Point Composite	XRF field screening, TAL Metals, Mercury and Cyanide
ECT-WR-02	46.269144	-111.954139	Waste material pile	Tailings	0-6 in.	Grab	XRF field screening, TAL Metals, Mercury and Cyanide
ECT-WR-03	46.266474	-111.957065	Waste material pile	Tailings	0-6 in.	30-Point Composite	XRF field screening, TAL Metals, Mercury and Cyanide
ECT-WR-04	46.266474	-111.957065	Waste material pile	Tailings	0-6 in.	Grab	XRF field screening, TAL Metals, Mercury and Cyanide
ECT-WR-05	46.264529	-111.957177	Waste material pile	Tailings	0-6 in.	30-Point Composite	XRF field screening, TAL Metals, Mercury and Cyanide
ECT-WR-06	46.264529	-111.957177	Waste material pile	Tailings	0-6 in.	Grab	XRF field screening, TAL Metals, Mercury and Cyanide
Union Elkhorn Mine							
UE-SW-BK01	46.29157	-111.942324	Source area-specific background location in Slaughterhouse Gulch	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
UE-SD-BK01				Sediment	0-6 in.		
UE-SW-01	46.290928	-111.942629	Slaughterhouse Gulch at most downstream probable point of entry of waste pile	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
UE-SD-01				Sediment	0-6 in.		
UE-SW-02	46.284274	-111.946033	Slaughterhouse Gulch at 1/10-mile inside of the wetland area	Surface Water	0-12 in.	Grab	Not Collected
UE-SD-02				Sediment	0-6 in.		
UE-SW-03	46.290928	-111.942629	Slaughterhouse Gulch at most downstream probable point of entry of waste pile	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
UE-SD-03				Sediment	0-6 in.		
UE-SW-04	46.291487	-111.942844	Drainage from pipe exiting adit	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
UE-SD-04				Sediment	0-6 in.		
UE-SO-BK01	46.291388	-111.942589	Background soil	Surface Soil	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
UE-WR-01	46.291488	-111.943259	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
UE-WR-02	46.291488	-111.943259	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury

Sample Location, Description, and Information
Site Inspection
Elkhorn Mining District

Table 1

Sample ID	Geographical Coordinates UTM Zone 12 (WGS 84)		Location Description	Matrix	Depth	Sample Type	Measurements/ Analyses
	Latitude	Longitude					
UE-WR-03	46.291424	-111.943204	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
UE-WR-04	46.291424	-111.943204	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
UE-WR-05	46.291188	-111.942509	Waste material pile	Waste Material	0-6 in.	15-Point Composite	XRF field screening, TAL Metals and Mercury
UE-WR-06	46.291379	-111.942789	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
UE-WR-07	46.291188	-111.942509	Waste material pile	Waste Material	0-6 in.	15-Point Composite	XRF field screening, TAL Metals and Mercury
UE-WR-08	46.291379	-111.942789	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
Greyback Gulch							
GG-SW-01	46.280903	-111.9688143	Source area-specific background location in Greyback Gulch	Surface Water	0-12 in.	Grab	TAL Metals and Mercury
GG-SD-01				Sediment	0-6 in.		TAL Metals and Mercury
GG-SW-02	46.2806055	-111.9700887	Unnamed creek just above confluence with Greyback Gulch	Surface Water	0-12 in.	Grab	TAL Metals and Mercury
GG-SD-02				Sediment	0-6 in.		TAL Metals and Mercury
GG-SW-03	46.2795906	-111.9716078	Greyback Gulch downstream of mill site and confluence with unnamed creek	Surface Water	0-12 in.	Grab	TAL Metals and Mercury
GG-SD-03				Sediment	0-6 in.		TAL Metals and Mercury
Trumley Heap							
THL-SW-BK01	46.27137	-111.973545	Source area-specific background location in Turnley Creek	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, Mercury, and Cyanide
THL-SD-BK01	46.271488	-111.97363		Sediment	0-6 in.		
THL-SW-01	46.270399	-111.970333	Turnley Creek at most downstream probable point of entry of the site	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, Mercury, and Cyanide
THL-SD-01	46.270399	-111.970333		Sediment	0-6 in.		
THL-SW-02	46.268929	-111.96869	Turnley Creek at 1/10-mile downstream of the most probably point of entry	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, Mercury, and Cyanide
THL-SD-02	46.269006	-111.968522		Sediment	0-6 in.		
THL-SW-03	46.258049	-111.962853	Turnley Creek just above the confluence with Elkhorn Creek	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, Mercury, and Cyanide
THL-SD-03	46.258049	-111.962853		Sediment	0-6 in.		
THL-SW-04	46.270399	-111.970333	Turnley Creek at most downstream probable point of entry of the site	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, Mercury, and Cyanide
THL-SD-04	46.270399	-111.970333		Sediment	0-6 in.		
THL-SO-BK01	46.268575	-111.973816	Background soil	Surface Soil	0-6 in.	Grab	XRF field screening, TAL Metals, Mercury and Cyanide
THL-SO-BK02	46.268592	-111.973825	Background soil	Surface Soil	0-6 in.	5-Point Composite	XRF field screening, TAL Metals, Mercury and Cyanide
THL-WR-01	46.269852	-111.971261	Waste material pile	Surface Soil	0-6 in.	30-Point Composite	XRF field screening, TAL Metals, Mercury and Cyanide
THL-WR-02	46.268966	-111.972193	Waste material pile	Surface Soil	0-6 in.	Grab	XRF field screening, TAL Metals, Mercury and Cyanide
Skyline Mine							
SM-SW-BK01	46.290586	-111.889397	Background location in headwaters of Queen Gulch	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
SM-SD-BK01				Sediment	0-6 in.		Not Collected
SM-SW-01	46.289477	-111.889447	Queen Gulch just above confluence with adit drainage	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
SM-SD-01				Sediment	0-6 in.		
SM-SW-02	46.2894854	-111.8893747	Adit drainage	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
SM-SD-02				Sediment	0-6 in.		
SM-SW-03	46.288662	-111.8892271	Queen Gulch at most downstream probable point of entry of adit drainage and waste pile	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
SM-SD-03				Sediment	0-6 in.		
SM-SW-04	46.2863275	-11.8846364	Leslie Lake at inlet	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
SM-SD-04				Sediment	0-6 in.		
SM-SW-05	46.2894854	-111.8893747	Adit drainage	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
SM-SD-05				Sediment	0-6 in.		
SM-SO-BK01	46.290419	-111.888679	Background soil	Surface Soil	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
SM-SO-BK02			Background soil	Surface Soil	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
SM-WR-01	46.290535	-111.889015	Waste material pile	Waste Material	0-6 in.	5-Point Composite	Not Collected
SM-WR-02						Grab	
SM-WR-03	46.290077	-111.889259	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
SM-WR-04	46.29012	-111.889259	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
SM-WR-05	46.29022497	-111.8890222	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
SM-WR-06	46.290109	-111.889094	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
SM-WR-07	46.289639	-111.889332	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
SM-WR-08	46.289559	-111.889258	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
SM-WR-09	46.290109	-111.889094	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
SM-WR-10	46.29022497	-111.8890222	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
Boulaway Mine							
BM-SW-BK01	46.260806	-111.945669	Source area-specific background location in Queen Gulch	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
BM-SD-BK01	46.260806	-111.945669		Sediment	0-6 in.		
BM-SW-01	46.259454	-111.948565	Queen Gulch at most downstream probable point of entry of waste pile	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
BM-SD-01	46.259454	-111.948565		Sediment	0-6 in.		

Sample Location, Description, and Information
Site Inspection
Elkhorn Mining District

Table 1

Sample ID	Geographical Coordinates UTM Zone 12 (WGS 84)		Location Description	Matrix	Depth	Sample Type	Measurements/ Analyses
	Latitude	Longitude					
BM-SW-02	46.257224	-111.950699	Queen Gulch at 1/10-mile inside of the wetland area	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
BM-SD-02	46.257224	-111.950699		Sediment	0-6 in.		
BM-SO-BK01	46.260861	-111.944363	Background soil	Surface Soil	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
BM-SO-BK02	46.260876	-111.944387	Background soil	Surface Soil	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
BM-WR-01	46.261832	-111.949063	Waste material pile	Waste Material	0-6 in.	5-Point Composite	Not Collected
BM-WR-02			Waste material pile	Waste Material	0-6 in.	Grab	
BM-WR-03	46.261349	-111.94858	Waste material pile	Waste Material	0-6 in.	5-Point Composite	Not Collected
BM-WR-04			Waste material pile	Waste Material	0-6 in.	Grab	
BM-WR-05	46.260953	-111.948634	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
BM-WR-06	46.260953	-111.948678	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
BM-WR-07	46.260518	-111.948306	Waste material pile	Waste Material	0-6 in.	15-Point Composite	Not Collected
BM-WR-08			Waste material pile	Waste Material	0-6 in.	Grab	
BM-WR-09	46.259071	-111.949294	Waste material pile	Waste Material	0-6 in.	15-Point Composite	Not Collected
BM-WR-10			Waste material pile	Waste Material	0-6 in.	Grab	
BM-WR-11	46.259702	-111.948839	Waste material pile	Waste Material	0-6 in.	5-Point Composite	Not Collected
BM-WR-12			Waste material pile	Waste Material	0-6 in.	Grab	
BM-WR-13	46.260072	-111.948323	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
BM-WR-14	46.260074	-111.948269	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
BM-WR-15	46.260152	-111.948072	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
BM-WR-16	46.260152	-111.948072	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
BM-WR-17	46.259786	-111.948286	Waste material pile	Waste Material	0-6 in.	15-Point Composite	XRF field screening, TAL Metals and Mercury
BM-WR-18	46.259786	-111.948286	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
BM-WR-19	46.259786	-111.948286	Waste material pile	Waste Material	0-6 in.	15-Point Composite	XRF field screening, TAL Metals and Mercury
BM-WR-20	46.259786	-111.948286	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
BM-WR-OP-01	46.25994	-111.948351	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
BM-WR-OP-02	46.25993973	-111.9483509	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
Elkhorn Queen							
EQ-SW-BK01	46.24503	-111.939022	Source area-specific background location in South Fork Queen Gulch	Surface Water	0-12 in.	Grab	Not Collected
EQ-SD-BK01				Sediment	0-6 in.		
EQ-SW-01	46.253542	-111.955422	Queen Gulch just above confluence with South Fork Queen Gulch	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
EQ-SD-01	46.253748	-111.955078		Sediment	0-6 in.		
EQ-SW-02	46.252679	-111.956012	South Fork Queen Gulch just above confluence with Queen Gulch	Surface Water	0-12 in.	Grab	Not Collected
EQ-SD-02				Sediment	0-6 in.		
EQ-SW-03	46.252735	-111.956748	Queen Gulch just below confluence with South Fork Queen Gulch	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
EQ-SD-03	46.252721	-111.956727		Sediment	0-6 in.		
EQ-SO-BK01	46.246018	-111.946096	Background soil	Surface Soil	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
EQ-SO-BK02	46.245992	-111.946026	Background soil	Surface Soil	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
EQ-WR-01	46.272764	-111.949761	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
EQ-WR-02	46.246642	-111.946299	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
EQ-WR-03	46.246476	-111.946628	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
EQ-WR-04	46.246574	-111.946646	Waste material pile	Tailings	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
EQ-WR-05	46.246801	-111.946472	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
EQ-WR-06	46.246767	-111.946411	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
EQ-WR-07	46.247809	-111.946841	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
EQ-WR-08	46.247829	-111.946799	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury

ID - Identification

in. - inches

TAL - Target Analyte List

UTM - Universal Transverse Mercator coordinate system

WGS - World Geodetic System

¹ Field Parameters: temperature, conductivity, pH, dissolved oxygen, oxygen reduction potential

² Water Quality – total and dissolved metals

Field Water Quality Parameters and Conditions
Site Inspection
Elkhorn Mining District

Table 2

Sample Locations	Date	Time	Temperature (°C)	pH	Oxygen Reduction Potential (mV)	Dissolved Oxygen (mg/L)	Conductivity	Water Quality Meter
C&D Mine								
CD-SW-BK01	6/5/2019	16:49	7.06	7.26	90.2	11.76	46 µS/cm	YSI 556 MPS
CD-SW-01	6/5/2019	17:07	6.84	7.3	69	11.35	46 µS/cm	YSI 556 MPS
Elkhorn Creek Tailings								
ECT-SW-BK01	6/3/2019	15:26	10.04	7.82	38.4	9.5	238 µS/cm	YSI 556 MPS
ECT-SW-BK01-2	9/10/2019	9:30	5	8.01	105	11.79	208 µS/cm	YSI 556 MPS
ECT-SW-01	6/3/2019	14:58	9.75	7.43	101.2	9.72	256 µS/cm	YSI 556 MPS
ECT-SW-01-2	9/10/2019	9:10	6.31	7.8	98.3	11.08	253 µS/cm	YSI 556 MPS
ECT-SW-03/05	6/3/2019	11:24	8.43	7.97	4.4	10.29	276 µS/cm	YSI 556 MPS
ECT-SW-03-2/05-2	9/10/2019	8:50	10.74	7.79	67.4	10.97	300 µS/cm	YSI 556 MPS
ECT-SW-04	6/3/2019	9:57	7.3	7.57	64.5	11.1	276 µS/cm	YSI 556 MPS
ECT-SW-04-2	9/10/2019	8:15	6.51	7.2	92.5	10.86	313 µS/cm	YSI 556 MPS
Union Elkhorn Mine								
UE-SW-BK01	6/5/2019	15:22	7.7	7.89	-19.4	10.05	104 µS/cm	YSI 556 MPS
UE-SW-BK01-2	9/10/2019	11:10	6	7.97	91.8	11.09	117 µS/cm	YSI 556 MPS
UE-SW-01/03	6/5/2019	15:53	8.31	7.61	39.7	9.69	103 µS/cm	YSI 556 MPS
UE-SW-01-2/03-2	9/10/2019	11:00	6.08	8.1	78.4	10.95	119 µS/cm	YSI 556 MPS
UE-SW-04	6/5/2019	15:45	6.42	6.64	79.3	5.81	483 µS/cm	YSI 556 MPS
Greyback Gulch								
GG-SW-01	9/12/2019	9:45	5.74	7.41	131.2	11.74	177 µS/cm	YSI 556 MPS
GG-SW-02	9/12/2019	10:00	6.6	7.66	91.07	11.15	76 µS/cm	YSI 556 MPS
GG-SW-03	9/12/2019	9:05	6.06	6.34	175.6	11.67	107 µS/cm	YSI 556 MPS
Trumley Heap Leach								
THL-SW-BK01	6/4/2019	11:03	7.18	6.7	167	13.79	0.074 mS/cm	Horiba U-50
THL-SW-BK01-2	9/9/2019	17:15	11.15	7.81	98.3	10.34	116 µS/cm	YSI 556 MPS
THL-SW-01/04	6/4/2019	11:32	7.77	6.1	199	9.5	0.074 mS/cm	Horiba U-50
THL-SW-01-2	9/9/2019	16:18	10.77	7.69	36	9.29	97 µS/cm	YSI 556 MPS
THL-SW-02	6/4/2019	12:05	9.02	6.46	174	9.11	0.074 mS/cm	Horiba U-50
THL-SW-02-2	9/9/2019	16:18	11.09	7.72	95.8	8.54	99 µS/cm	YSI 556 MPS
THL-SW-03	6/4/2019	12:31	9.78	6.76	168	9.15	0.078 mS/cm	Horiba U-50
THL-SW-03-2	9/9/2019	15:55	11.53	7.82	127.3	9.62	104 µS/cm	YSI 556 MPS
Skyline Mine								
SM-SW-BK01	9/11/2019	14:30	6.15	9.78	79.37	9.78	28 µS/cm	YSI 556 MPS
SM-SW-01	9/11/2019	12:35	3.98	6.97	134.3	11.58	42 µS/cm	YSI 556 MPS
SM-SW-02	9/11/2019	12:15	4.29	6.85	149.9	11.29	42 µS/cm	YSI 556 MPS
SM-SW-03	9/11/2019	11:40	3.97	7.09	149	11.45	43 µS/cm	YSI 556 MPS
SM-SW-04	9/11/2019	11:05	4.3	7.34	179.4	11.2	50 µS/cm	YSI 556 MPS
SM-SW-05	9/11/2019	12:20	4.29	6.85	149.9	11.29	42 µS/cm	YSI 556 MPS
Boulaway Mine								
BM-SW-BK01	6/4/2019	16:26	7.61	7.26	32.6	10.39	43 µS/cm	YSI 556 MPS
BM-SW-BK01-2	9/9/2019	15:20	10.14	7.85	139.7	9.78	93 µS/cm	YSI 556 MPS
BM-SW-01	6/4/2019	15:55	7.71	6.96	49.7	10.6	46 µS/cm	YSI 556 MPS
BM-SW-01-2	9/9/2019	15:05	9.63	7.75	147.6	10.18	108 µS/cm	YSI 556 MPS
BM-SW-02	6/4/2019	15:12	8.09	7.24	10.4	11.92	48 µS/cm	YSI 556 MPS
BM-SW-02-2	9/9/2019	14:50	9.99	7.58	151.9	9.55	110 µS/cm	YSI 556 MPS
Elkhorn Queen								
EQ-SW-01	6/4/2019	13:16	8.14	6.86	170	10.41	0.047 mS/cm	Horiba U-50
EQ-SW-01-2	9/9/2019	14:30	11.11	7.6	150.5	9.66	113 µS/cm	YSI 556 MPS
EQ-SW-03	6/4/2019	12:56	8.24	6.89	164	11.15	0.048 mS/cm	Horiba U-50
EQ-SW-03-2	9/9/2019	14:00	10.67	7.28	146.7	10.06	112 µS/cm	YSI 556 MPS

Notes:

°C - degrees Celsius

mg/L - milligrams per liter

mS/cm - millisiemens per centimeter

µS/cm - microsiemens per centimeter

mV - millivolts

Source Surface Water - HRS Benchmarks
Analytical Results Summary
Site Inspection- June/September 2019
Elkhorn Mining District

Table 3a

Analyte	Location:			Union Elkhorn	Skyline Mine	
	Sample ID:	SCDM Acute	SCDM Chronic	UE-SW-04	SM-SW-02	SM-SW-05
	Type:			Field Sample	Field Sample	Duplicate
	Sample Date:			6/5/19	9/11/19	9/11/19
Total Metals						
Aluminum	µg/L	NE	NE	20 U	77.6 J	97.7 J
Antimony	µg/L	NE	NE	99.2	2 U	2 U
Arsenic	µg/L	NE	NE	2.5 J+	9.9	10.1
Barium	µg/L	NE	NE	10 UJ	1.4 J	1.6 J
Beryllium	µg/L	NE	NE	1 U	1 U	1 U
Cadmium	µg/L	NE	NE	102	0.54 J	0.71 J
Calcium	µg/L	NE	NE	102000	6090	5970
Chromium	µg/L	NE	NE	2 U	1.5 U	1.5 U
Cobalt	µg/L	NE	NE	1 U	1 U	0.23 J
Copper	µg/L	NE	NE	35.2	1.3 J	2.4
Iron	µg/L	NE	NE	200 UJ	73.9 J	88.3 J
Lead	µg/L	NE	NE	13.1	1.3 J	3.1 J
Magnesium	µg/L	NE	NE	9290 J+	1190	1180
Manganese	µg/L	NE	NE	34.3 J+	4.8 J	10 J
Mercury	µg/L	NE	NE	0.2 U	0.043 J	0.2 U
Nickel	µg/L	NE	NE	121	0.73 J	0.82 J
Potassium	µg/L	NE	NE	706 J+	500 U	500 U
Selenium	µg/L	NE	NE	3.8 J	5 U	5 U
Silver	µg/L	NE	NE	0.26 J	1 U	1 U
Sodium	µg/L	NE	NE	821 J+	1410	1370
Thallium	µg/L	NE	NE	1 U	1 U	1 U
Vanadium	µg/L	NE	NE	5 U	5 U	5 U
Zinc	µg/L	NE	NE	5060	49.7 J+	54.4 J+
Dissolved Metals						
Aluminum	µg/L	750	87	14.5 J	14.3 J	14.9 J
Antimony	µg/L	NE	NE	98.4	2 U	2 U
Arsenic	µg/L	340	150	2.6	9.4	9.8
Barium	µg/L	NE	NE	7.3 J	1.1 J	1.2 J
Beryllium	µg/L	NE	NE	1 U	1 U	1 U
Cadmium	µg/L	2	0.25	99.1	0.46 J	0.53 J
Calcium	µg/L	NE	NE	100,000	5,470	5,720
Chromium	µg/L	NE	NE	2 U	2 U	2 U
Cobalt	µg/L	NE	NE	1.4	1 U	1 U
Copper	µg/L	2.3	1.4	33	2 U	2 U
Iron	µg/L	NE	1000	200 U	21.8 J	200 U
Lead	µg/L	65	2.5	20.2	0.077 J	0.069 J
Magnesium	µg/L	NE	NE	8,920	998	1,030
Manganese	µg/L	NE	NE	36.5	1 U	1 U

Source Surface Water - HRS Benchmarks
Analytical Results Summary
Site Inspection- June/September 2019
Elkhorn Mining District

Table 3a

Mercury	µg/L	1.4	0.77	0.2 U	0.2 U	0.2 U
Nickel	µg/L	470	52	122	0.43 J	0.53 J
Potassium	µg/L	NE	NE	706	279 J	289 J
Selenium	µg/L	290	5	3.9 J	5 U	5 U
Silver	µg/L	3.2	NE	0.35 J	1 U	1 U
Sodium	µg/L	NE	NE	803	1,370	1,400
Thallium	µg/L	NE	NE	1 U	1 U	1 U
Vanadium	µg/L	NE	NE	5 U	5 U	5 U
Zinc	µg/L	120	120	5,800 J	45.1 J+	52.3 J+

Notes:

- Bold** The analyte was detected above the sample quantitation limit.
- J The associated value is an estimated quantity.
- J+ The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential positive bias.
- U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
- UJ The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- µg/L micrograms per liter

Source Surface Water - Ecological Benchmarks
Analytical Results Summary
Site Inspection- June/September 2019
Elkhorn Mining District

Table 3b

Analyte	Location:	Union Elkhorn			Skyline Mine				
	Sample ID:	Montana Numeric Water		UE-SW-04	Montana Numeric Water		SM-SW-02	Montana Numeric Water	
	Type:	Quality Standards ¹		Field Sample	Quality Standards ¹		Field Sample	Quality Standards ¹	
	Sample Date:	Aquatic Life Acute	Aquatic Life Chronic	6/5/19	Aquatic Life Acute	Aquatic Life Chronic	9/11/19	Aquatic Life Acute	Aquatic Life Chronic
Hardness*	mg/L as CaCO ₃	--		286.43	--		17.77	--	
pH	Standard Units	6.5-9.0		6.64	6.5-9.0		6.85	6.5-9.0	
Dissolved Metals									
Aluminum	µg/L	750	87	14.5 J	750	87	14.3 J	750	87
Antimony	µg/L	--	--	98.4	--	--	2 U	--	--
Arsenic	µg/L	340	150	2.6	340	150	9.4	340	150
Barium	µg/L	--	--	7.3 J	--	--	1.1 J	--	--
Beryllium	µg/L	--	--	1 U	--	--	1 U	--	--
Cadmium ¹	µg/L	5.3	1.8	99.1	0.5	0.3	0.46 J	0.5	0.3
Calcium	µg/L	--	--	100,000	--	--	5,470	--	--
Chromium ¹	µg/L	4,269	204	2 U	579	28	2 U	579	28
Cobalt	µg/L	--	--	1.4	--	--	1 U	--	--
Copper ¹	µg/L	38	23	33	4	3	2 U	4	3
Iron	µg/L	--	1,000	200 U	--	1,000	21.8 J	--	1,000
Lead ¹	µg/L	311.7	12.1	20.2	14.0	0.5	0.077 J	14.0	0.5
Magnesium	µg/L	--	--	8,920	--	--	998	--	--
Manganese	µg/L	--	--	36.5	--	--	1 U	--	--
Mercury	µg/L	1.7	0.91	0.2 U	1.7	0.91	0.2 U	1.7	0.91
Nickel ¹	µg/L	1,143	127	122	145	16	0.43 J	145	16
Potassium	µg/L	--	--	706	--	--	279 J	--	--
Selenium	µg/L	20	5	3.9 J	20	5	5 U	20	5
Silver ¹	µg/L	24.80	--	0.35 J	0.37	--	1 U	0.37	--
Sodium	µg/L	--	--	803	--	--	1,370	--	--
Thallium	µg/L	--	--	1 U	--	--	1 U	--	--
Vanadium	µg/L	--	--	5 U	--	--	5 U	--	--
Zinc ¹	µg/L	292	292	5,800 J	37	37	45.1 J+	37	37

Notes:

- Bold** The analyte was detected above the sample quantitation limit.
- Bold** The analyte concentration exceeds both Montana Acute and Chronic Aquatic Life Water Quality Standards.
- Bold** The analyte concentration exceeds the Aquatic Life Chronic Montana Water Quality Standard.
- J The associated value is an estimated quantity.
- J+ The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential positive bias.
- U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
- mg/L as Ca CO₃ milligrams per liter as calcium carbonate
- µg/L micrograms per liter

* Hardness calculated using the formula: (2.497 * dissolved Calcium mg/L) + (4.118 * dissolved Magnesium mg/L) per Circular DEQ-7 Montana Numeric Water Quality Standards (June 2019)

Source Sediment - HRS Benchmarks
Analytical Results Summary
Site Inspection- June/September 2019
Elkhorn Mining District

Table 4a

Analyte	Location:	Skyline Mine	
	Sample ID:	SM-SD-02	SM-SD-05
	Type:	Field Sample	Duplicate
	Sample Date:	9/11/19	9/11/19
Total Metals			
Aluminum	mg/kg	11800 J	27100 J
Antimony	mg/kg	10.6 U	5.7 J
Arsenic	mg/kg	101 J	314 J
Barium	mg/kg	33.8 J	93.1 J
Beryllium	mg/kg	0.58 J	1.6
Cadmium	mg/kg	8.8 J	32.1 J
Calcium	mg/kg	4130 J	11200 J
Chromium	mg/kg	47.9 J	85.4 J
Cobalt	mg/kg	14.8 J	42.5 J
Copper	mg/kg	58.7 J	166 J
Iron	mg/kg	12400 J	24700 J
Lead	mg/kg	114 J	377 J
Magnesium	mg/kg	3420 J	6190 J
Manganese	mg/kg	442 J	1520 J
Mercury	mg/kg	0.027 J-	0.15 J
Nickel	mg/kg	27.5 J	63.3 J
Potassium	mg/kg	1210 J	3780 J
Selenium	mg/kg	6.2 R	6.8 R
Silver	mg/kg	1.8 U	1.5
Sodium	mg/kg	887 U	172 J
Thallium	mg/kg	4.4 UJ	4.9 UJ
Vanadium	mg/kg	22.8 J	46 J
Zinc	mg/kg	625 J	1610 J

Notes:

Bold	The analyte was detected above the sample quantitation limit.
J	The associated value is an estimated quantity.
J-	The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential negative bias.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
UJ	The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
R	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.
mg/kg	milligrams per kilogram

Source Sediment - Ecological Benchmarks
Analytical Results Summary
Site Inspection- June/September 2019
Elkhorn Mining District

Table 4b

Analyte	Location:	Sediment		Skyline Mine	
	Sample ID:	Benchmarks		SM-SD-02	SM-SD-05
	Type:	TEC ⁽¹⁾	PEC ⁽²⁾	Field Sample	Duplicate
	Sample Date:			9/11/19	9/11/19
Total Metals					
Antimony	mg/kg	2	--	10.6 U	5.7 J
Arsenic	mg/kg	9.79	33	101 J	314 J
Cadmium	mg/kg	0.99	4.98	8.8 J	32.1 J
Chromium	mg/kg	43.4	111	47.9 J	85.4 J
Copper	mg/kg	31.6	--	58.7 J	166 J
Lead	mg/kg	35.8	128	114 J	377 J
Manganese	mg/kg	460	1.06	442 J	1520 J
Nickel	mg/kg	22.7	--	27.5 J	63.3 J
Silver	mg/kg	1	--	1.8 U	1.5
Zinc	mg/kg	121	459	625 J	1610 J

Notes:

--	No Benchmark Established
Bold	The analyte was detected above the sample quantitation limit.
Bold	The analyte concentration exceeds the PEC benchmark.
Bold	The analyte concentration exceeds the TEC benchmark.
Bold	The analyte concentration exceeds both the TEC and PEC benchmarks.
J	The associated value is an estimated quantity.
J-	The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential negative bias.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
UJ	The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
R	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.
mg/kg	milligrams per kilogram
PEC	Probable Effect Concentration
TEC	Threshold Effect Concentration

(1) EPA Region 3 Biological Technical Assistance Group Freshwater Sediment aquatic life benchmarks (EPA, 2006)

(2) Prediction of sediment toxicity using consensus-based freshwater sediment quality guidelines (EPA, 2000)

Source Waste Material - HRS Benchmarks
Analytical Results Summary
Site Inspection- June/September 2019
Elkhorn Mining District

Analyte	Location:	EPA		C&D Mine								
	Sample ID:			CD-SO-BK02	Three Times Background Concentration	CD-WR-02	CD-WR-04	CD-WR-06	CD-WR-08	CD-WR-10	CD-WR-12	CD-WR-14
	Type:	Field Sample	Field Sample	Field Sample		Field Sample	Field Sample	Field Sample	Field Sample	Duplicate		
	Sample Type:	Grab	Grab	Grab		Grab	Grab	Grab	Grab	Grab		
	Sample Date	6/4/2019	6/4/2019	6/5/2019		6/5/2019	6/5/2019	6/5/2019	6/4/2019	6/4/2019		
Total Metals												
Antimony	mg/kg	30	NE	3.1 J (6.1)	18.4	190	16	315	278	203	121 J	29.3 J (14.8)
Arsenic	mg/kg	30	0.77	76.3 J (132.8)	398.3	102000	407	43600	21400	38800	12900 J	5350 J
Barium	mg/kg	10,000	NE	183 J (730.2)	2190.5	216	21.8	190	82.4	142	227 J	116 J
Beryllium	mg/kg	100	NE	0.35 J (0.45)	1.34	1.2	0.45 J	4.5	4.4	1.2	1.7	1.2
Cadmium	mg/kg	30	NE	7.7 J (10.8)	32.6	11.2	3.8	45.2 J (32.1)	7.4	7.4	246 J-	80.1 J-
Calcium	mg/kg	NE	NE	2950	8850	69400	294000	38000	5580	36200	26500 J	190000 J
Chromium	mg/kg	200	0.3	5.2	15.6	22.2	5.3	26.8	45.6	16.5	9.7 J	6.7 J
Cobalt	mg/kg	20	NE	3.1 J (3.9)	11.6	3.8	2.1	4.5	5.2	4.8	6	4.4
Copper	mg/kg	300	NE	45.3 J (55.3)	165.8	784	66.5	4000	1760	1290	11000 J	2890 J
Iron	mg/kg	50,000	NE	11700	35100	247000	8300	294000	204000	205000	232000 J	84000 J
Lead	mg/kg	NE	NE	269 J (387.4)	1162	5550	1720	3880	38200	11000	13200 J	4620 J
Magnesium	mg/kg	NE	NE	2540	7620	5830 J	12200	4150	1200	3890	6820	6140
Manganese	mg/kg	10,000	NE	1890 J (2343.6)	7030	670	246	2310	562	1100	1310 J	615 J
Mercury	mg/kg	12	NE	0.26	0.78	0.44	0.074 J	0.98	0.38	0.12	0.18	0.28
Nickel	mg/kg	1,000	NE	6	18	30.3	15	39.9	39.6	23.9	26.5	26.2
Potassium	mg/kg	NE	NE	1800	5400	5830 J (333)	525 J	477 J	572 J	710	979 J	917
Selenium	mg/kg	300	NE	0.59 J (1.4)	4.21	3 UJ	2.6 UJ	0.98 J	3 UJ	2.8 UJ	2.9 UJ	2.8 UJ
Silver	mg/kg	300	NE	1.9	5.7	36.4	3.9	32.2	52.6	43.9	55.5 J	32.8 J
Sodium	mg/kg	NE	NE	75.1 J (1909.8)	5729	5830 U	525 U	89 J	572 U	603 J	59.2 J	566 U
Thallium	mg/kg	0.7	NE	0.69 U	--	0.91	0.52 U	0.99	0.9	0.86	0.6 J+	0.57 U
Vanadium	mg/kg	390	NE	15.8 J+	47.4	300	225	1090	2410	520	353 J	98.5 J (73.5)
Zinc	mg/kg	20,000	NE	273	819	783	252	3280	1130	655	15400 J	5420 J

Notes:

- No Value
- Bold**The analyte was detected above the sample quantitation limit.
- JThe associated value is an estimated quantity.
- J-

The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential negative bias.
- J+

The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential positive bias.
- U

The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
- UJ

The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- mg/kgmilligrams per kilogram
- NANot Analyzed
- NENo Benchmark Established
- CRSCCancer Risk Screening Concentration
- EPAUnited States Environmental Protection Agency
- RDSCReference Dose Screening Concentration
- SCDMSuperfund Chemical Data Matrix

SCDM Soil Exposure Benchmarks (December 2018)

- Exceeds SCDM and 3X BKG
- Exceeds CRSC only and 3X BKG
- Exceeds 3X BKG

Source Waste Material - HRS Benchmarks
Analytical Results Summary
Site Inspection- June/September 2019
Elkhorn Mining District

Table 5a

Analyte	Location:	EPA		Elkhorn Creek Tailings						Union Elkhorn Mine					
	Sample ID:			CD-SO-BK02	Three Times Background Concentration	ECT-SO-OP-01	ECT-WR-02	ECT-WR-04	ECT-WR-06	CD-SO-BK02	Three Times Background Concentration	UE-WR-02	UE-WR-04	UE-WR-06	UE-WR-08
	Type:	Field Sample	Field Sample			Field Sample	Field Sample	Field Sample	Field Sample	Field Sample		Field Sample	Field Sample	Duplicate	
	Sample Type:	Grab	Grab			Grab	Grab	Grab	Grab	Grab		Grab	Grab	Grab	Grab
	Sample Date	6/4/2019	6/4/2019			6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/4/2019		6/5/2019	6/5/2019	6/5/2019	6/5/2019
Total Metals															
Antimony	mg/kg	30	NE	3.1 J (6.1)	18.4	558 J	667	485	273	3.1 J (6.1)	18.4	328 J	346 J	485	375
Arsenic	mg/kg	30	0.77	76.3 J (132.8)	398.3	797 J	581	453	230	76.3 J (132.8)	398.3	205 J	468 J	146	97.9
Barium	mg/kg	10,000	NE	183 J (730.2)	2190.5	29.5 J	37.7	39.1	10.1	183 J (730.2)	2190.5	3.9 J	130 J	11.3	7.1
Beryllium	mg/kg	100	NE	0.35 J (0.45)	1.34	0.14 J	0.22 J	0.22 J	0.094 J	0.35 J (0.45)	1.34	0.1 J	3	0.24 J	0.24 J
Cadmium	mg/kg	30	NE	7.7 J (10.8)	32.6	252 J	231	132	115	7.7 J (10.8)	32.6	252 J	33.2 J	463 J	183 J
Calcium	mg/kg	NE	NE	2950	8850	85500	112000	29400	125000	2950	8850	9000	976 J	1980	1840
Chromium	mg/kg	200	0.3	5.2	15.6	2.7 J	3.5	4.7	1.4	5.2	15.6	0.91 J+	22.9 J+	0.86 J	0.74 J
Cobalt	mg/kg	20	NE	3.1 J (3.9)	11.6	1.9 J	3.8	2	1.5	3.1 J (3.9)	11.6	5.3 J	3.6 J	8.3	5.5
Copper	mg/kg	300	NE	45.3 J (55.3)	165.8	2410	848	1460	331	45.3 J (55.3)	165.8	1020	582	936	629
Iron	mg/kg	50,000	NE	11700	35100	25000	18100	21800	9170	11700	35100	18000 J	27200 J	13900	10800
Lead	mg/kg	NE	NE	269 J (387.4)	1162	11600	9590	15400	4140	269 J (387.4)	1162	15800	15500	33700 J	17300 J
Magnesium	mg/kg	NE	NE	2540	7620	48700	61300	21600	69000	2540	7620	1210 J	1090 J	915 J	332 J
Manganese	mg/kg	10,000	NE	1890 J (2343.6)	7030	2840	3590	1220	1800	1890 J (2343.6)	7030	463	3790	1190 J	696 J
Mercury	mg/kg	12	NE	0.26	0.78	262	6.8	126	2.8	0.26	0.78	2.7	1.5	3.2	3.8
Nickel	mg/kg	1,000	NE	6	18	5.2 J	9.4	4.4	3.8	6	18	146 J	29 J	61.9	51.6
Potassium	mg/kg	NE	NE	1800	5400	743 J	1260	840	502 J	1800	5400	508 J	800 J	688	677
Selenium	mg/kg	300	NE	0.59 J (1.4)	4.21	3.5 UJ	2.7 U	3.1 U	2.9 U	0.59 J (1.4)	4.21	15.5 J	0.8 J	11.8	10
Silver	mg/kg	300	NE	1.9	5.7	333	164	198	113	1.9	5.7	223	102	350	241
Sodium	mg/kg	NE	NE	75.1 J (1909.8)	54853	1620	63.9 J	2550	17.2 J	75.1 J (1909.8)	6690.6	2680 U	2370 U	9.2 J	6.8 J
Thallium	mg/kg	0.7	NE	0.69 U	--	0.7 U	0.55 U	0.62 U	0.58 U	0.69 U	--	0.53 U	0.71	0.52 U	0.47 U
Vanadium	mg/kg	390	NE	15.8 J+	47.4	14.1 J	28.6	15.3	7.8	15.8 J+	47.4	8.6 J	934 J	3.5	3.1
Zinc	mg/kg	20,000	NE	273	819	53900	21300	37500	12100	273	819	8700 J	5580 J	17100 J	7660 J

- Notes:
- No Value
- Bold**

The analyte was detected above the sample quantitation limit.
- J

The associated value is an estimated quantity.
- J-

The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential negative bias.
- J+

The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential positive bias.
- U

The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
- UJ

The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- mg/kg

milligrams per kilogram
- NA

Not Analyzed
- NE

No Benchmark Established
- CRSC

Cancer Risk Screening Concentration
- EPA

United States Environmental Protection Agency
- RDSC

Reference Dose Screening Concentration
- SCDM

Superfund Chemical Data Matrix
- SCDM Soil Exposure Benchmarks (December 2018)

Exceeds SCDM and 3X BKG

Exceeds CRSC only and 3X BKG

Exceeds 3X BKG

Analyte	Location:	EPA		Trumley Heap Leach			Skyline Mine					
	Sample ID:			THL-SO-BK02	Three Times Background Concentration	THL-WR-02	SM-SO-BK02	Three Times Background Concentration	SM-WR-04	SM-WR-06	SM-WR-09	SM-WR-08
	Type:	Field Sample	Field Sample	Field Sample		Field Sample	Field Sample		Duplicate	Field Sample		
	Sample Type:	Grab	Grab	Grab		Grab	Grab		Grab	Grab	Grab	
	Sample Date	6/4/2019	6/4/2019	9/11/2019		9/11/2019	9/11/2019		9/11/2019	9/11/2019	9/11/2019	9/11/2019
Total Metals												
Antimony	mg/kg	30	NE	1.9 J (3.8)	11.4	3.1 J	2.1 J (4.2)	12.6	6.6 J	9.1 J	15.4 J (7.8)	14.7 J (7.4)
Arsenic	mg/kg	30	0.77	9.2 J (16)	48	260 J	66.6	199.8	6500 J	5820 J	10900 J	2270 J
Barium	mg/kg	10,000	NE	137	411	140	156 J (622.4)	1867	90 J	4.5 J	7.6 J	71.3 J
Beryllium	mg/kg	100	NE	0.39 J (0.51)	1.53	0.47 J	0.77	2.31	0.59 J	0.24 J	0.33 J	0.44 J
Cadmium	mg/kg	30	NE	1.7 J (2.4)	7.2	2.2 J	1	3	55.7	118	191	19.9
Calcium	mg/kg	NE	NE	2710 J (3468)	10406	3010 J	4500	13500	2820 J	3290 J	3300 J	1720 J
Chromium	mg/kg	200	0.3	28.5 J (36)	110	13 J	31.7 J (40.9)	122.7	159 J (123.3)	66.5 J	75.9 J	20.6 J
Cobalt	mg/kg	20	NE	6.4 J (8)	24	8.8 J	11.1	33.3	29	4.5 J	7.8	25.2
Copper	mg/kg	300	NE	16.7 J (20.4)	61.1	21.6 J	26.3 J (32.1)	96.3	149 J (122.1)	580 J	834 J	96.4 J
Iron	mg/kg	50,000	NE	17500 J (23450)	70350	25000 J	31300	93900	75600 J	33400 J	45400 J	61200 J
Lead	mg/kg	NE	NE	40.3 J (58)	174	66.1 J	27.1	81.3	969 J	10500 J	27000 J	418 J
Magnesium	mg/kg	NE	NE	2820 J (3468.6)	10406	3560 J	7630	22890	9860 J	12100 J	17500 J	3440 J
Manganese	mg/kg	10,000	NE	504 J (625)	1875	652 J	1530 J (1897)	5692	1170	939	1250	1730
Mercury	mg/kg	12	NE	0.033 J- (0.06)	0.181	0.039 J-	0.051 J (0.0933)	0.28	0.0065 J-	0.067 J	0.14	0.11 UJ
Nickel	mg/kg	1,000	NE	9.4 J (12.7)	38.1	9.7 J	29.6 J (40)	119.9	60.6	27.4	35.2	22.9
Potassium	mg/kg	NE	NE	1890 J (33056)	99168	2420 J	8470 J (148140)	444421	2000 J	261 J	340 J	2080 J
Selenium	mg/kg	300	NE	5.4 U	--	5.5 U	10.2 U	--	13.2 U	7.1 U	7.6 U	10.7 U
Silver	mg/kg	300	NE	0.4 J- (0.696)	2.09	0.62 J-	0.49 J (0.85)	2.56	4.5 J (2.59)	26.4 J	53.3 J	3 J (1.7)
Sodium	mg/kg	NE	NE	106 J (2696)	8087	167 J	162 J (4120)	12359	628 U	505 U	544 U	184 J
Thallium	mg/kg	0.7	NE	0.54 U	--	0.55 U	7.3 U	--	3.1 U	2.5 U	5.4 U	7.6 U
Vanadium	mg/kg	390	NE	57.7 J (77.3)	232	32.6 J	58.6	175.8	72 J	32.3 J	48.3 J	36.6 J
Zinc	mg/kg	20,000	NE	147 J (221)	662	219 J	113 J (169.5)	508.5	498 J	3100 J	4880 J	407 J

- Notes:
- No Value
- Bold**

The analyte was detected above the sample quantitation limit.
- J

The associated value is an estimated quantity.
- J-

The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential negative bias.
- J+

The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential positive bias.
- U

The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
- UJ

The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- mg/kg

milligrams per kilogram
- NA

Not Analyzed
- NE

No Benchmark Established
- CRSC

Cancer Risk Screening Concentration
- EPA

United States Environmental Protection Agency
- RDSC

Reference Dose Screening Concentration
- SCDM

Superfund Chemical Data Matrix
- SCDM Soil Exposure Benchmarks (December 2018)

Exceeds SCDM and 3X BKG

Exceeds CRSC only and 3X BKG

Exceeds 3X BKG

Analyte		Location:	EPA		Boulaway Mine							Elkhorn Queen Mine							
		Sample ID:			BM-SO-BK02	Three Times Background Concentration	BM-WR-06	BM-WR-14	BM-WR-16	BM-WR-18	BM-WR-20	BM-WR-OP-02	EQ-SO-BK02	Three Times Background Concentration	EQ-WR-02	EQ-WR-04	EQ-WR-06	EQ-WR-08	
		Type:	Field Sample	Field Sample	Field Sample		Field Sample	Duplicate	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample		Field Sample	Field Sample	Field Sample	Field Sample	
		Sample Type:	Grab	Grab	Grab		Grab	Grab	Grab	Grab	Grab	Grab	Grab		Grab	Grab	Grab	Grab	
		Sample Date	6/4/2019	6/4/2019	6/4/2019		6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/3/2019		6/3/2019	6/3/2019	6/3/2019	6/3/2019	
Total Metals																			
Antimony	mg/kg	30	NE	8.3 U	--	13.6 J-	26.1 J-	37.8	6.8 U	2.7 J-	2 J-	7.8 U	--	19 J	5.8 J	32.9	10.1 J-		
Arsenic	mg/kg	30	0.77	27.6	82.8	1390 J	2900 J	2160 J	458 J	414 J	162 J (93.1)	119	357	4790 J	3340	2780	654 J (375.9)		
Barium	mg/kg	10,000	NE	283	849	543 J	512 J	620	232 J	349 J	362 J	151	453	16.5 J	31.7	306	127 J		
Beryllium	mg/kg	100	NE	1.1	3.3	1.8	5.9	12.7	13.6	14	16.6	1.6	4.8	0.7	0.84	2	0.75		
Cadmium	mg/kg	30	NE	1.7	5.1	47.5 J	34.6 J	63.6 J-	68.6 J	78.4 J	178 J	0.67	2.01	89.4 J	49.1	62.2	4.7 J (3.33)		
Calcium	mg/kg	NE	NE	29100	87300	17400 J	6080 J	27500 J	4910 J	4310 J	18800 J	4410	13230	29800	27000	93000	11300 J		
Chromium	mg/kg	200	0.3	16.4	49.2	5.4 J-	2.5 J-	1.3 J	30.7 J	24.4 J-	7 J-	19.1	57.3	1.8 J+	2.4	6.1	4.8 J-		
Cobalt	mg/kg	20	NE	7.4	22.2	58.1 J (46.5)	200 J	940	280	399 J	199 J	10.4	31.2	8.3 J	9.1	63.4	10 J		
Copper	mg/kg	300	NE	46.9	140.7	1170	1390	5160 J	10100 J	8160	16000	14.7	44.1	69.1	41.3	67.1	34.5		
Iron	mg/kg	50,000	NE	20400	61200	37800	186000	167000	19400	17100	3830	18900	56700	48500 J	30600	61200	26000		
Lead	mg/kg	NE	NE	89.9	269.7	179 J	582 J (404)	646	80.2	81.3 J	44 J	106	318	25500	2360	3300	1270 J		
Magnesium	mg/kg	NE	NE	24000	72000	4810 J	556 J	1130	5830	5400 J	2580 J	2480	7440	15000	11100	38800	2940 J		
Manganese	mg/kg	10,000	NE	1120	3360	4780 J (3855)	8590 J	12400	1740	1380 J	7540 J	784	2352	683	431	4360	571 J		
Mercury	mg/kg	12	NE	0.2	0.6	0.039 J-	0.11 UJ	0.21	0.15	0.11	0.79	0.065 J (0.119)	0.357	0.14	0.24	0.36	0.2		
Nickel	mg/kg	1,000	NE	16.4	49.2	71.5 J (53)	40.3 J	201	292	283 J	343 J	29.4	88.2	26.4 J	30.2	54.7	19.3 J		
Potassium	mg/kg	NE	NE	4490	13470	3580 J	3020 J	812	1860	1820 J	307 J	3050	9150	2060 J	1970	1260	2230 J		
Selenium	mg/kg	300	NE	3.3 UJ	--	2.7 UJ	2.9 UJ	3 UJ	5.5 UJ	5.9 UJ	3.1 UJ	6.3 UJ	--	2.7 J	2.6 U	1.5 J	2.7 UJ		
Silver	mg/kg	300	NE	1.5	4.5	2.4 J	9.3 J (5.3)	7.5	0.86 J	0.74 J	0.33 J	1.1 J (1.9)	5.7	133	13.4	12	5.5 J		
Sodium	mg/kg	NE	NE	184 J (4679)	14037	51.7 J	29.8 J	60.7 J	568 U	9.7 J-	4.2 J-	63.1 J (1604.6)	4813.9	40 J	46.9 J	43.1 J	97.8 J		
Thallium	mg/kg	0.7	NE	0.65 U	--	1.3 J+	0.97 J+	0.61 U	0.7 J+	0.92 J+	0.62 UJ	0.85	2.55	0.48	0.51 U	11.4	0.7 J+		
Vanadium	mg/kg	390	NE	23	69	10.3	6.6	3.2 J	24 J	19.3	12.8	50.1	150.3	3.6 J	2.7	17.6	12		
Zinc	mg/kg	20,000	NE	257	771	10300	5840	33600	36300	31700	47800	209	627	8290 J	4760	9420	847		

Notes:

- No Value
- Bold**The analyte was detected above the sample quantitation limit.
- JThe associated value is an estimated quantity.
- J-

The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential negative bias.
- J+

The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential positive bias.
- U

The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
- UJ

The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- mg/kgmilligrams per kilogram
- NANot Analyzed
- NENo Benchmark Established
- CRSCCancer Risk Screening Concentration
- EPAUnited States Environmental Protection Agency
- RDSCReference Dose Screening Concentration
- SCDMSuperfund Chemical Data Matrix
- SCDM Soil Exposure Benchmarks (December 2018)
- Exceeds SCDM and 3X BKG
- Exceeds CRSC only and 3X BKG
- Exceeds 3X BKG

Analyte	Location:	EPA Regional Screening Levels	C & D Mine								Elkhorn Creek Tailings				
	Sample ID:		CD-SO-BK01	CD-WR-01	CD-WR-03	CD-WR-05	CD-WR-07	CD-WR-09	CD-WR-11	CD-WR-13	ECT-SO-BK01	ECT-WR-01	ECT-WR-03	ECT-WR-05	
	Type:	Industrial	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Duplicate	Field Sample	Field Sample	Field Sample	Field Sample	
	Sample Type:		Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	
	Sample Date		6/4/2019	6/4/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/4/2019	6/4/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019
Total Metals															
Aluminum	mg/kg	1,100,000	8480	14000	6120	6680	4880	9100	21600 J	49900 J	18400	2640	6600	1020	
Antimony	mg/kg	470	7.2 UJ	187	63.5	217	220	126	18.7 J-	71.8 J	17.2 J	431	440	188	
Arsenic	mg/kg	3	60.1 J	78000	319	15500	33200	29500	4760 J	12600 J	84.3 J	357	291	173	
Barium	mg/kg	220,000	134 J	256	48.2	158	112	165	120 J	215 J	148 J	24.5	32	13.6	
Beryllium	mg/kg	2,300	0.34 J	1.5	0.74	2.1	4.9	1.1	1.5	1.5	0.8	0.14 J	0.26 J	0.087 J	
Cadmium	mg/kg	980	4.8 J	16.8	4	39.8	11.1	15.7	75 J	197 J-	6 J	178	72.9	114	
Calcium	mg/kg	--	2140	66000	304000	34300	24500	93900	187000 J	36000 J	6790	129000	27500	134000	
Chromium	mg/kg	--	4.6 J	21	6.6	10.2	50.4	10.1	7.2 J-	10.1 J	17.1 J	2.4	4.8	1.2	
Cobalt	mg/kg	350	3 J	5.5	3	4.1	6.6	3.8	7.3 J	4.5	9.9 J	2.8	2.3	1.6	
Copper	mg/kg	47,000	29.6	1420	55.9	1830	1810	1500	2600 J	11700 J	114	619	857	240	
Cyanide	mg/kg	150	NA	NA	NA	NA	NA	NA	NA	NA	NA	24.9 J	0.31 J	24.3 J	
Iron	mg/kg	820,000	10400	221000	10200	119000	242000	151000	81400 J	236000 J	31400	13100	16200	7630	
Lead	mg/kg	800	142	2550	1420	3950	16600	5120	3560 J	9690 J	521	7600	10300	2440	
Magnesium	mg/kg	--	2540	6670	11600	3410	2140	8930	6150 J	5020 J	8050	71400	17400	75400	
Manganese	mg/kg	26,000	1790	1430	331	2370	797	1450	570 J	1400 J	1260	3100	818	1660	
Mercury	mg/kg	46	0.19	0.54	0.044 J-	0.86	0.33	1	0.26	0.24	1.5	5.3	54.9	1.2	
Nickel	mg/kg	22,000	5.3 J	39.3	17.3	23.9	54	19.3	32.8 J	23.5	18.4 J	6.8	4.8	3.8	
Potassium	mg/kg	--	1580	6150 J	519 J	520 J	591 J	667	757 J	795 J	4880	863	1160	350 J	
Selenium	mg/kg	5,800	3 UJ	3 UJ	2.5 UJ	2.6 UJ	3 UJ	2.8 UJ	2.7 UJ	0.3 J-	3.6 UJ	2.8 U	3.3 U	2.6 U	
Silver	mg/kg	5,800	1.2	35.7	40.3	12.4	72	23.5	10.9 J	42.4 J	8	102	146	55.4	
Sodium	mg/kg	--	604 U	6150 U	519 U	520 U	591 U	576 J	21.1 J-	5890 UJ	719 J	34.7 J	1940	26.8 J	
Thallium	mg/kg	12	0.6 U	0.78	0.5 U	0.78	1.2	0.57	0.54 U	0.56 U	0.71 U	0.55 U	0.67 U	0.53 U	
Vanadium	mg/kg	5,800	15.7 J	320	65.8	1060	2030	404	86.7 J	399 J	18.5 J	18.5	14.3	7.6	
Zinc	mg/kg	350,000	224	874	292	3280	1300	1840	5900 J	18600 J	1240	17700	19300	10700	

Notes:

-- No Value

Bold The analyte was detected above the sample quantitation limit.

Bold The analyte concentration exceeds the EPA RSL.

J The associated value is an estimated quantity.

J- The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential negative bias.

J+ The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential positive bias.

U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

UJ The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

mg/kg milligrams per kilo; milligrams per kilogram

NA Not Analyzed

NE No Benchmark Established

U.S. Environmental Protection Agency (EPA) Regional Screening Level (RSL) for Soil (May 2020).

Analyte	Location:	EPA Regional Screening Levels	Union Elkhorn Mine					Trumley Heap Leach		Skyline Mine			
	Sample ID:		UE-SO-BK01	UE-WR-01	UE-WR-03	UE-WR-05	UE-WR-07	THL-SO-BK01	THL-WR-01	SM-WR-03	SM-WR-05	SM-WR-10	SM-WR-07
	Type:	Industrial	Field Sample	Field Sample	Field Sample	Field Sample	Duplicate	Field Sample	Field Sample	Field Sample	Field Sample	Duplicate	Field Sample
	Sample Type:		Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite
	Sample Date		6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/4/2019	6/4/2019	9/11/2019	9/11/2019	9/11/2019	9/11/2019
Total Metals													
Aluminum	mg/kg	1,100,000	17300	1310	5570	5940 J	3710	12200 J	22200 J	22000 J	28900 J	17400 J	8550 J
Antimony	mg/kg	470	2.4 J	284 J	330 J	152 J-	142	1.1 J	16.5 J	6 J	11.4 J	15.4 J	5.1 J
Arsenic	mg/kg	3	98.4 J	256 J	645 J	399 J	265	9.3 J	149 J	4540 J	5870 J	9200 J	1300 J
Barium	mg/kg	220,000	116 J	4.6 J	28.3 J	9.6 J	16.4 J	165	143	109 J	150 J	83.1 J	44.7 J
Beryllium	mg/kg	2,300	0.98 J	0.15 J	0.52 J	0.24 J	0.47 J	0.38 J	0.44 J	0.61	0.69	0.53	0.29 J
Cadmium	mg/kg	980	7.5 J	112 J	125 J	135 J	98.5	1.3 J	8.7 J	38.6	85.3	123	12.7
Calcium	mg/kg	--	12800	12200	1060 J	8000 J	5700	4290 J	15500 J	2920 J	4120 J	2760 J	3740 J
Chromium	mg/kg	--	23	1.1 J+	9.9 J+	2.3 J-	6.5 J	15.9 J	14.7 J	39.6 J	90.8 J	81.4 J	25.7 J
Cobalt	mg/kg	350	6.4 J	7.9 J	57.9 J	8.3 J	11.7	6.3 J	7.4 J	24.7	42.7	44.9	16.2
Copper	mg/kg	47,000	45.7 J	907	696	550	415	17.4 J	74.7 J	60.9 J	263 J	389 J	49.2 J
Cyanide	mg/kg	150	NA	NA	NA	NA	NA	0.61 U	0.44 J	NA	NA	NA	NA
Iron	mg/kg	820,000	20700	22400 J	34200 J	28800	21000	17100 J	35100 J	54800 J	75400 J	71000 J	36400 J
Lead	mg/kg	800	89.3 J	10000	38700	7610 J	8390	28.3 J	564 J	732 J	6180 J	7890 J	262 J
Magnesium	mg/kg	--	5810	1050 J	1360 J	1810 J	1410	3710 J	13600 J	5720 J	14100 J	8980 J	5330 J
Manganese	mg/kg	26,000	574 J	713	2480	533 J	514	715 J	1290 J	869	1760	1500	1660
Mercury	mg/kg	46	0.15	1.7	1.3	2.1	1.7	0.053 J-	0.23	0.026 J	0.66	0.83	0.0071 J-
Nickel	mg/kg	22,000	18.7	223 J	209 J	78.1 J	138 J	10.2 J	9.8 J	37.5	58.2	54.6	29.3
Potassium	mg/kg	--	2690	616 J	1010 J	826 J	941	2970 J	4990 J	2590 J	3990 J	1810 J	1650 J
Selenium	mg/kg	5,800	1.2 J	18.9 J	13 J	4.8 J	10.3 J	3 U	2.8 U	7.6 U	11.7 U	10.2 U	10.5 U
Silver	mg/kg	5,800	0.77 J	249	200	157 J	159	0.15 J-	10.7 J-	3.4 J	12.8 J	25.7 J	1.6 J
Sodium	mg/kg	--	87.7 J	2460 U	2640 U	21.8 J-	32 J	245 J	251 J	86.7 J	163 J	484 U	187 J
Thallium	mg/kg	12	0.8 U	0.47 U	0.6	0.52 U	0.52 U	0.6 U	0.56 U	2.7 U	8.4 U	7.3 U	7.5 U
Vanadium	mg/kg	5,800	37.9 J+	12.9 J	54.8 J	16.3 J	40.9 J	30.7 J	31.5 J	41.6 J	74.3 J	50.2 J	29.4 J
Zinc	mg/kg	350,000	233	15700 J	7140 J	6160	5410	127 J	1910 J	269 J	1600 J	2180 J	299 J

Notes:

- No Value
- Bold**The analyte was detected above the sample quantitation limit.
- Bold**The analyte concentration exceeds both EPA RSLs.
- JThe associated value is an estimated quantity.
- J- The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential negative bias.
- J+ The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential positive bias.
- U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
- UJ The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- mg/kgmilligrams per kilogram
- NANot Analyzed
- NENo Benchmark Established
- U.S. Environmental Protection Agency (EPA) Regional Screening Level (RSL) for Soil (May, 2020).

Analyte	Location:	EPA	Boulaway Mine							Elkhorn Queen Mine				
	Sample ID:	Regional Screening Levels	BM-SO-BK01	BM-WR-05	BM-WR-13	BM-WR-15	BM-WR-17	BM-WR-19	BM-WR-OP-01	EQ-SO-BK01	EQ-WR-01	EQ-WR-03	EQ-WR-05	EQ-WR-07
	Type:	Industrial	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Duplicate	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
	Sample Type:		Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite
	Sample Date		6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019
Total Metals														
Aluminum	mg/kg	1,100,000	15100	13100	8180	9310	11600 J	12700 J	40700 J	21300	4830	7030	8180	19200
Antimony	mg/kg	470	4.2 J	15	31.1	14.8	5.9 J-	4.6 J-	2.1 J-	7.9 U	37.6 J	10.7 J	32.6	15.5
Arsenic	mg/kg	3	22.5	1970 J	2630	2110	1050 J	1070 J	203 J	168	26700 J	1780	3630	1170
Barium	mg/kg	220,000	221	863	419	287	326 J	544 J	352 J	287	9.6 J	29.8	144	354
Beryllium	mg/kg	2,300	0.27 J	1.8	4.5	6.8	4.6 J	8.6 J	13.5	1.1	0.59	0.71	1.3	3.2
Cadmium	mg/kg	980	3.3	39 J-	31.9	49	44.2 J	54.9 J	199 J	2.2	129 J	108 J	58.1	20.7
Calcium	mg/kg	--	23400	16600 J	9320	15500	4340 J	4150 J	6300 J	7720	19900	7910	110000	11700
Chromium	mg/kg	--	7.7	12.7 J	2.4	1.6	10.1 J-	14.6 J-	10.9 J-	13.8	2.8 J+	3.6	7.6	20.7
Cobalt	mg/kg	350	3.2	42.8	232	260	140 J	278 J	375 J	7.6	11.6 J	8.3	28	52
Copper	mg/kg	47,000	66.5	1280 J	1060	2090	3330	3340	17000	37.8	75	40.7	47.1	61.7
Cyanide	mg/kg	150	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	mg/kg	820,000	12200	63500	160000	141000	33600	32700	10100	20300	91400 J	41000	59100	34900
Lead	mg/kg	800	203	265	688	248	194 J	163 J	56.3 J	227	34100	2450	6660	583
Magnesium	mg/kg	--	9420	7150	667	674	3450 J	3840 J	3850 J	3050	14100	6660	65800	5550
Manganese	mg/kg	26,000	1190	6860	8670	5270	1570 J	3260 J	6500 J	1550	732	396	1630	1940
Mercury	mg/kg	46	0.52	0.051 J	0.1 UJ	0.25	0.11 J	0.2	0.38	0.1 J	1	0.075 J	0.32	0.31
Nickel	mg/kg	22,000	7	80.4	46.3	139	103 J	176 J	377 J	14.7	22 J	21.3	30	107
Potassium	mg/kg	--	3200	3190	1450	1350	1560 J	1760 J	441 J	4150	1930 J	2390 J	1190	1780
Selenium	mg/kg	5,800	5 UJ	3 UJ	2.7 U	0.9 J	3 UJ	5.5 UJ	3.2 UJ	3.2 UJ	4.4 J	2.7	0.83 J	2 J
Silver	mg/kg	5,800	2.4	2.9	4.5	0.61 J	1.6 J	1.5 J	0.59 J	1.7	160	11.3	18.9	2.6
Sodium	mg/kg	--	114 J	589 U	54 J	124 J	36.9 J	69.1 J	7.1 J-	111 J	45.7 J	2640 U	66.8 J	50.8 J
Thallium	mg/kg	12	1 U	1.6	0.88 J+	0.59 U	1.2 U	1.1 J+	0.65 UJ	0.84	0.55	0.71	31.5	2.1
Vanadium	mg/kg	5,800	8.6	20.7 J	5.5	4.1	12.6	18.6	17.4	22	5 J	4.3 J	18.1	32.3
Zinc	mg/kg	350,000	361	9690	7320	21900	15000	16900	47200	234	13000 J	5640	8500	3650

Notes:

- No Value
- Bold**The analyte was detected above the sample quantitation limit.
- Bold**The analyte concentration exceeds both EPA RSLs.
- JThe associated value is an estimated quantity.
- J- The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential negative bias.
- J+ The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential positive bias.
- U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
- UJ The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- mg/kgmilligrams per kilogram
- NANot Analyzed
- NENo Benchmark Established

U.S. Environmental Protection Agency (EPA) Regional Screening Level (RSL) for Soil (May, 2020).

Analyte	Pathway:	Surface Water Pathway Environmental		Elkhorn Creek														
	Location:			C&D Mine				Elkhorn Creek Tailings										
	Sample ID:			CD-SW-BK01	Three Times Background Concentration	CD-SW-01	ECT-SW-BK01	Three Times Background Concentration	ECT-SW-01	ECT-SW-03	ECT-SW-05	ECT-SW-04	ECT-SW-BK01-2	Three Times Background Concentration	ECT-SW-01-2	ECT-SW-03-2	ECT-SW-05-2	ECT-SW-04-2
	Type:	SCDM Acute	SCDM Chronic	Field Sample		Field Sample	Field Sample		Field Sample	Field Sample	Duplicate	Field Sample	Field Sample		Field Sample	Field Sample	Duplicate	Field Sample
	Sample Date:			6/5/19		6/5/19	6/3/19		6/3/19	6/3/19	6/3/19	6/3/19	9/10/19		9/10/19	9/10/19	9/10/19	9/10/19
Total Metals																		
Aluminum	µg/L	NE	NE	20 U	--	20 U	217	651	130	86	84.2	24.1	113 J (146.9)	440.7	48.8 J	87.4 J	108 J	31.8
Antimony	µg/L	NE	NE	2 UJ	--	2 UJ	2.4 J (3.1)	9.1	4.5 J	13.4 J (10.6)	13.4 J (10.6)	11.4 J	2 U	--	3.5	20	22.9	14.6
Arsenic	µg/L	NE	NE	5.5 J+	16.5	5.6 J+	11.3 J (15.3)	45.8	9.7 J	10.9 J	10.4 J	9.1 J	5.6	16.8	6.3	11.9	12.9	11.4
Barium	µg/L	NE	NE	10 UJ	--	10 UJ	14.5 J (18.2)	54.4	16.5 J	20.2 J	19.9 J	20.1 J	9.3 J (11.6)	34.9	16	23.5	23.8	24.7
Beryllium	µg/L	NE	NE	1 U	--	1 U	1 U	--	1 U	1 U	1 U	1 U	1 U	--	1 U	1 U	1 U	1 U
Cadmium	µg/L	NE	NE	1 UJ	--	1 UJ	10.1 J (13)	39.1	12.2 J	12.9 J	12.9 J	10.7 J	0.22 J (0.28)	0.85	10	13.4	14.4	10.4
Calcium	µg/L	NE	NE	7920 J+	23760	7780 J+	39900 J (49476)	148428	41000 J	44200 J	44400 J	42700 J	35700	107100	41100	49000	49100	47200
Chromium	µg/L	NE	NE	2 U	--	2 U	2 U	--	2 U	2 U	2 U	2 U	0.69 J (0.90)	2.69	0.78 J	0.71 J	0.64 J	2 U
Cobalt	µg/L	NE	NE	1 U	--	1 U	1.1	3.3	1.1	1.1	1.1	0.99 J	0.44 J (0.56)	1.7	1	1.3	1.4	1.3
Copper	µg/L	NE	NE	2 UJ	--	2 UJ	8.9 J (11.1)	33.4	6.5 J	9.3 J	9.4 J	6.1 J	4.2	12.6	3.8	14	17.1	7.9
Iron	µg/L	NE	NE	200 U	--	200 U	719	2157	385	304	265	200 U	338	1014	226	403	474	293
Lead	µg/L	NE	NE	1 UJ	--	1 UJ	11.2 J (14.7)	44	12 J	58.8 J (44.9)	61.9 J (47.3)	28 J	2.8	8.4	12.9	109	147	49
Magnesium	µg/L	NE	NE	500 UJ	--	500 UJ	6230 J (7725)	23176	7140 J	8570 J	8760 J	7670 J	6700	20100	8100	10500	10800	9880
Manganese	µg/L	NE	NE	1 UJ	--	1 UJ	12.2 J (15.6)	46.9	7.7 J	34.8 J	34.1 J	19.1 J	6.4	19.2	17.6	73.8	93.2	106
Mercury	µg/L	NE	NE	0.2 U	--	0.2 U	0.062 J (0.093)	0.279	0.071 J	0.08 J	0.11 J	0.043 J	0.2 U	--	0.028 J	0.12 J	0.14 J	0.031 J-
Nickel	µg/L	NE	NE	1 U	--	1 U	1 U	--	1 U	1 U	1 U	1 U	1 U	--	0.42 J	0.88 J	0.72 J	0.71 J
Potassium	µg/L	NE	NE	500 UJ	--	500 UJ	1040 J (1290)	3869	1340 J	1530 J	1520 J	1520 J	910	2730	1650	2330	2340	2370 J
Selenium	µg/L	NE	NE	5 U	--	5 U	5 U	--	5 U	5 U	5 U	5 U	5 U	--	5 U	5 U	5 U	5 U
Silver	µg/L	NE	NE	1 U	--	1 U	0.29 J (0.41)	1.2	0.12 J	0.73 J	0.68 J	0.56 J	1 U	--	0.16 J	1.3	1.7	0.84 J
Sodium	µg/L	NE	NE	1010 J+	3030	977 J+	2490 J (3137)	9412	3060 J	3690 J	3620 J	3830 J	2190	6570	3060	4190	4130	4340
Thallium	µg/L	NE	NE	1 U	--	1 U	1 U	--	1 U	1 U	1 U	1 U	1 U	--	1 U	1 U	1 U	1 U
Vanadium	µg/L	NE	NE	5 U	--	5 U	1.1 J (1.38)	4.13	1 J	0.92 J	0.94 J	0.62 J	5 U	--	5 U	5 U	5 U	5 U
Zinc	µg/L	NE	NE	6.6 J+	19.8	5.5 J+	103 J (132.9)	398.6	135 J	417 J (323.3)	425 J (329.5)	348 J	10.5	31.5	119	533	614	476
Dissolved Metals																		
Aluminum	µg/L	750	87	20 U	--	20 U	20 U	--	20 U	20 U	20 U	20 U	6.9 J (9)	26.9	20 U	20 U	20 U	20 U
Antimony	µg/L	NE	NE	2 U	--	2 U	2.4	7.2	5.1	6.8	7.3	8.3	2 U	--	2 U	5.8	5.2	6.6
Arsenic	µg/L	340	150	5.5	16.5	5.7	6	18	7.1	7.3	7.3	8.2	4.4	13.2	5.7	7.1	6.7	8.6
Barium	µg/L	NE	NE	10 U	--	10 U	13	39	16.5	20.5	20.2	20.9	8.8 J (11)	33	16.5	23.3	22	24.3
Beryllium	µg/L	NE	NE	1 U	--	1 U	1 U	--	1 U	1 U	1 U	1 U	1 U	--	1 U	1 U	1 U	1 U
Cadmium	µg/L	2	0.25	1 U	--	1 U	8.3	24.9	11.2	9.9	10.2	9.5	0.14 J (0.18)	0.54	9.8	10.3	9.8	8.7
Calcium	µg/L	NE	NE	8090 J (10,032)	30,096	8210 J	40100 J (49724)	149,172	42600 J	44500 J	44500 J	44700 J	36000	108000	42000	48300	46600	48400
Chromium	µg/L	NE	NE	2 U	--	2 U	2 U	--	2 U	2 U	5.1 J (3.9)	2 U	0.65 J (0.85)	2.5	0.75 J	0.66 J	0.57 J	2 U
Cobalt	µg/L	NE	NE	1 U	--	1 U	1.1	3.3	1.4	1.4	1.2	1.4	0.4 J (0.5)	1.5	1.1	1.3	1.2	1.4
Copper	µg/L	2.3	1.4	2 U	--	2 U	2.3 J+	6.9	2.4 J+	3 J+	3 J+	3.4 J+	1.4 J (1.75)	5.3	1.7 J	3.3	2.9	2.9
Iron	µg/L	NE	1000	200 U	--	200 U	200 U	--	200 U	200 U	200 U	200 U	122 J (154.9)	464.8	133 J	160 J	152 J	192 J
Lead	µg/L	65	2.5	1 UJ	--	1 UJ	4.4 J (5.8)	17.3	3.1 J	7.7 J	8.2 J	6.7 J	0.28 J (0.37)	1.1	2.1	13.9	13.1	6.8
Magnesium	µg/L	NE	NE	462 J (572.9)	1719	482 J	5990	17970	6840	7630	7560	7720	6560	19680	8170	9750	9520	9730
Manganese	µg/L	NE	NE	1 U	--	1 U	1.6 J+	4.8	1.6 J+	6.3	5.8	11.7	0.85 J (1.1)	3.3	0.87 J	28.4	27.5	92.4
Mercury	µg/L	1.4	0.77	0.2 U	--	0.2 U	0.2 U	--	0.2 U	0.2 U	0.2 U	0.2 U	0.057 J (0.086)	0.257	0.058 J	0.07 J	0.074 J	0.2 U
Nickel	µg/L	470	52	1 U	--	1 U	1 U	--	1 U	1 U	1.8	1 U	1 U	--	0.42 J	0.52 J	0.47 J	0.63 J
Potassium	µg/L	NE	NE	316 J (391.8)	1175.5	331 J	979	2937	1310	1570	1560	1580	902	2706	1710	2340	2240	2430 J
Selenium	µg/L	290	5	5 UJ	--	5 UJ	5 UJ	--	5 UJ	5 UJ	5 UJ	5 UJ	5 U	--	5 U	5 U	5 U	5 U
Silver	µg/L	3.2	NE	1 U	--	1 U	1 U	--	1 U	1 U	1 U	1 U	1 U	--	1 U	1 U	0.062 J	0.091 J
Sodium	µg/L	NE	NE	889	2667	891	2360	7080	2870	3660	3600	3860	2250	6750	3170	4170	4050	4330
Thallium	µg/L	NE	NE	1 U	--	1 U	1 U	--	1 U	1 U	1 U	1 U	1 U	--	1 U	1 U	1 U	1 U
Vanadium	µg/L	NE	NE	0.69 J (0.86)	2.59	0.64 J	0.59 J (0.74)	2.21	0.85 J	0.49 J	5 U	0.45 J	5 U	--	5 U	5 U	5 U	5 U
Zinc	µg/L	120	120	5.1 J+	15.3	5.8 J+	85.2 J+	255.6	115	236	241	275	9.3	27.9	97.2	286	268	357

Notes:

-- No Value

Bold The analyte was detected above the sample quantitation limit.

Bold The analyte was detected above the three times Background concentration limit.

Bold The analyte was detected above the three times Background concentration limit and exceeds one or both SCDMs.

J The associated value is an estimated quantity.

J+ The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential positive bias.

U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

UJ The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

mg/L as Ca CO₃ = milligrams per liter as calcium carbonate

N/A = Not Applicable

µg/L = micrograms per liter

SCMD = Superfund Chemical Data Matrix

Analyte	Pathway:	Slaughterhouse Gulch								Greyback Gulch			
	Location:	Union Elkhorn Mine								Greyback Gulch			
	Sample ID:	UE-SW-BK01	Three Times Background Concentration	UE-SW-01	UE-SW-03	UE-SW-BK01-2	Three Times Background Concentration	UE-SW-01-2	UE-SW-03-2	GG-SW-01	Three Times Background Concentration	GG-SW-02	GG-SW-03
	Type:	Field Sample		Field Sample	Duplicate	Field Sample		Field Sample	Duplicate	Field Sample		Field Sample	Field Sample
	Sample Date:	6/5/19		6/5/19	6/5/19	9/10/19		9/10/19	9/10/19	9/12/19		9/12/19	9/12/19
Total Metals													
Aluminum	µg/L	120 J+	360	479 J+ (368.5)	128 J+	91.5	274.5	133 J	165	92.8 J (120.6)	361.9	52.5 J	52.1 J
Antimony	µg/L	2 UJ	--	2 U	2 UJ	2 U	--	2 U	2 U	2 U	--	2 U	2 U
Arsenic	µg/L	2.2 J+	6.6	4.7 J+	2.2 J+	2.2	6.6	2	1.9	2.2	6.6	1.1	1.1
Barium	µg/L	10 UJ	--	10 UJ	10 UJ	6.6 J (8.25)	24.8	7 J	7 J	8.1 J (10.1)	30.4	6.1 J	6.4 J
Beryllium	µg/L	1 U	--	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1 U
Cadmium	µg/L	1 UJ	--	0.27 J	1 UJ	1 U	--	0.074 J	1 U	1 U	--	1 U	1 U
Calcium	µg/L	18500 J+	55500	19000 J+	18400 J+	19200	57600	19800	20400	21800	65400	8910	12600
Chromium	µg/L	2 U	--	2 U	2 U	0.93 J (1.21)	3.6	0.98 J	1 J	1.3 U	--	1.2 U	1.3 U
Cobalt	µg/L	1 U	--	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1 U
Copper	µg/L	2 UJ	--	3.8 J+	1.7 UJ	1.2 J (1.5)	4.5	1.5 J	1.3 J	4.5	13.5	0.94 J	2
Iron	µg/L	200 U	--	603 J+	200 UJ	176 J (223.5)	671	217	258	206	618	139 J	139 J
Lead	µg/L	0.84 J (1.1)	3.3	9 J	1.1 J	0.54 J (0.71)	2.1	1.1	1.2	0.25 J (0.328)	0.983	0.068 J	0.094 J
Magnesium	µg/L	2220 J+	6660	2410 J+	2230 J+	2810	8430	3070	2980	9380	28140	2410	4490
Manganese	µg/L	7 J+	21	24 J+ (18.8)	7.4 J+	5.3	15.9	8.9	7.6	9.3 J+	27.9	4.1 J+	4.3 J+
Mercury	µg/L	0.2 U	--	0.2 U	0.2 U	0.2 UJ	--	0.2 U	0.2 UJ	0.2 U	--	0.2 U	0.2 U
Nickel	µg/L	1 U	--	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1 U
Potassium	µg/L	513 J+	1539	580 J+	535 J+	694 J (860.6)	2581.7	689	744 J	1560	4680	1220	1340
Selenium	µg/L	5 U	--	5 UJ	5 U	5 U	--	5 U	5 U	5 U	--	5 U	5 U
Silver	µg/L	1 U	--	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1 U
Sodium	µg/L	1940 J+	5820	1920 J+	2030 J+	2000	6000	2160	2110	2830	8490	2670	2750
Thallium	µg/L	1 U	--	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1 U
Vanadium	µg/L	5 U	--	5 U	5 U	5 U	--	5 U	5 U	5 U	--	5 U	5 U
Zinc	µg/L	5.5 J+	16.5	15.1 J+	8.7 J+	5.9 J+	17.7	6.1	6.2 J+	6 J+	18	5.2 J+	4.1 J+
Dissolved Metals													
Aluminum	µg/L	20 U	--	20 U	20 U	7.1 J (9.2)	27.7	6.2 J	4.7 J	6.4 J (8.3)	25	15.5 J	11.9 J
Antimony	µg/L	2 U	--	2 U	2 U	2 U	--	2 U	2 U	2 U	--	2 U	2 U
Arsenic	µg/L	1.7	5.1	1.6	1.8	1.3	3.9	1.6	1.8	2.4	7.2	0.65 J	1.1
Barium	µg/L	10 U	--	10 U	10 U	6 J (7.5)	22.5	6.1 J	6.1 J	7.1 J (8.9)	26.6	5.3 J	6.1 J
Beryllium	µg/L	1 U	--	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1 U
Cadmium	µg/L	1 U	--	1 U	0.16 J	1 U	--	1 U	1 U	1 U	--	1 U	1 U
Calcium	µg/L	19200 J (23808)	71,424	18700 J	19200 J	19400	58200	19400	19500	20100	60300	8020	11700
Chromium	µg/L	2 U	--	2 U	2 U	2 U	--	0.74 J	2 U	2 U	--	2 U	2 U
Cobalt	µg/L	1 U	--	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1 U
Copper	µg/L	2 U	--	2 U	2 U	2 U	--	2 U	2 U	1.8 J (2.3)	6.8	2 U	1.1 J
Iron	µg/L	200 U	--	200 U	200 U	69.9 J (88.8)	266.3	60.8 J	60.8 J	67.5 J (85.7)	257	68.2 J	67.3 J
Lead	µg/L	1 UJ	--	1 UJ	1.2 J (0.92)	0.12 J (0.16)	0.47	0.069 J	1 U	1 U	--	1 U	1 U
Magnesium	µg/L	2190	6,570	2190	2220	2820	8460	2950	2810	7740	23220	2040	3880
Manganese	µg/L	1.2 J+	3.6	1.3 J+	1 U	0.58 U	--	0.45 J	0.58 U	1 U	--	1 J+	1 U
Mercury	µg/L	0.2 U	--	0.2 U	0.2 U	0.2 U	--	0.055 J	0.2 U	0.2 U	--	0.2 U	0.2 U
Nickel	µg/L	1 U	--	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1 U
Potassium	µg/L	503	1509	503	510	695 J (861.8)	2585	661	707 J	1430	4290	1060	1190
Selenium	µg/L	5 UJ	--	5 UJ	5 UJ	5 U	--	5 U	5 U	5 U	--	5 U	5 U
Silver	µg/L	1 U	--	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1 U
Sodium	µg/L	1880	5,640	1910	1950	2090	6270	2140	2060	2890	8670	2720	2830
Thallium	µg/L	1 U	--	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1 U
Vanadium	µg/L	0.57 J (0.71)	2.14	0.49 J	0.53 J	5 U	--	5 U	5 U	5 U	--	5 U	5 U
Zinc	µg/L	5.7 J+	17.1	5.1 J+	9.5 J+	9.9 J+	29.7	8.2	9.7 J+	7.8 J+	23.4	8.3 J+	6.7 J+

Notes:

-- No Value

Bold The analyte was detected above the sample quantitation limit.

Bold The analyte was detected above the three times Background concentration limit.

Bold The analyte was detected above the three times Background concentration limit and exceeds one or both SCDMs.

J The associated value is an estimated quantity.

J+ The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential positive bias.

U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

UJ The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

mg/L as Ca CO₃ = milligrams per liter as calcium carbonate

N/A = Not Applicable

µg/L = micrograms per liter

SCMD = Superfund Chemical Data Matrix

Analyte	Pathway:	Turnley Creek											
	Location:	Trumley Heap Leach											
	Sample ID:	THL-SW-BK01	Three Times Background Concentration	THL-SW-01	THL-SW-04	THL-SW-02	THL-SW-03	THL-SW-BK01-2	Three Times Background Concentration	THL-SW-01-2	THL-SW-02-2	THL-SW-03-2	
	Type:	Field Sample		Field Sample	Duplicate	Field Sample	Field Sample	Field Sample		Field Sample	Field Sample	Field Sample	Field Sample
	Sample Date:	6/4/19		6/4/19	6/4/19	6/4/19	6/4/19	6/4/19		9/9/19	9/9/19	9/9/19	9/9/19
Total Metals													
Aluminum	µg/L	130	390	74.9 J	42.2 J	20 U	121	514	1542	200 J	102	244	
Antimony	µg/L	2 U	--	2 UJ	2 UJ	2 UJ	2 U	2 U	--	2 U	2 U	2 U	
Arsenic	µg/L	1.3	3.9	1.1 J	1 J	1 UJ	1.3	1.2	3.6	2.2	1.9	2	
Barium	µg/L	8 J (10)	30	7.6 J	7.4 J	10 UJ	8.9 J	17.5	52.5	9.8 J	10.2	12.7	
Beryllium	µg/L	1 U	--	1 U	1 U	1 U	1 U	1 U	--	1 U	1 U	1 U	
Cadmium	µg/L	1 U	--	1 UJ	1 UJ	1 UJ	1 U	1 U	--	1 U	1 U	1 U	
Calcium	µg/L	9060	27180	8760 J	8610 J	500 UJ	9440	16200	48600	12300	13700	14400	
Chromium	µg/L	2 U	--	2 U	2 U	2 U	2 U	1.7 J (2.2)	6.6	1.5 J	1.1 J	1.6 J	
Cobalt	µg/L	1 U	--	1 U	1 U	1 U	1 U	0.38 J (0.48)	1.5	0.19 J	0.14 J	0.3 J	
Copper	µg/L	2.2	6.6	2.6 J	1.9 J	2 UJ	2.9	2	6	4	3.3	4.8	
Iron	µg/L	206 J (261.6)	785	148 J	136 J	200 U	272 J	1020	3060	666	634	841	
Lead	µg/L	1 U	--	1 UJ	1 UJ	1 UJ	1 U	0.72 J (0.94)	2.8	0.28 J	0.16 J	0.34 J	
Magnesium	µg/L	2240	6720	2240 J	2180 J	500 UJ	2410	3690	11070	3570	3590	3790	
Manganese	µg/L	12.2 J (15.6)	46.9	7.3 J	6.4 J	1 UJ	16.4 J	59.6	178.8	35	39.2	51.6	
Mercury	µg/L	0.2 U	--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 UJ	--	0.2 U	0.2 UJ	0.2 UJ	
Nickel	µg/L	1 U	--	1 U	1 U	1 U	1 U	0.59 J (0.76)	2.28	0.56 J	0.43 J	0.57 J	
Potassium	µg/L	921	2763	918 J	902 J	500 UJ	931	1710 J (2120)	6361	1450	1790 J	2030 J	
Selenium	µg/L	5 UJ	--	5 U	5 U	5 U	5 UJ	5 U	--	5 U	5 U	5 U	
Silver	µg/L	1 U	--	1 U	1 U	1 U	1 U	1 U	--	1 U	1 U	1 U	
Sodium	µg/L	2720	8160	2910 J	2830 J	500 UJ	2880	3430	10290	2980	3170	3300	
Thallium	µg/L	1 U	--	1 U	1 U	1 U	1 U	1 U	--	1 U	1 U	1 U	
Vanadium	µg/L	1.3 J (1.6)	4.9	1.2 J	1.1 J	5 U	1.4 J	2.1 J (2.6)	7.9	0.93 J	0.79 J	1.2 J	
Zinc	µg/L	8 J+	24	8.7 J+	5.8 J+	8.7 J+	6 J+	7.9 J+	23.7	4.7	5.7 J+	9 J+	
Dissolved Metals													
Aluminum	µg/L	36	108	20 J+	20 U	21.5 J+	9.1 J	13.4 J (17.4)	52.3	26.8	20.1	21.1	
Antimony	µg/L	2 U	--	2 U	2 U	2 U	2 U	2 U	--	2 U	2 U	2 U	
Arsenic	µg/L	1.1	3.3	1.1	1.1	1.1	1.2	1.1	3.3	1.5	1.3	1.6	
Barium	µg/L	10 U	--	10 U	10 U	10 U	8.3 J	12	36	8.5 J	9 J	9.4 J	
Beryllium	µg/L	1 U	--	1 U	1 U	1 U	1 U	1 U	--	1 U	1 U	1 U	
Cadmium	µg/L	1 U	--	1 U	1 U	1 U	1 U	1 U	--	1 U	1 U	1 U	
Calcium	µg/L	8920 J (11060.8)	33,182	8840 J	9020 J	8780 J	9720	16200	48600	12200	13300	13700	
Chromium	µg/L	2 U	--	2 U	2 U	2 U	2 U	2 U	--	1.2 J	2 U	2 U	
Cobalt	µg/L	1 U	--	1 U	1 U	1 U	1 U	1 U	--	0.13 J	0.16 J	0.28 J	
Copper	µg/L	2 U	--	2 U	2 U	2 U	2 J+	2 U	--	2.8	2.6	3.1	
Iron	µg/L	200 U	--	200 U	200 U	200 U	200 U	178 J (226)	678	238	272	275	
Lead	µg/L	1 UJ	--	1 UJ	1 UJ	1 UJ	1 U	1 U	--	1 U	1 U	1 U	
Magnesium	µg/L	2190	6,570	2110	2170	2170	2330	3580	10740	3530	3430	3550	
Manganese	µg/L	4.7 J+	14.1	4.8	5.6	4.4 J+	10.1	10.4	31.2	17.7	21.7	16.3	
Mercury	µg/L	0.2 U	--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	--	0.057 J	0.2 U	0.2 U	
Nickel	µg/L	1 U	--	1 U	1 U	1 U	1 U	1 U	--	1 U	1 U	0.46 J	
Potassium	µg/L	901	2703	876	897	884	944	1670 J (2071)	6212	1430	1680 J	1910 J	
Selenium	µg/L	5 UJ	--	5 UJ	5 UJ	5 UJ	5 UJ	5 U	--	5 U	5 U	5 U	
Silver	µg/L	1 U	--	1 U	1 U	1 U	1 U	1 U	--	1 U	1 U	1 U	
Sodium	µg/L	2720	8,160	2630	2740	2690	2800	3470	10410	3010	3080	3200	
Thallium	µg/L	1 U	--	1 U	1 U	1 U	1 U	1 U	--	1 U	1 U	1 U	
Vanadium	µg/L	1.1 J (1.38)	4.13	0.97 J	0.95 J	0.97 J	0.99 J	5 U	--	5 U	5 U	5 U	
Zinc	µg/L	7.8 J+	23.4	5.8 J+	6.7 J+	4.6 J+	11.3 J+	7.5 J+	22.5	6.9	11.4 J+	11 J+	

Notes:
-- No Value
Bold The analyte was detected above the sample quantitation limit.
Bold The analyte was detected above the three times Background concentration limit.
Bold The analyte was detected above the three times Background concentration limit and exceeds one or both SCDMs.
J The associated value is an estimated quantity.
J+ The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential positive bias.
U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
UJ The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
mg/L as Ca CO₃ = milligrams per liter as calcium carbonate
N/A = Not Applicable
µg/L = micrograms per liter
SCMD = Superfund Chemical Data Matrix

Analyte	Pathway:	Queen Gulch																		
	Location:	Skyline Mine						Boulaway Mine						Elkhorn Queen Mine						
	Sample ID:	SM-SW-BK01	Three Times Background Concentration	SM-SW-01	SM-SW-03	SM-SW-04	BM-SW-BK01	Three Times Background Concentration	BM-SW-01	BM-SW-02	BM-SW-BK01-2	Three Times Background Concentration	BM-SW-01-2	BM-SW-02-2	EQ-SW-01	Three Times Background Concentration	EQ-SW-03	EQ-SW-01-2	Three Times Background Concentration	EQ-SW-03-2
	Type:	Field Sample		Field Sample	Field Sample	Field Sample	Field Sample		Field Sample	Field Sample	Field Sample		Field Sample	Field Sample	Field Sample		Field Sample	Field Sample		
	Sample Date:	9/11/19		9/11/19	9/11/19	6/4/19	6/4/19		6/4/19	9/9/19	9/9/19		9/9/19	6/4/19	9/9/19		9/9/19			
Total Metals																				
Aluminum	µg/L	29.5 J (38.4)	115	46.1 J	101 J	27.7 J	197	591	182	205	252 J (328)	983	200 J	175 J	249	747	268	183	549	210
Antimony	µg/L	2 U	--	2 U	2 U	2 U	2 UJ	--	2 UJ	2 UJ	2 U	--	2 U	2 U	2 UJ	--	2 UJ	2 U	--	2 U
Arsenic	µg/L	0.67 J (0.91)	2.7	2	5.5	3.8	1.4 J (1.9)	5.7	1.4 J	1.5 J	1.5	4.5	1.3	1.5	1.7 J (2.3)	6.9	1.8 J	3.5	10.5	3.7
Barium	µg/L	1.4 J (1.75)	5.3	0.95 J	1.7 J	2.9 J	3.6 J (4.5)	13.5	10 J	4 J	6.6 J (8.3)	24.8	6.6 J	7 J	4.4 J (5.5)	16.5	4.3 J	7.8 J (9.8)	29.3	8.1 J
Beryllium	µg/L	1 U	--	1 U	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1 U	--	1 U
Cadmium	µg/L	1 U	--	0.089 J	0.23 J	1 U	1 UJ	--	1 UJ	1 UJ	1 U	--	1 U	1 U	1 UJ	--	1 UJ	1 U	--	1 U
Calcium	µg/L	3700	11100	5460	5740	5840	5620 J (6969)	20,906	6000 J	6180 J	12300	36900	14900	15700	6210 J (7700)	23101	6350 J	18000	54000	17900
Chromium	µg/L	1.4 U	--	1.2 U	1.4 U	1.3 U	2 U	--	2 U	2 U	1.2 J (1.6)	4.7	0.9 J	0.98 J	2 U	--	2 U	1.2 J (1.6)	4.7	1.2 J
Cobalt	µg/L	1 U	--	1 U	1 U	1 U	0.055 J (0.070)	0.21	0.054 J	0.073 J	1 U	--	1 U	1 U	1 U	--	1 U	1 U	--	1 U
Copper	µg/L	2 U	--	2 U	2 U	2 U	2 UJ	--	2 UJ	1.1 UJ	2 U	--	2 U	0.89 J	1.1 UJ	--	1.1 UJ	0.91 J (1.14)	3.4	0.9 J
Iron	µg/L	34.6 J (43.9)	131.8	37.7 J	92.1 J	34.4 J	200 U	--	200 U	200 U	231	693	194 J	172 J	187 J (237.5)	712.5	202	205	615	218
Lead	µg/L	0.34 J (0.45)	1.3	0.37 J	1.1	0.38 J	1 UJ	--	1 UJ	1 UJ	0.36 J (0.47)	1.4	0.34 J	0.28 J	1 UJ	--	1 UJ	0.34 J (0.45)	1.34	0.36 J
Magnesium	µg/L	952	2856	979	1020	1040	1060 J (1314)	3,943	1200 J	1300 J	2670	8010	3570	3920	1280 J (1587)	4762	1320 J	4230	12690	4200
Manganese	µg/L	1.1 J+	3.3	1.3 J+	6.3	1.9 J+	5.2 J (6.7)	20	5.8 J	6.8 J	8	24	7.5	5.4	6.5 J (8.3)	25	7.6 J	6.7 J+	20.1	7.4 J+
Mercury	µg/L	0.2 U	--	0.2 U	0.2 U	0.2 U	0.2 U	--	0.2 U	0.2 U	0.2 U	--	0.2 U	0.2 U	0.2 U	--	0.2 U	0.2 UJ	--	0.2 UJ
Nickel	µg/L	1 U	--	1 U	0.41 J	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1 U	--	1 U
Potassium	µg/L	500 U	--	500 U	500 U	500 U	328 J (407)	1220	333 J	341 J	539	1617	610	616	345 J (428)	1283	353 J	712 J (883)	2649	727 J
Selenium	µg/L	5 U	--	5 U	5 U	5 U	5 U	--	5 U	5 U	5 U	--	5 U	5 U	5 U	--	5 U	5 U	--	5 U
Silver	µg/L	1 U	--	1 U	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1 U	--	1 U
Sodium	µg/L	1030	3090	1480	1380	1380	1480 J (1865)	5,594	1480 J	1490 J	1960	5880	2090	2130	1430 J (1802)	5405	1440 J	2240	6720	2230
Thallium	µg/L	1 U	--	1 U	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1 U	--	1 U
Vanadium	µg/L	5 U	--	5 U	5 U	5 U	1 J (1.25)	3.8	1 J	1.1 J	5 U	--	5 U	5 U	0.96 J (1.2)	3.6	0.97 J	5 U	--	5 U
Zinc	µg/L	10 J+	30	9.7 J+	21 J+	9.9 J+	5.2 J+	15.6	5.4 J+	4.7 J+	4.5	13.5	4.7	6.8	7.6 J+	22.8	6.6 J+	7 J+	21	7.6 J+
Dissolved Metals																				
Aluminum	µg/L	11.4 J (14.8)	44.5	13.2 J	10.1 J	11.1 J	20 U	--	28.1 J+ (21.6)	31.1	35.5	106.5	26.4	21.3	34.9	104.7	34.6	20 U	--	20.5
Antimony	µg/L	2 U	--	2 U	2 U	2 U	2 UJ	--	2 U	2 U	2 U	--	2 U	2 U	2 U	--	2 U	6.6	19.8	2 U
Arsenic	µg/L	1 U	--	2.3	4.9	4	0.65 J+	1.95	1.3	1.4	1.2	3.6	1.3	1.3	1.6	4.8	1.6	8.6	25.8	3.1
Barium	µg/L	1.2 J (1.5)	4.5	0.94 J	1.1 J	2.7 J	46.5	139.5	10 U	10 U	5.6 J (7)	21	5.7 J	5.7 J	10 U	--	10 U	24.3	72.9	6.6 J
Beryllium	µg/L	1 U	--	1 U	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1 U	--	1 U
Cadmium	µg/L	1 U	--	1 U	0.12 J	1 U	1 UJ	--	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	8.7	26.1	1 U
Calcium	µg/L	3320	9960	4750	5150	5400	64,900	194,700	6240 J	6230 J	14100	42300	16100	15300	6540 J (8110)	24329	6560 J	48400	145200	17600
Chromium	µg/L	2 U	--	2 U	2 U	2 U	0.25 J- (0.33)	0.98	2 U	2 U	1.1 J (1.4)	4.3	0.84 J	0.85 J	2 U	--	2 U	2 U	--	2 U
Cobalt	µg/L	1 U	--	1 U	1 U	1 U	0.09 J+	0.27	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1.4	4.2	1 U
Copper	µg/L	1.3 J (1.6)	4.9	2 U	2 U	2 U	0.37 UJ	--	2 U	2 U	2 U	--	2 U	2 U	2 U	--	2 U	2.9	8.7	2 U
Iron	µg/L	200 U	--	200 U	200 U	200 U	200 U	--	200 U	200 U	66.5 J (84.5)	253.4	65.4 J	59 J	200 U	--	200 U	192 J (243.8)	731.5	67.7 J
Lead	µg/L	0.079 J (0.104)	0.3	0.1 J	1 U	1 U	1 U	--	1 UJ	1 UJ	1 U	--	1 U	1 U	1 UJ	--	1 UJ	6.8	20.4	1 U
Magnesium	µg/L	805	2415	809	867	907	21,200	63,600	1170	1190	2970	8910	3810	3730	1240	3720	1240	9730	29190	4080
Manganese	µg/L	1 U	--	1 U	1 U	1 U	0.57 J (0.73)	2.2	1 U	1 U	0.75 J (0.96)	2.9	0.8 J	0.67 J	1.2 J+	3.6	1 U	92.4	277.2	0.9 U
Mercury	µg/L	0.2 U	--	0.2 U	0.2 U	0.2 U	0.2 U	--	0.2 U	0.2 U	0.056 J (0.084)	0.252	0.055 J	0.056 J	0.2 U	--	0.2 U	0.2 U	--	0.2 U
Nickel	µg/L	1 U	--	1 U	1 U	1 U	0.2 J- (0.3)	0.8	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	0.63 J (0.81)	2.4	1 U
Potassium	µg/L	175 J (217)	651	262 J	249 J	254 J	565	1695	307 J	304 J	568	1704	595	564	315 J (391)	1172	345 J	2430 J (3013)	9040	681 J
Selenium	µg/L	5 U	--	5 U	5 U	5 U	5 U	--	5 UJ	5 UJ	5 U	--	5 U	5 U	5 UJ	--	5 UJ	5 U	--	5 U
Silver	µg/L	1 U	--	1 U	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	0.091 J (0.129)	0.388	1 U
Sodium	µg/L	1040	3120	1500	1400	1410	5,020	15,060	1350	1340	2250	6750	2240	2060	1370	4110	1410	4330	12990	2170
Thallium	µg/L	1 U	--	1 U	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1 U	1 U	--	1 U	1 U	--	1 U
Vanadium	µg/L	5 U	--	5 U	5 U	5 U	0.2 J- (0.3)	0.8	0.64 J	0.75 J	5 U	--	5 U	5 U	0.74 J (0.93)	2.78	0.75 J	5 U	--	5 U
Zinc	µg/L	15.5 J+	46.5	13.6 J+	18.1 J+	12.9 J+	5.3	15.9	4.3 J+	4.5 J+	7	21	9.1	8.2	5.5 J+	16.5	6.4 J+	357	1071	9.3 J+

Notes:

-- No Value

Bold The analyte was detected above the sample quantitation limit.

Bold The analyte was detected above the three times Background concentration limit.

Bold The analyte was detected above the three times Background concentration limit and exceeds one or both SCMDs.

J The associated value is an estimated quantity.

J+ The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential positive bias.

U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

UJ The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

mg/L as Ca CO₃ = milligrams per liter as calcium carbonate

N/A = Not Applicable

µg/L = micrograms per liter

SCMD = Superfund Chemical Data Matrix

Analyte	EPA Maximum Contaminant Levels (MCLs) for Drinking Water (ugl/L) ¹	Pathway:	Elkhorn Creek					
		Location:	C&D Mine					
		Sample ID:	Montana Numeric Water Quality Standards ²		CD-SW-BK01 Field Sample	Montana Numeric Water Quality Standards ²		CD-SW-01 Field Sample
		Type:						
		Sample Date:	Aquatic Life Acute	Aquatic Life Chronic	6/5/19	Aquatic Life Acute	Aquatic Life Chronic	6/5/19
Hardness*		mg/L as CaCO ₃	--		22.10	--		22.49
pH		Standard Units	--		7.26	--		7.3
Dissolved Metals								
Aluminum	--	µg/L	750	87	20 U	750	87	20 U
Antimony	6	µg/L	--	--	2 U	--	--	2 U
Arsenic	10	µg/L	340	150	5.5	340	150	5.7
Barium	2000	µg/L	--	--	10 U	--	--	10 U
Beryllium	4	µg/L	--	--	1 U	--	--	1 U
Cadmium ¹	5	µg/L	0.4	0.2	1 U	0.4	0.2	1 U
Calcium	--	µg/L	--	--	8090 J	--	--	8210 J
Chromium ¹	100	µg/L	524	25	2 U	531	25	2 U
Cobalt	--	µg/L	--	--	1 U	--	--	1 U
Copper ¹	1300	µg/L	3	3	2 U	3	3	2 U
Iron	--	µg/L	--	1,000	200 U	--	1,000	200 U
Lead ¹	15	µg/L	12.0	0.5	1 UJ	12.2	0.5	1 UJ
Magnesium	--	µg/L	--	--	462 J	--	--	482 J
Manganese	--	µg/L	--	--	1 U	--	--	1 U
Mercury	2	µg/L	1.7	0.91	0.2 U	1.7	0.91	0.2 U
Nickel ¹	--	µg/L	131	15	1 U	133	15	1 U
Potassium	--	µg/L	--	--	316 J	--	--	331 J
Selenium	50	µg/L	20	5	5 UJ	20	5	5 UJ
Silver ¹	--	µg/L	0.30	--	1 U	0.31	--	1 U
Sodium	--	µg/L	--	--	889	--	--	891
Thallium	2	µg/L	--	--	1 U	--	--	1 U
Vanadium	--	µg/L	--	--	0.69 J	--	--	0.64 J
Zinc ¹	--	µg/L	33	33	5.1 J+	34	34	5.8 J+

Notes:

-- No Benchmark Established

Bold	The analyte was detected above the sample quantitation limit.
Bold	The analyte concentration exceeds both Montana Aquatic Life Water Quality Standards and the MCL.
Bold	The analyte concentration exceeds both Montana Aquatic Life Water Quality Standards.
Bold	The analyte concentration exceeds the 4 Day Average Montana Water Quality Standard.
Bold	The analye concentraion exceeds the MCL value
J	The associated value is an estimated quantity.
J+	The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential positive bias.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
UJ	The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

mg/L as Ca CO₃ milligrams per liter as calcium carbonate

µg/L micrograms per liter

* Hardness calculated using the formula: (2.497 * dissolved Calcium mg/L) + (4.118 * dissolved Magnesium mg/L).

¹ Obtained from the EPA National Primary Drinking Water Regulations (May 2009)- <https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations#seven>

² Hardness dependent dissolved water quality standard calculated from the equations in the Circular DEQ-7 Montana Numeric Water Quality Standards (June 2019)

Surface Water - Human Health and Ecological Benchmarks
Analytical Results Summary
Site Inspection- June/September 2019
Elkhorn Mining District

Table 6b

Analyte	EPA Maximum Contaminant Levels (MCLs) for Drinking Water (ug/L) ¹	Pathway:	Elkhorn Creek														
		Location:	Elkhorn Creek Tailings														
		Sample ID:	Montana Numeric Water Quality Standards ²		ECT-SW-BK01 Field Sample	Montana Numeric Water Quality Standards ²		ECT-SW-BK01-2 Field Sample	Montana Numeric Water Quality Standards ²		ECT-SW-01 Field Sample	Montana Numeric Water Quality Standards ²		ECT-SW-01-2 Field Sample	Montana Numeric Water Quality Standards ²		ECT-SW-03 Field Sample
		Type:															
		Sample Date:	Aquatic Life Acute	Aquatic Life Chronic	6/3/19	Aquatic Life Acute	Aquatic Life Chronic	9/10/19	Aquatic Life Acute	Aquatic Life Chronic	6/3/19	Aquatic Life Acute	Aquatic Life Chronic	9/10/19	Aquatic Life Acute	Aquatic Life Chronic	6/3/19
Hardness*		mg/L as CaCO ₃	--		124.80	--		116.91	--		134.54	--		138.52	--		142.54
pH		Standard Units	--		7.82	--		8.01	--		7.43	--		7.8	--		7.97
Dissolved Metals																	
Aluminum	--	µg/L	750	87	20 U	750	87	6.9 J	750	87	20 U	750	87	20 U	750	87	20 U
Antimony	6	µg/L	--	--	2.4	--	--	2 U	--	--	5.1	--	--	2 U	--	--	6.8
Arsenic	10	µg/L	340	150	6	340	150	4.4	340	150	7.1	340	150	5.7	340	150	7.3
Barium	2000	µg/L	--	--	13	--	--	8.8 J	--	--	16.5	--	--	16.5	--	--	20.5
Beryllium	4	µg/L	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U
Cadmium ¹	5	µg/L	2.4	0.9	8.3	2.2	0.9	0.14 J	2.5	1.0	11.2	2.6	1.0	9.8	2.7	1.0	9.9
Calcium	--	µg/L	--	--	40100 J	--	--	36000	--	--	42600 J	--	--	42000	--	--	44500 J
Chromium ¹	100	µg/L	2,162	103	2 U	2,049	98	0.65 J	2,299	110	2 U	2,355	113	0.75 J	2,410	115	2 U
Cobalt	--	µg/L	--	--	1.1	--	--	0.4 J	--	--	1.4	--	--	1.1	--	--	1.4
Copper ¹	1300	µg/L	17	11	2.3 J+	16	11	1.4 J	19	12	2.4 J+	19	12	1.7 J	20	13	3 J+
Iron	--	µg/L	--	1,000	200 U	--	1,000	122 J	--	1,000	200 U	--	1,000	133 J	--	1,000	200 U
Lead ¹	15	µg/L	108.2	4.2	4.4 J	99.6	3.9	0.28 J	119.1	4.6	3.1 J	123.6	4.8	2.1	128.2	5.0	7.7 J
Magnesium	--	µg/L	--	--	5990	--	--	6560	--	--	6840	--	--	8170	--	--	7630
Manganese	--	µg/L	--	--	1.6 J+	--	--	0.85 J	--	--	1.6 J+	--	--	0.87 J	--	--	6.3
Mercury	2	µg/L	1.7	0.91	0.2 U	1.7	0.91	0.057 J	1.7	0.91	0.2 U	1.7	0.91	0.058 J	1.7	0.91	0.2 U
Nickel ¹	--	µg/L	566	63	1 U	535	60	1 U	603	67	1 U	618	69	0.42 J	633	70	1 U
Potassium	--	µg/L	--	--	979	--	--	902	--	--	1310	--	--	1710	--	--	1570
Selenium	50	µg/L	20	5	5 UJ	20	5	5 U	20	5	5 UJ	20	5	5 U	20	5	5 UJ
Silver ¹	--	µg/L	5.94	--	1 U	5.31	--	1 U	6.76	--	1 U	7.11	--	1 U	7.47	--	1 U
Sodium	--	µg/L	--	--	2360	--	--	2250	--	--	2870	--	--	3170	--	--	3660
Thallium	2	µg/L	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U
Vanadium	--	µg/L	--	--	0.59 J	--	--	5 U	--	--	0.85 J	--	--	5 U	--	--	0.49 J
Zinc ¹	--	µg/L	145	145	85.2 J+	137	137	9.3	154	154	115	158	158	97.2	162	162	236

Notes:

-- No Benchmark Established

Bold The analyte was detected above the sample quantitation limit.

Bold The analyte concentration exceeds both Montana Aquatic Life Water Quality Standards and the MCL.

Bold The analyte concentration exceeds both Montana Aquatic Life Water Quality Standards.

Bold The analyte concentration exceeds the 4 Day Average Montana Water Quality Standard.

Bold The analye concentraion exceeds the MCL value

J The associated value is an estimated quantity.

J+ The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential positive bias.

U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

UJ The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

mg/L as Ca CO₃ milligrams per liter as calcium carbonate

µg/L micrograms per liter

* Hardness calculated using the formula: (2.497 * dissolved Calcium mg/L) + (4.118 * dissolved Magnesium mg/L).

²

Obtained from the EPA National Primary Drinking Water Regulations (May 2009)-<https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations#seven>

¹

Hardness dependent dissolved water quality standard calculated from the equations in the Circular DEQ-7 Montana Numeric Water Quality Standards (June 2019)

Surface Water - Human Health and Ecological Benchmarks
Analytical Results Summary
Site Inspection- June/September 2019
Elkhorn Mining District

Table 6b

Analyte	EPA Maximum Contaminant Levels (MCLs) for Drinking Water (ug/L) ¹	Pathway:	Elkhorn Creek														
		Location:	Elkhorn Creek Tailings														
		Sample ID:	Montana Numeric Water Quality Standards ²		ECT-SW-03-2 Field Sample	Montana Numeric Water Quality Standards ²		ECT-SW-05 Duplicate	Montana Numeric Water Quality Standards ²		ECT-SW-05-2 Duplicate	Montana Numeric Water Quality Standards ²		ECT-SW-04 Field Sample	Montana Numeric Water Quality Standards ²		ECT-SW-04-2 Field Sample
		Type:	Aquatic Life		9/10/19	Aquatic Life		6/3/19	Aquatic Life		9/10/19	Aquatic Life		6/3/19	Aquatic Life		9/10/19
		Sample Date:	Acute	Chronic		Acute	Chronic		Acute	Chronic		Acute	Chronic		Acute	Chronic	
Hardness*		mg/L as CaCO ₃	--		160.76	--		142.25	--		155.56	--		143.41	--		160.92
pH		Standard Units	--		7.79	--		7.97	--		7.97	--		7.57	--		7.2
Dissolved Metals																	
Aluminum	--	µg/L	750	87	20 U	750	87	20 U	750	87	20 U	750	87	20 U	750	87	20 U
Antimony	6	µg/L	--	--	5.8	--	--	7.3	--	--	5.2	--	--	8.3	--	--	6.6
Arsenic	10	µg/L	340	150	7.1	340	150	7.3	340	150	6.7	340	150	8.2	340	150	8.6
Barium	2000	µg/L	--	--	23.3	--	--	20.2	--	--	22	--	--	20.9	--	--	24.3
Beryllium	4	µg/L	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U
Cadmium ¹	5	µg/L	3.0	1.2	10.3	2.7	1.0	10.2	2.9	1.1	9.8	2.7	1.1	9.5	3.0	1.2	8.7
Calcium	--	µg/L	--	--	48300	--	--	44500 J	--	--	46600	--	--	44700 J	--	--	48400
Chromium ¹	100	µg/L	2,660	127	0.66 J	2,406	115	5.1 J	2,589	124	0.57 J	2,422	116	2 U	2,662	127	2 U
Cobalt	--	µg/L	--	--	1.3	--	--	1.2	--	--	1.2	--	--	1.4	--	--	1.4
Copper ¹	1300	µg/L	22	14	3.3	20	13	3 J+	21	14	2.9	20	13	3.4 J+	22	14	2.9
Iron	--	µg/L	--	1,000	160 J	--	1,000	200 U	--	1,000	152 J	--	1,000	200 U	--	1,000	192 J
Lead ¹	15	µg/L	149.4	5.8	13.9	127.9	5.0	8.2 J	143.3	5.6	13.1	129.2	5.0	6.7 J	149.6	5.8	6.8
Magnesium	--	µg/L	--	--	9750	--	--	7560	--	--	9520	--	--	7720	--	--	9730
Manganese	--	µg/L	--	--	28.4	--	--	5.8	--	--	27.5	--	--	11.7	--	--	92.4
Mercury	2	µg/L	1.7	0.91	0.07 J	1.7	0.91	0.2 U	1.7	0.91	0.074 J	1.7	0.91	0.2 U	1.7	0.91	0.2 U
Nickel ¹	--	µg/L	701	78	0.52 J	632	70	1.8	682	76	0.47 J	636	71	1 U	702	78	0.63 J
Potassium	--	µg/L	--	--	2340	--	--	1560	--	--	2240	--	--	1580	--	--	2430 J
Selenium	50	µg/L	20	5	5 U	20	5	5 UJ	20	5	5 U	20	5	5 UJ	20	5	5 U
Silver ¹	--	µg/L	9.18	--	1 U	7.44	--	1 U	8.68	--	0.062 J	7.55	--	1 U	9.20	--	0.091 J
Sodium	--	µg/L	--	--	4170	--	--	3600	--	--	4050	--	--	3860	--	--	4330
Thallium	2	µg/L	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U
Vanadium	--	µg/L	--	--	5 U	--	--	5 U	--	--	5 U	--	--	0.45 J	--	--	5 U
Zinc ¹	--	µg/L	179	179	286	162	162	241	174	174	268	163	163	275	179	179	357

Notes:

-- No Benchmark Established

Bold The analyte was detected above the sample quantitation limit.

Bold The analyte concentration exceeds both Montana Aquatic Life Water Quality Standards and the MCL.

Bold The analyte concentration exceeds both Montana Aquatic Life Water Quality Standards.

Bold The analyte concentration exceeds the 4 Day Average Montana Water Quality Standard.

Bold The analye concentraion exceeds the MCL value

J The associated value is an estimated quantity.

J+ The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential positive bias.

U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

UJ The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

mg/L as Ca CO₃ milligrams per liter as calcium carbonate

µg/L micrograms per liter

* Hardness calculated using the formula: (2.497 * dissolved Calcium mg/L) + (4.118 * dissolved Magnesium mg/L).

² Obtained from the EPA National Primary Drinking Water Regulations (May 2009)-<https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations#seven>

¹ Hardness dependent dissolved water quality standard calculated from the equations in the Circular DEQ-7 Montana Numeric Water Quality Standards (June 2019)

Surface Water - Human Health and Ecological Benchmarks
Analytical Results Summary
Site Inspection- June/September 2019
Elkhorn Mining District

Table 6b

Analyte	EPA Maximum Contaminant Levels (MCLs) for Drinking Water (ugl/L) ¹	Pathway:	Slaughterhouse Gulch																	
		Location:	Union Elkhorn Mine																	
		Sample ID:	Montana Numeric Water Quality Standards ²		UE-SW-BK01 Field Sample	Montana Numeric Water Quality Standards ²		UE-SW-BK01-2 Field Sample	Montana Numeric Water Quality Standards ²		UE-SW-01 Field Sample	Montana Numeric Water Quality Standards ²		UE-SW-01-2 Field Sample	Montana Numeric Water Quality Standards ²		UE-SW-03 Duplicate	Montana Numeric Water Quality Standards ²		UE-SW-03-2 Duplicate
		Type:																		
		Sample Date:	Aquatic Life Acute	Aquatic Life Chronic	6/5/19	Aquatic Life Acute	Aquatic Life Chronic	9/10/19	Aquatic Life Acute	Aquatic Life Chronic	6/5/19	Aquatic Life Acute	Aquatic Life Chronic	9/10/19	Aquatic Life Acute	Aquatic Life Chronic	6/5/19	Aquatic Life Acute	Aquatic Life Chronic	9/10/19
Hardness*		mg/L as CaCO ₃	--		56.96	--		60.05	--		55.71	--		60.59	--		57.08	--		60.26
pH		Standard Units	--		7.89	--		7.97	--		7.61	--		8.1	--		7.61	--		8.1
Dissolved Metals																				
Aluminum	--	µg/L	750	87	20 U	750	87	7.1 J	750	87	20 U	750	87	6.2 J	750	87	20 U	750	87	4.7 J
Antimony	6	µg/L	--	--	2 U	--	--	2 U	--	--	2 U	--	--	2 U	--	--	2 U	--	--	2 U
Arsenic	10	µg/L	340	150	1.7	340	150	1.3	340	150	1.6	340	150	1.6	340	150	1.8	340	150	1.8
Barium	2000	µg/L	--	--	10 U	--	--	6 J	--	--	10 U	--	--	6.1 J	--	--	10 U	--	--	6.1 J
Beryllium	4	µg/L	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U
Cadmium ¹	5	µg/L	1.1	0.5	1 U	1.2	0.5	1 U	1.1	0.5	1 U	1.2	0.5	1 U	1.1	0.5	0.16 J	1.2	0.5	1 U
Calcium	--	µg/L	--	--	19200 J	--	--	19400	--	--	18700 J	--	--	19400	--	--	19200 J	--	--	19500
Chromium ¹	100	µg/L	1,137	54	2 U	1,188	57	2 U	1,117	53	2 U	1,196	57	0.74 J	1,139	54	2 U	1,191	57	2 U
Cobalt	--	µg/L	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U
Copper ¹	1300	µg/L	8	6	2 U	9	6	2 U	8	6	2 U	9	6	2 U	8	6	2 U	9	6	2 U
Iron	--	µg/L	--	1,000	200 U	--	1,000	69.9 J	--	1,000	200 U	--	1,000	60.8 J	--	1,000	200 U	--	1,000	60.8 J
Lead ¹	15	µg/L	39.9	1.6	1 UJ	42.7	1.7	0.12 J	38.8	1.5	1 UJ	43.1	1.7	0.069 J	40.0	1.6	1.2 J	42.8	1.7	1 U
Magnesium	--	µg/L	--	--	2190	--	--	2820	--	--	2190	--	--	2950	--	--	2220	--	--	2810
Manganese	--	µg/L	--	--	1.2 J+	--	--	0.58 U	--	--	1.3 J+	--	--	0.45 J	--	--	1 U	--	--	0.58 U
Mercury	2	µg/L	1.7	0.91	0.2 U	1.7	0.91	0.2 U	1.7	0.91	0.2 U	1.7	0.91	0.055 J	1.7	0.91	0.2 U	1.7	0.91	0.2 U
Nickel ¹	--	µg/L	291	32	1 U	305	34	1 U	286	32	1 U	307	34	1 U	292	32	1 U	306	34	1 U
Potassium	--	µg/L	--	--	503	--	--	695 J	--	--	503	--	--	661	--	--	510	--	--	707 J
Selenium	50	µg/L	20	5	5 UJ	20	5	5 U	20	5	5 UJ	20	5	5 U	20	5	5 UJ	20	5	5 U
Silver ¹	--	µg/L	1.54	--	1 U	1.69	--	1 U	1.48	--	1 U	1.71	--	1 U	1.55	--	1 U	1.70	--	1 U
Sodium	--	µg/L	--	--	1880	--	--	2090	--	--	1910	--	--	2140	--	--	1950	--	--	2060
Thallium	2	µg/L	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U
Vanadium	--	µg/L	--	--	0.57 J	--	--	5 U	--	--	0.49 J	--	--	5 U	--	--	0.53 J	--	--	5 U
Zinc ¹	--	µg/L	74	74	5.7 J+	78	78	9.9 J+	73	73	5.1 J+	78	78	8.2	75	75	9.5 J+	78	78	9.7 J+

Notes:

-- No Benchmark Established

Bold	The analyte was detected above the sample quantitation limit.
Bold	The analyte concentration exceeds both Montana Aquatic Life Water Quality Standards and the MCL.
Bold	The analyte concentration exceeds both Montana Aquatic Life Water Quality Standards.
Bold	The analyte concentration exceeds the 4 Day Average Montana Water Quality Standard.
Bold	The analyte concentraion exceeds the MCL value

J	The associated value is an estimated quantity.
J+	The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential positive bias.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
UJ	The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

mg/L as Ca CO₃ milligrams per liter as calcium carbonate

µg/L micrograms per liter

* Hardness calculated using the formula: (2.497 * dissolved Calcium mg/L) + (4.118 * dissolved Magnesium mg/L).

² Obtained from the EPA National Primary Drinking Water Regulations (May 2009)-<https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations#seven>

¹ Hardness dependent dissolved water quality standard calculated from the equations in the Circular DEQ-7 Montana Numeric Water Quality Standards (June 2019)

Surface Water - Human Health and Ecological Benchmarks
Analytical Results Summary
Site Inspection- June/September 2019
Elkhorn Mining District

Table 6b

Analyte	EPA Maximum Contaminant Levels (MCLs) for Drinking Water (ug/L) ¹	Pathway:	Greyback Guch								
		Location:	Greyback Gulch								
		Sample ID:	Montana Numeric Water Quality Standards ²		GG-SW-01	Montana Numeric Water Quality Standards ²		GG-SW-02	Montana Numeric Water Quality Standards ²		GG-SW-03
		Type:			Field Sample			Field Sample			Field Sample
		Sample Date:	Aquatic Life Acute	Aquatic Life Chronic	9/12/19	Aquatic Life Acute	Aquatic Life Chronic	9/12/19	Aquatic Life Acute	Aquatic Life Chronic	9/12/19
Hardness*		mg/L as CaCO ₃	--		82.06	--		28.43	--		45.19
pH		Standard Units	--		7.41	--		7.66	--		6.34
Dissolved Metals											
Aluminum	--	µg/L	750	87	6.4 J	750	87	15.5 J	750	87	11.9 J
Antimony	6	µg/L	--	--	2 U	--	--	2 U	--	--	2 U
Arsenic	10	µg/L	340	150	2.4	340	150	0.65 J	340	150	1.1
Barium	2000	µg/L	--	--	7.1 J	--	--	5.3 J	--	--	6.1 J
Beryllium	4	µg/L	--	--	1 U	--	--	1 U	--	--	1 U
Cadmium ¹	5	µg/L	1.6	0.7	1 U	0.6	0.3	1 U	0.9	0.4	1 U
Calcium	--	µg/L	--	--	20100	--	--	8020	--	--	11700
Chromium ¹	100	µg/L	1,534	73	2 U	644	31	2 U	941	45	2 U
Cobalt	--	µg/L	--	--	1 U	--	--	1 U	--	--	1 U
Copper ¹	1300	µg/L	12	8	1.8 J	4	3	2 U	7	5	1.1 J
Iron	--	µg/L	--	1,000	67.5 J	--	1,000	68.2 J	--	1,000	67.3 J
Lead ¹	15	µg/L	63.5	2.5	1 U	16.5	0.6	1 U	29.7	1.2	1 U
Magnesium	--	µg/L	--	--	7740	--	--	2040	--	--	3880
Manganese	--	µg/L	--	--	1 U	--	--	1 J+	--	--	1 U
Mercury	2	µg/L	1.7	0.91	0.2 U	1.7	0.91	0.2 U	1.7	0.91	0.2 U
Nickel ¹	--	µg/L	397	44	1 U	162	18	1 U	240	27	1 U
Potassium	--	µg/L	--	--	1430	--	--	1060	--	--	1190
Selenium	50	µg/L	20	5	5 U	20	5	5 U	20	5	5 U
Silver ¹	--	µg/L	2.89	--	1 U	0.47	--	1 U	1.04	--	1 U
Sodium	--	µg/L	--	--	2890	--	--	2720	--	--	2830
Thallium	2	µg/L	--	--	1 U	--	--	1 U	--	--	1 U
Vanadium	--	µg/L	--	--	5 U	--	--	5 U	--	--	5 U
Zinc ¹	--	µg/L	101	101	7.8 J+	41	41	8.3 J+	61	61	6.7 J+

- Notes:
- No Benchmark Established
- Bold**

The analyte was detected above the sample quantitation limit.
- Bold**

The analyte concentration exceeds both Montana Aquatic Life Water Quality Standards and the MCL.
- Bold**

The analyte concentration exceeds both Montana Aquatic Life Water Quality Standards.
- Bold**

The analyte concentration exceeds the 4 Day Average Montana Water Quality Standard.
- Bold**

The analye concentraion exceeds the MCL value
- J

The associated value is an estimated quantity.
- J+

The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential positive bias.
- U

The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
- UJ

The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- mg/L as Ca CO₃

milligrams per liter as calcium carbonate
- µg/L

micrograms per liter
- * Hardness calculated using the formula: (2.497 * dissolved Calcium mg/L) + (4.118 * dissolved Magnesium mg/L).

²

Obtained from the EPA National Primary Drinking Water Regulations (May 2009)-<https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations#seven>
- ¹

Hardness dependent dissolved water quality standard calculated from the equations in the Circular DEQ-7 Montana Numeric Water Quality Standards (June 2019)

Surface Water - Human Health and Ecological Benchmarks
Analytical Results Summary
Site Inspection- June/September 2019
Elkhorn Mining District

Table 6b

Analyte	EPA Maximum Contaminant Levels (MCLs) for Drinking Water (ugl/L) ¹	Pathway:	Turnley Creek																	
		Location:	Trumley Heap Leach																	
		Sample ID:	Montana Numeric Water Quality Standards		THL-SW-BK01 Field Sample	Montana Numeric Water Quality Standards ²		THL-SW-BK01-2 Field Sample	Montana Numeric Water Quality Standards ²		THL-SW-01 Field Sample	Montana Numeric Water Quality Standards ²		THL-SW-01-2 Field Sample	Montana Numeric Water Quality Standards ²		THL-SW-04 Duplicate	Montana Numeric Water Quality Standards ²		THL-SW-02 Field Sample
		Type:																		
		Sample Date:	Aquatic Life Acute	Aquatic Life Chronic	6/4/19	Aquatic Life Acute	Aquatic Life Chronic	9/9/19	Aquatic Life Acute	Aquatic Life Chronic	6/4/19	Aquatic Life Acute	Aquatic Life Chronic	9/9/19	Aquatic Life Acute	Aquatic Life Chronic	6/4/19	Aquatic Life Acute	Aquatic Life Chronic	6/4/19
Hardness*		mg/L as CaCO ₃	--		31.29	--		55.19	--		30.76	--		45.00	--		31.46	--		30.86
pH		Standard Units	--		6.7	--		7.81	--		6.1	--		7.69	--		6.1	--		6.46
Dissolved Metals																				
Aluminum	--	µg/L	750	87	36	750	87	13.4 J	750	87	20 J+	750	87	26.8	750	87	20 U	750	87	21.5 J+
Antimony	6	µg/L	--	--	2 U	--	--	2 U	--	--	2 U	--	--	2 U	--	--	2 U	--	--	2 U
Arsenic	10	µg/L	340	150	1.1	340	150	1.1	340	150	1.1	340	150	1.5	340	150	1.1	340	150	1.1
Barium	2000	µg/L	--	--	10 U	--	--	12	--	--	10 U	--	--	8.5 J	--	--	10 U	--	--	10 U
Beryllium	4	µg/L	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U
Cadmium ¹	5	µg/L	0.6	0.3	1 U	1.1	0.5	1 U	0.6	0.3	1 U	0.9	0.4	1 U	0.6	0.3	1 U	0.6	0.3	1 U
Calcium	--	µg/L	--	--	8920 J	--	--	16200	--	--	8840 J	--	--	12200	--	--	9020 J	--	--	8780 J
Chromium ¹	100	µg/L	696	33	2 U	1,108	53	2 U	687	33	2 U	938	45	1.2 J	699	33	2 U	688	33	2 U
Cobalt	--	µg/L	--	--	1 U	--	--	1 U	--	--	1 U	--	--	0.13 J	--	--	1 U	--	--	1 U
Copper ¹	1300	µg/L	5	3	2 U	8	6	2 U	5	3	2 U	7	5	2.8	5	3	2 U	5	3	2 U
Iron	--	µg/L	--	1,000	200 U	--	1,000	178 J	--	1,000	200 U	--	1,000	238	--	1,000	200 U	--	1,000	200 U
Lead ¹	15	µg/L	18.6	0.7	1 UJ	38.3	1.5	1 U	18.2	0.7	1 UJ	29.5	1.2	1 U	18.7	0.7	1 UJ	18.3	0.7	1 UJ
Magnesium	--	µg/L	--	--	2190	--	--	3580	--	--	2110	--	--	3530	--	--	2170	--	--	2170
Manganese	--	µg/L	--	--	4.7 J+	--	--	10.4	--	--	4.8	--	--	17.7	--	--	5.6	--	--	4.4 J+
Mercury	2	µg/L	1.7	0.91	0.2 U	1.7	0.91	0.2 U	1.7	0.91	0.2 U	1.7	0.91	0.057 J	1.7	0.91	0.2 U	1.7	0.91	0.2 U
Nickel ¹	--	µg/L	176	20	1 U	284	32	1 U	173	19	1 U	239	27	1 U	176	20	1 U	174	19	1 U
Potassium	--	µg/L	--	--	901	--	--	1670 J	--	--	876	--	--	1430	--	--	897	--	--	884
Selenium	50	µg/L	20	5	5 UJ	20	5	5 UJ	20	5	5 UJ	20	5	5 U	20	5	5 UJ	20	5	5 UJ
Silver ¹	--	µg/L	0.55	--	1 U	1.46	--	1 U	0.53	--	1 U	1.03	--	1 U	0.56	--	1 U	0.54	--	1 U
Sodium	--	µg/L	--	--	2720	--	--	3470	--	--	2630	--	--	3010	--	--	2740	--	--	2690
Thallium	2	µg/L	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U
Vanadium	--	µg/L	--	--	1.1 J	--	--	5 U	--	--	0.97 J	--	--	5 U	--	--	0.95 J	--	--	0.97 J
Zinc ¹	--	µg/L	45	45	7.8 J+	72	72	7.5 J+	44	44	5.8 J+	61	61	6.9	45	45	6.7 J+	44	44	4.6 J+

Notes:

-- No Benchmark Established

- Bold** The analyte was detected above the sample quantitation limit.
- Bold** The analyte concentration exceeds both Montana Aquatic Life Water Quality Standards and the MCL.
- Bold** The analyte concentration exceeds both Montana Aquatic Life Water Quality Standards.
- Bold** The analyte concentration exceeds the 4 Day Average Montana Water Quality Standard.
- Bold** The analye concentraion exceeds the MCL value

- J The associated value is an estimated quantity.
- J+ The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential positive bias.
- U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
- UJ The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

mg/L as Ca CO₃ milligrams per liter as calcium carbonate

µg/L micrograms per liter

* Hardness calculated using the formula: (2.497 * dissolved Calcium mg/L) + (4.118 * dissolved Magnesium mg/L).

² Obtained from the EPA National Primary Drinking Water Regulations (May 2009)-<https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations#seven>

¹ Hardness dependent dissolved water quality standard calculated from the equations in the Circular DEQ-7 Montana Numeric Water Quality Standards (June 2019)

Surface Water - Human Health and Ecological Benchmarks
Analytical Results Summary
Site Inspection- June/September 2019
Elkhorn Mining District

Table 6b

Analyte	EPA Maximum Contaminant Levels (MCLs) for Drinking Water (ug/L) ¹	Pathway:	Turnley Creek								
		Location:	Trumley Heap Leach								
		Sample ID:	Montana Numeric Water Quality Standards ²		THL-SW-02-2 Field Sample	Montana Numeric Water Quality Standards ²		THL-SW-03 Field Sample	Montana Numeric Water Quality Standards ²		THL-SW-03-2 Field Sample
		Type:									
		Sample Date:	Aquatic Life Acute	Aquatic Life Chronic	9/9/19	Aquatic Life Acute	Aquatic Life Chronic	6/4/19	Aquatic Life Acute	Aquatic Life Chronic	9/9/19
Hardness*		mg/L as CaCO ₃	--		47.33	--		33.87	--		48.83
pH		Standard Units	--		7.72	--		6.76	--		7.82
Dissolved Metals											
Aluminum	--	µg/L	750	87	20.1	750	87	9.1 J	750	87	21.1
Antimony	6	µg/L	--	--	2 U	--	--	2 U	--	--	2 U
Arsenic	10	µg/L	340	150	1.3	340	150	1.2	340	150	1.6
Barium	2000	µg/L	--	--	9 J	--	--	8.3 J	--	--	9.4 J
Beryllium	4	µg/L	--	--	1 U	--	--	1 U	--	--	1 U
Cadmium ¹	5	µg/L	0.9	0.4	1 U	0.7	0.3	1 U	0.9	0.4	1 U
Calcium	--	µg/L	--	--	13300	--	--	9720	--	--	13700
Chromium ¹	100	µg/L	977	47	2 U	743	36	2 U	1,002	48	2 U
Cobalt	--	µg/L	--	--	0.16 J	--	--	1 U	--	--	0.28 J
Copper ¹	1300	µg/L	7	5	2.6	5	4	2 J+	7	5	3.1
Iron	--	µg/L	--	1,000	272	--	1,000	200 U	--	1,000	275
Lead ¹	15	µg/L	31.5	1.2	1 U	20.6	0.8	1 U	32.8	1.3	1 U
Magnesium	--	µg/L	--	--	3430	--	--	2330	--	--	3550
Manganese	--	µg/L	--	--	21.7	--	--	10.1	--	--	16.3
Mercury	2	µg/L	1.7	0.91	0.2 U	1.7	0.91	0.2 U	1.7	0.91	0.2 U
Nickel ¹	--	µg/L	249	28	1 U	188	21	1 U	256	28	0.46 J
Potassium	--	µg/L	--	--	1680 J	--	--	944	--	--	1910 J
Selenium	50	µg/L	20	5	5 U	20	5	5 UJ	20	5	5 U
Silver ¹	--	µg/L	1.12	--	1 U	0.63	--	1 U	1.18	--	1 U
Sodium	--	µg/L	--	--	3080	--	--	2800	--	--	3200
Thallium	2	µg/L	--	--	1 U	--	--	1 U	--	--	1 U
Vanadium	--	µg/L	--	--	5 U	--	--	0.99 J	--	--	5 U
Zinc ¹	--	µg/L	64	64	11.4 J+	48	48	11.3 J+	65	65	11 J+

Notes:

-- No Benchmark Established

Bold	The analyte was detected above the sample quantitation limit.
Bold	The analyte concentration exceeds both Montana Aquatic Life Water Quality Standards and the MCL.
Bold	The analyte concentration exceeds both Montana Aquatic Life Water Quality Standards.
Bold	The analyte concentration exceeds the 4 Day Average Montana Water Quality Standard.
Bold	The analye concentraion exceeds the MCL value

J The associated value is an estimated quantity.

J+ The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential positive bias.

U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

UJ The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

mg/L as Ca CO₃ milligrams per liter as calcium carbonate

µg/L micrograms per liter

* Hardness calculated using the formula: (2.497 * dissolved Calcium mg/L) + (4.118 * dissolved Magnesium mg/L).

² Obtained from the EPA National Primary Drinking Water Regulations (May 2009)-<https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations#seven>

¹ Hardness dependent dissolved water quality standard calculated from the equations in the Circular DEQ-7 Montana Numeric Water Quality Standards (June 2019)

Surface Water - Human Health and Ecological Benchmarks
Analytical Results Summary
Site Inspection- June/September 2019
Elkhorn Mining District

Table 6b

Analyte	EPA Maximum Contaminant Levels (MCLs) for Drinking Water (ugl/L) ¹	Pathway:	Queen Gulch											
		Location:	Skyline Mine											
		Sample ID:	Montana Numeric Water Quality Standards ²		SM-SW-BK01 Field Sample	Montana Numeric Water Quality Standards ²		SM-SW-01 Field Sample	Montana Numeric Water Quality Standards ²		SM-SW-03 Field Sample	Montana Numeric Water Quality Standards ²		SM-SW-04 Field Sample
		Type:												
		Sample Date:	Aquatic Life Acute	Aquatic Life Chronic	9/11/19	Aquatic Life Acute	Aquatic Life Chronic	9/11/19	Aquatic Life Acute	Aquatic Life Chronic	9/11/19	Aquatic Life Acute	Aquatic Life Chronic	9/11/19
Hardness*		mg/L as CaCO ₃	--		11.61	--		15.19	--		16.43	--		17.22
pH		Standard Units	--		9.78	--		6.97	--		7.09	--		7.34
Dissolved Metals														
Aluminum	--	µg/L	750	87	11.4 J	750	87	13.2 J	750	87	10.1 J	750	87	11.1 J
Antimony	6	µg/L	--	--	2 U	--	--	2 U	--	--	2 U	--	--	2 U
Arsenic	10	µg/L	340	150	1 U	340	150	2.3	340	150	4.9	340	150	4
Barium	2000	µg/L	--	--	1.2 J	--	--	0.94 J	--	--	1.1 J	--	--	2.7 J
Beryllium	4	µg/L	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U
Cadmium ¹	5	µg/L	0.2	0.1	1 U	0.3	0.2	1 U	0.3	0.2	0.12 J	0.3	0.2	1 U
Calcium	--	µg/L	--	--	3320	--	--	4750	--	--	5150	--	--	5400
Chromium ¹	100	µg/L	309	15	2 U	385	18	2 U	411	20	2 U	427	20	2 U
Cobalt	--	µg/L	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U
Copper ¹	1300	µg/L	2	1	1.3 J	2	2	2 U	3	2	2 U	3	2	2 U
Iron	--	µg/L	--	1,000	200 U	--	1,000	200 U	--	1,000	200 U	--	1,000	200 U
Lead ¹	15	µg/L	5.3	0.2	0.079 J	7.4	0.3	0.1 J	8.2	0.3	1 U	8.7	0.3	1 U
Magnesium	--	µg/L	--	--	805	--	--	809	--	--	867	--	--	907
Manganese	--	µg/L	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U
Mercury	2	µg/L	1.7	0.91	0.2 U	1.7	0.91	0.2 U	1.7	0.91	0.2 U	1.7	0.91	0.2 U
Nickel ¹	--	µg/L	76	8	1 U	95	11	1 U	102	11	1 U	106	12	1 U
Potassium	--	µg/L	--	--	175 J	--	--	262 J	--	--	249 J	--	--	254 J
Selenium	50	µg/L	20	5	5 U	20	5	5 U	20	5	5 U	20	5	5 U
Silver ¹	--	µg/L	0.10	--	1 U	0.16	--	1 U	0.18	--	1 U	0.20	--	1 U
Sodium	--	µg/L	--	--	1040	--	--	1500	--	--	1400	--	--	1410
Thallium	2	µg/L	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U
Vanadium	--	µg/L	--	--	5 U	--	--	5 U	--	--	5 U	--	--	5 U
Zinc ¹	--	µg/L	19	19	15.5 J+	24	24	13.6 J+	26	26	18.1 J+	27	27	12.9 J+

Notes:

-- No Benchmark Established

Bold	The analyte was detected above the sample quantitation limit.
Bold	The analyte concentration exceeds both Montana Aquatic Life Water Quality Standards and the MCL.
Bold	The analyte concentration exceeds both Montana Aquatic Life Water Quality Standards.
Bold	The analyte concentration exceeds the 4 Day Average Montana Water Quality Standard.
Bold	The analye concentraion exceeds the MCL value

J	The associated value is an estimated quantity.
J+	The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential positive bias.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
UJ	The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

mg/L as Ca CO₃ milligrams per liter as calcium carbonate

µg/L micrograms per liter

* Hardness calculated using the formula: (2.497 * dissolved Calcium mg/L) + (4.118 * dissolved Magnesium mg/L).

² Obtained from the EPA National Primary Drinking Water Regulations (May 2009)-<https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations#seven>

¹ Hardness dependent dissolved water quality standard calculated from the equations in the Circular DEQ-7 Montana Numeric Water Quality Standards (June 2019)

Surface Water - Human Health and Ecological Benchmarks
Analytical Results Summary
Site Inspection- June/September 2019
Elkhorn Mining District

Table 6b

Analyte	EPA Maximum Contaminant Levels (MCLs) for Drinking Water (ug/L) ¹	Pathway:	Queen Gulch																	
		Location:	Boulaway Mine																	
		Sample ID:	Montana Numeric Water Quality Standards ²		BM-SW-BK01 Field Sample	Montana Numeric Water Quality Standards ²		BM-SW-BK01-2 Field Sample	Montana Numeric Water Quality Standards ²		BM-SW-01 Field Sample	Montana Numeric Water Quality Standards ²		BM-SW-01-2 Field Sample	Montana Numeric Water Quality Standards ²		BM-SW-02 Field Sample	Montana Numeric Water Quality Standards ²		BM-SW-02-2 Field Sample
		Type:	Aquatic Life		6/4/19	Aquatic Life		9/9/19	Aquatic Life		6/4/19	Aquatic Life		9/9/19	Aquatic Life		6/4/19	Aquatic Life		9/9/19
		Sample Date:	Acute	Chronic		Acute	Chronic		Acute	Chronic		Acute	Chronic		Acute	Chronic		Acute	Chronic	
Hardness*		mg/L as CaCO ₃	--		249.36	--		47.44	--		20.40	--		55.89	--		20.46	--		53.56
pH		Standard Units	--		7.26	--		7.85	--		6.96	--		7.75	--		7.24	--		7.58
Dissolved Metals																				
Aluminum	--	µg/L	750	87	20 U	750	87	35.5	750	87	28.1 J+	750	87	26.4	750	87	31.1	750	87	21.3
Antimony	6	µg/L	--	--	2 UJ	--	--	2 U	--	--	2 U	--	--	2 U	--	--	2 U	--	--	2 U
Arsenic	10	µg/L	340	150	0.65 J+	340	150	1.2	340	150	1.3	340	150	1.3	340	150	1.4	340	150	1.3
Barium	2000	µg/L	--	--	46.5	--	--	5.6 J	--	--	10 U	--	--	5.7 J	--	--	10 U	--	--	5.7 J
Beryllium	4	µg/L	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U
Cadmium ¹	5	µg/L	4.6	1.6	1 UJ	0.9	0.4	1 U	0.4	0.2	1 U	1.1	0.5	1 U	0.4	0.2	1 U	1.0	0.5	1 U
Calcium	--	µg/L	--	--	64,900	--	--	14100	--	--	6240 J	--	--	16100	--	--	6230 J	--	--	15300
Chromium ¹	100	µg/L	3,811	182	0.25 J-	979	47	1.1 J	490	23	2 U	1,120	54	0.84 J	492	23	2 U	1,081	52	0.85 J
Cobalt	--	µg/L	--	--	0.09 J+	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U
Copper ¹	1300	µg/L	33	20	0.37 UJ	7	5	2 U	3	2	2 U	8	6	2 U	3	2	2 U	8	5	2 U
Iron	--	µg/L	--	1,000	200 U	--	1,000	66.5 J	--	1,000	200 U	--	1,000	65.4 J	--	1,000	200 U	--	1,000	59 J
Lead ¹	15	µg/L	261.3	10.2	1 U	31.6	1.2	1 U	10.8	0.4	1 UJ	38.9	1.5	1 U	10.8	0.4	1 UJ	36.9	1.4	1 U
Magnesium	--	µg/L	--	--	21,200	--	--	2970	--	--	1170	--	--	3810	--	--	1190	--	--	3730
Manganese	--	µg/L	--	--	0.57 J	--	--	0.75 J	--	--	1 U	--	--	0.8 J	--	--	1 U	--	--	0.67 J
Mercury	2	µg/L	1.7	0.91	0.2 U	1.7	0.91	0.056 J	1.7	0.91	0.2 U	1.7	0.91	0.055 J	1.7	0.91	0.2 U	1.7	0.91	0.056 J
Nickel ¹	--	µg/L	1,016	113	0.2 J-	250	28	1 U	122	14	1 U	287	32	1 U	123	14	1 U	277	31	1 U
Potassium	--	µg/L	--	--	565	--	--	568	--	--	307 J	--	--	595	--	--	304 J	--	--	564
Selenium	50	µg/L	20	5	5 U	20	5	5 U	20	5	5 UJ	20	5	5 U	20	5	5 UJ	20	5	5 U
Silver ¹	--	µg/L	19.54	--	1 U	1.13	--	1 U	0.26	--	1 U	1.49	--	1 U	0.26	--	1 U	1.39	--	1 U
Sodium	--	µg/L	--	--	5,020	--	--	2250	--	--	1350	--	--	2240	--	--	1340	--	--	2060
Thallium	2	µg/L	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U	--	--	1 U
Vanadium	--	µg/L	--	--	0.2 J-	--	--	5 U	--	--	0.64 J	--	--	5 U	--	--	0.75 J	--	--	5 U
Zinc ¹	--	µg/L	260	260	5.3	64	64	7	31	31	4.3 J+	73	73	9.1	31	31	4.5 J+	71	71	8.2

Notes:

-- No Benchmark Established

Bold The analyte was detected above the sample quantitation limit.

Bold The analyte concentration exceeds both Montana Aquatic Life Water Quality Standards and the MCL.

Bold The analyte concentration exceeds both Montana Aquatic Life Water Quality Standards.

Bold The analyte concentration exceeds the 4 Day Average Montana Water Quality Standard.

Bold The analyte concentraion exceeds the MCL value

J The associated value is an estimated quantity.

J+ The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential positive bias.

U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

UJ The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

mg/L as Ca CO₃ milligrams per liter as calcium carbonate
µg/L micrograms per liter

* Hardness calculated using the formula: (2.497 * dissolved Calcium mg/L) + (4.118 * dissolved Magnesium mg/L).
²

² Obtained from the EPA National Primary Drinking Water Regulations (May 2009)-<https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations#seve>

¹ Hardness dependent dissolved water quality standard calculated from the equations in the Circular DEQ-7 Montana Numeric Water Quality Standards (June 2019)

Surface Water - Human Health and Ecological Benchmarks
Analytical Results Summary
Site Inspection- June/September 2019
Elkhorn Mining District

Table 6b

Analyte	EPA Maximum Contaminant Levels (MCLs) for Drinking Water (ugl/L) ¹	Pathway:	South Fork Queen Gulch											
		Location:	Elkhorn Queen Mine											
		Sample ID:	Montana Numeric Water Quality Standards ²			EQ-SW-01 Field Sample	Montana Numeric Water Quality Standards ²			EQ-SW-01-2 Field Sample	Montana Numeric Water Quality Standards ²			EQ-SW-03 Field Sample
		Type:												
		Sample Date:	Aquatic Life Acute	Aquatic Life Chronic		6/4/19	Aquatic Life Acute	Aquatic Life Chronic		9/9/19	Aquatic Life Acute	Aquatic Life Chronic		6/4/19
Hardness*		mg/L as CaCO ₃	--			21.44	--			160.92	--			21.49
pH		Standard Units	--			6.86	--			7.6	--			6.89
Dissolved Metals														
Aluminum	--	µg/L	750	87		34.9	750	87		20 U	750	87		34.6
Antimony	6	µg/L	--	--		2 U	--	--		6.6	--	--		2 U
Arsenic	10	µg/L	340	150		1.6	340	150		8.6	340	150		1.6
Barium	2000	µg/L	--	--		10 U	--	--		24.3	--	--		10 U
Beryllium	4	µg/L	--	--		1 U	--	--		1 U	--	--		1 U
Cadmium ¹	5	µg/L	0.4	0.2		1 U	3.0	1.2		8.7	0.4	0.2		1 U
Calcium	--	µg/L	--	--		6540 J	--	--		48400	--	--		6560 J
Chromium ¹	100	µg/L	511	24		2 U	2,662	127		2 U	512	24		2 U
Cobalt	--	µg/L	--	--		1 U	--	--		1.4	--	--		1 U
Copper ¹	1300	µg/L	3	3		2 U	22	14		2.9	3	3		2 U
Iron	--	µg/L	--	1,000		200 U	--	1,000		192 J	--	1,000		200 U
Lead ¹	15	µg/L	11.5	0.4		1 UJ	149.6	5.8		6.8	11.5	0.4		1 UJ
Magnesium	--	µg/L	--	--		1240	--	--		9730	--	--		1240
Manganese	--	µg/L	--	--		1.2 J+	--	--		92.4	--	--		1 U
Mercury	2	µg/L	1.7	0.91		0.2 U	1.7	0.91		0.2 U	1.7	0.91		0.2 U
Nickel ¹	--	µg/L	127	14		1 U	702	78		0.63 J	128	14		1 U
Potassium	--	µg/L	--	--		315 J	--	--		2430 J	--	--		345 J
Selenium	50	µg/L	20	5		5 UJ	20	5		5 U	20	5		5 UJ
Silver ¹	--	µg/L	0.29	--		1 U	9.20	--		0.091 J	0.29	--		1 U
Sodium	--	µg/L	--	--		1370	--	--		4330	--	--		1410
Thallium	2	µg/L	--	--		1 U	--	--		1 U	--	--		1 U
Vanadium	--	µg/L	--	--		0.74 J	--	--		5 U	--	--		0.75 J
Zinc ¹	--	µg/L	32	32		5.5 J+	179	179		357	33	33		6.4 J+

- Notes:
- No Benchmark Established
- Bold** The analyte was detected above the sample quantitation limit.
- Bold** The analyte concentration exceeds both Montana Aquatic Life Water Quality Standards and the MCL.
- Bold** The analyte concentration exceeds both Montana Aquatic Life Water Quality Standards.
- Bold** The analyte concentration exceeds the 4 Day Average Montana Water Quality Standard.
- Bold** The analye concentraion exceeds the MCL value
- J The associated value is an estimated quantity.
- J+ The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential positive bias.
- U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
- UJ The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- mg/L as Ca CO₃ milligrams per liter as calcium carbonate
- µg/L micrograms per liter
- * Hardness calculated using the formula: (2.497 * dissolved Calcium mg/L) + (4.118 * dissolved Magnesium mg/L).
- ² Obtained from the EPA National Primary Drinking Water Regulations (May 2009)-<https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations#seven>
- ¹ Hardness dependent dissolved water quality standard calculated from the equations in the Circular DEQ-7 Montana Numeric Water Quality Standards (June 2019)

Surface Water - Human Health and Ecological Benchmarks
Analytical Results Summary
Site Inspection- June/September 2019
Elkhorn Mining District

Table 6b

**Equations to Convert Total Recoverable Metals Standard with Hardness Dependence to Dissolved Metals
Standard by Application of a Conversion Factor**

Metals	Acute = exp.{ma[ln(hardness)]+ba}		Chronic = exp.{mc[ln(hardness)]+bc}	
	ma	ba	mc	bc
Cadmium	0.9789	-3.866	0.7977	-3.909
Copper	0.9422	-1.7	0.8545	-1.702
Chromium (III)	0.819	3.7256	0.819	0.6848
Lead	1.273	-1.46	1.273	-4.705
Nickel	0.846	2.255	0.846	0.0584
Silver	1.72	-6.52	NE	NE
Zinc	0.8473	0.884	0.8473	0.884

Notes:

ln – natural logarithm

NE – None Established

If the hardness is <25mg/L as CaCO₃, the number 25 must be used in the calculation.

If the hardness is greater than or equal to 400 mg/L as CaCO₃, 400 mg/L must be used in the calculation.

Sediment - HRS Benchmarks
Analytical Results Summary
Site Inspection- June/September 2019
Elkhorn Mining District

Table 7a

Analyte	Location:	C&D Mine						Elkhorn Creek Tailings					
	Sample ID:	CD-SD-BK01	Three Times	CD-SD-01	CD-SD-BK01-2	Three Times	CD-SD-01-2	ECT-SD-BK01	Three Times	ECT-SD-01	ECT-SD-03	ECT-SD-05	ECT-SD-04
	Type:	Field Sample	Background	Field Sample	Field Sample	Background	Field Sample	Field Sample	Background	Field Sample	Field Sample	Duplicate	Field Sample
	Sample Date:	6/5/2019	Concentration	6/5/2019	9/10/2019	Concentration	9/10/2019	6/3/2019	Concentration	6/3/2019	6/3/2019	6/3/2019	6/3/2019
Total Metals													
Aluminum	mg/kg	12400	37200	12700	20400 J (33864)	101592	16300 J	11300	33,900	8780	1360	1360	2800
Antimony	mg/kg	0.31 J- (0.61)	1.84	0.42 J-	2.6 J (5.2)	15.4	5.7 U	20.9 J (41.4)	124.2	42.3 J	192 J (96.9)	184 J (92.9)	152 J (76.8)
Arsenic	mg/kg	62.7	188.1	47.5	63.3	189.9	19	62.12	186.36	62.8	62.9	62.11	62.10
Barium	mg/kg	35.6	106.8	25.3	63.7 J (254.2)	762.5	38 J	45.4	136.2	60.1 J	10.4	10.6	16.3
Beryllium	mg/kg	0.56 U	--	0.54 U	0.68	2.04	0.35 J	0.65 U	--	0.58 UJ	0.61 U	0.6 U	0.61 U
Cadmium	mg/kg	0.53 J (0.75)	2.25	0.67	1.9	5.7	0.42 J	30.2	90.6	72.9 J	109	119	85.8
Calcium	mg/kg	8530	25590	5170	12,300	36900	4,960	17800	53400	19300	142000	138000	98100
Chromium	mg/kg	32.2 J (41.5)	124.6	12.2 J	49.4 J (63.7)	191.2	82.3 J	10.8 J (13.9)	41.8	8.8 J	1.4 J	1.5 J	2.9 J
Cobalt	mg/kg	5.6 J (7)	21	3.9 J	9.6 J (12)	36	13.4 J	10 J (12.5)	37.5	10.1 J	1.4 J	1.6 J	2.7 J
Copper	mg/kg	33.3 J (40.6)	121.9	17.4 J	38.7	116.1	13.3	276 J (336.7)	1010	1210 J (991.8)	281 J	269 J	276 J
Iron	mg/kg	21100	63300	22000	23,800	71400	22,400	37200	111,600	23700	9620	9440	12700
Lead	mg/kg	70.2 J (101.1)	303.3	65.5 J	198	594	35.5	645 J (928.8)	2786	1320 J	3050 J (2118.1)	2900 J (2013.9)	2370 J
Magnesium	mg/kg	4530	13590	4810	7,520	22560	9,850	7800	23,400	10100	74800	72700	51300
Manganese	mg/kg	368 J (456.3)	1369	422 J	482	1446	355	618 J (766)	2299	631 J	1780 J	1690 J	1780 J
Mercury	mg/kg	0.1 J (0.183)	0.549	0.021 J-	0.27 J (0.49)	1.48	0.0045 J-	8.4	25.2	11.1	2.5	2.1	3.4
Nickel	mg/kg	27.8 J (37.5)	112.6	16.9 J	38 J (51.3)	153.9	73.9 J	10.1 J (13.6)	40.9	10.3 J	4.2 J	4.5 J	4.7 J
Potassium	mg/kg	1910	5730	2550	2,100	6300	2,110	1420	4,260	993	438 J	428 J	590 J
Selenium	mg/kg	0.39 J (0.93)	2.79	0.29 J	4.4 R	--	3.3 R	0.64 J (1.52)	4.6	0.7 J	0.31 J	0.34 J	0.3 J
Silver	mg/kg	2.2 J (3.8)	11.5	2.2 J	2.6	7.8	0.95 U	12.8 J (22.3)	66.8	19.3 J	56.4 J	53.4 J	52.6 J
Sodium	mg/kg	352 J (8951)	26854	234 J	397 J (10096)	30287	161 J	300 J (7629)	22887	283 J	32.6 J	37.2 J	115 J
Thallium	mg/kg	0.56 U	--	0.54 U	3.1 UJ	--	2.4 UJ	0.65 U	--	0.58 UJ	0.61 U	0.6 U	0.61 U
Vanadium	mg/kg	19	57	18.7	41.4 J (55.5)	166.4	40.7 J	24.3	72.9	32.2 J	8.8	9.1	12.7
Zinc	mg/kg	92.6 J (139)	417	108 J	198	594	107	3064 J (4596)	13788	3060 J	3061 J	3063 J	3062 J

Notes:

- No Benchmark Established
- Bold**The analyte was detected above the sample quantitation limit.
- Bold**The analyte concentration exceeds the three time background concentration
- JThe associated value is an estimated quantity.
- J-The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential negative bias.
- UThe material was analyzed for, but
- UJThe analyte was not deemed above the
- RThe data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.
- mg/kgmilligrams per kilogram

Analyte	Location:	Elkhorn Creek Tailings						Union Elkhorn Mine							
	Sample ID:	ECT-SD-BK01-2	Three Times Background Concentration	ECT-SD-01-2	ECT-SD-03-2	ECT-SD-05-2	ECT-SD-04-2	UE-SD-BK01	Three Times Background Concentration	UE-SD-01	UE-SD-03	UE-SD-BK01-2	Three Times Background Concentration	UE-SD-01-2	UE-SD-03-2
	Type:	Field Sample		Field Sample	Field Sample	Duplicate	Field Sample	Field Sample		Field Sample	Duplicate	Field Sample		Field Sample	Duplicate
	Sample Date:	9/10/2019		9/10/2019	9/10/2019	9/10/2019	9/10/2019	9/10/2019		6/5/2019	6/5/2019	6/5/2019		9/10/2019	9/10/2019
Total Metals															
Aluminum	mg/kg	19100 J (31706)	95,118	12600 J	2920 J	2790 J	6290 J	7040	21,120	5210	5020	3,990	11,970	4270 J	7180 J
Antimony	mg/kg	30.5	92	71.8	269	247	330	6.9 UJ	--	2.6 UJ	5.9 J	6.8 UJ	--	8 J	11.9 J
Arsenic	mg/kg	270	810	410	229	207	510	40.1	120.3	40.2	34.4	41.7	125	35	36.2
Barium	mg/kg	63.5 J (253.4)	760.1	43 J	14.8 J	13.8 J	57.4 J	26.1	78	23.6	20.8	20.3 J (81)	243	19.4 J	29.2
Beryllium	mg/kg	0.69 J (0.88)	2.6	0.6 J	0.85 U	0.79 U	0.24 J	0.63 U	--	0.59 U	0.65 U	0.35 J (0.45)	1.34	0.28 J	0.47 J
Cadmium	mg/kg	50.5	152	65	125	139	240	0.86	3	1.7	1.8	0.89 J (1.3)	3.8	2.3 J	4.7 J (3.3)
Calcium	mg/kg	25,600	76,800	22,300	85,900	120,000	122,000	4880	14,640	3650 J	11100 J	4,280	12,840	2480 J	5060 J
Chromium	mg/kg	22 J (28.4)	85.1	14.3 J	4 J	3.9 J	8.3 J	10.5 J (13.6)	40.6	8.4 J	7.3 J	9.2	28	10.2	13.9
Cobalt	mg/kg	20 J (25)	75	8.2 J	2.2 J	2.1 J	9 J	3.2 J (4)	12	3.1 J	2.7 J	2.1 J (2.6)	7.9	3.1 J	3.7 J
Copper	mg/kg	397	1,191	211	339	323	565	20.9 J (25.5)	76.5	29.7 J	22.8 J	12.6 J (15.4)	46.1	26.9 J	28.7 J
Iron	mg/kg	60,100	180,300	39,100	11,300	11,500	30,500	16000	48,000	13000	11100	11300 J (15142)	45,426	9330 J	12400 J
Lead	mg/kg	800	2,400	1780	3940	3880	4870	28.7 J (41.3)	124	147 J (102.1)	396 J (275)	11.5	35	200 J	357 J
Magnesium	mg/kg	12,400	37,200	13,700	47,000	67,200	66,600	2780	8,340	1610	1530	1,740	5,220	1,580	2,450
Manganese	mg/kg	757	2,271	1010	1210	1410	4730	208 J (257.9)	773.8	236 J	260 J	248 J (307.5)	922.6	193 J	212 J
Mercury	mg/kg	9.4 J (17.2)	51.6	171 J (93.4)	4 J	2.4 J	14.3 J	0.12 UJ	--	0.13 UJ	0.11 J	0.12 UJ	--	0.12 UJ	0.016 J-
Nickel	mg/kg	13.3 J (18)	53.9	5.9 J	3.7 J	3.4 J	7.4 J	6 J (8.1)	24.3	7.2 J	8.4 J	4 J (5.4)	16.2	7.2	6.1
Potassium	mg/kg	2,500	7,500	2,280	806 J	789	1,350	1040	3,120	812	693	434 J (7591)	22,772	734	895
Selenium	mg/kg	12.7 R	--	6.4 R	6 R	5.5 R	43.6 R	0.41 J (0.98)	2.93	0.74 J	0.71 J	4 U	--	3.8 U	4.7 U
Silver	mg/kg	14.5	44	21.1	68.1	60.7	107	1.4 J (2.4)	7.3	3.1 J	3.2 J	1.1 UJ	--	4.8 J (2.8)	1.8 J (1.0)
Sodium	mg/kg	444 J (11291)	33873	310 J	854 U	786 U	257 J	55 J (1398.7)	4196	49.4 J	52.8 J	570 U	--	545 U	672 U
Thallium	mg/kg	4.6 UJ	--	4.5 UJ	4.3 UJ	3.9 UJ	31.1 UJ	0.63 U	--	0.59 U	0.65 U	2.8 U	--	2.7 U	3.4 U
Vanadium	mg/kg	47.2 J (63.3)	189.7	39 J	13 J	12.9 J	26.3 J	25.7	77	20.3	16.4	18.6	56	16.3 J	28.9 J
Zinc	mg/kg	2250	6,750	3200	10100	9850	17900	74.4 J (111.6)	334.8	90.6 J	184 J	32.2 J (48.3)	145	130 J	227 J (151.3)

Notes:

- No Benchmark Established
- Bold**The analyte was detected above the sample quantitation limit.
- Bold**The analyte concentration exceeds the three time background concentration
- JThe associated value is an estimated quantity.
- J-The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential negative bias.
- UThe material was analyzed for, but was
- UJThe analyte was not deemed above the
- RThe data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.
- mg/kgmilligrams per kilogram

Sediment - HRS Benchmarks
Analytical Results Summary
Site Inspection- June/September 2019
Elkhorn Mining District

Table 7a

Analyte	Location:	Greyback Gulch				Trumley Heap Leach					
	Sample ID:	GG-SD-01	Three Times Background Concentration	GG-SD-02	GG-SD-03	THL-SD-BK01	Three Times Background Concentration	THL-SD-01	THL-SD-04	THL-SD-02	THL-SD-03
	Type:	Field Sample		Field Sample	Field Sample	Field Sample		Field Sample	Duplicate	Field Sample	Field Sample
	Sample Date:	9/12/2019		9/12/2019	9/12/2019	6/4/2019		6/4/2019	6/4/2019	6/4/2019	6/4/2019
Total Metals											
Aluminum	mg/kg	7480 J (12417)	37,250	3650 J	4290 J	4130	12,390	3330	2450	3780	4050
Antimony	mg/kg	8.1 U	--	7.5 U	7 U	6.6 UJ	--	7 UJ	7.1 UJ	7.2 UJ	6.9 UJ
Arsenic	mg/kg	39.2	118	4.7	99.6	8.6	26	4.9	3.8	5.6	7.9
Barium	mg/kg	37.9 J (151.2)	454	16.4 J	35 J	20	60	14.8	13.6	19.1	15.3
Beryllium	mg/kg	0.27 J (0.35)	1.04	0.63 U	0.23 J	0.59 U	--	0.56 U	0.58 U	0.52 U	0.58 U
Cadmium	mg/kg	0.51 J (0.72)	2.16	0.63 U	0.75	0.59 U	--	0.56 U	0.58 U	0.52 U	0.58 U
Calcium	mg/kg	3,380	10,140	2,290	2,460	1820	5,460	1500	1290	2340	2240
Chromium	mg/kg	25.9 J (33.4)	100.2	24.8 J	15.6 J	8.6 J (11.1)	33.3	5.3 J	4.9 J	6.3 J	5.5 J
Cobalt	mg/kg	8.7 J (10.9)	32.6	3.1 J	8 J	2.4 J (3)	9	1.5 J	1.6 J	2.5 J	1.6 J
Copper	mg/kg	91.2	274	14.3	75.4	14 J (17.1)	51.2	12.3 J	10.8 J	8 J	7.4 J
Iron	mg/kg	14,600	43,800	9,190	11,300	7560	22,680	6770	4310	7360	7340
Lead	mg/kg	9.4	28	5.9	7.7	3.5 J (5)	15.1	3.2 J	2.4 J	2.4 J	2.9 J
Magnesium	mg/kg	4,290	12,870	2,170	2,530	1820	5,460	1520 J	673 J	1550	987
Manganese	mg/kg	468	1,404	148	528	142 J (176.1)	528	195 J	90 J	202 J	285 J
Mercury	mg/kg	0.13 UJ	--	0.12 UJ	0.12 UJ	0.11 UJ	--	0.13 UJ	0.11 UJ	0.11 UJ	0.11 UJ
Nickel	mg/kg	11.4 J (15.4)	46.2	4.5 J	7.1 J	4.8 J (84)	251.9	2.4 J	2.7 J	3.1 J	2.5 J
Potassium	mg/kg	1,710	5,130	702	1,030	921	2,763	697	389 J	580 J	562 J
Selenium	mg/kg	4.7 R	--	4.4 R	4.1 R	0.28 J (0.67)	2	0.25 J	0.22 J	0.23 J	2.9 U
Silver	mg/kg	1.3 U	--	1.3 U	1.2 U	1.1 UJ	--	1.2 UJ	1.2 UJ	1.2 UJ	1.2 UJ
Sodium	mg/kg	135 J (3433)	10299	627 U	585 U	64.4 J (1638)	4913	53.4 J	54.1 J	68.1 J	146 J
Thallium	mg/kg	3.4 UJ	--	3.1 UJ	2.9 UJ	0.59 U	--	0.56 U	0.58 U	0.52 U	0.58 U
Vanadium	mg/kg	33.6 J (45)	135.1	27.9 J	27.5 J	15.9	48	9.2	10.1	13.2	8.7
Zinc	mg/kg	47.4	142	14.7	29.6	18.7 J (28.1)	84.2	14.2 J	8.3 J	15.1 J	14.2 J

Notes:

- No Benchmark Established
- Bold**The analyte was detected above the sample quantitation limit.
- Bold**The analyte concentration exceeds the TEC benchmark.
- JThe associated value is an estimated quantity.
- J-The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential negative bias.
- UThe material was analyzed for, but was
- UJThe analyte was not deemed above the
- RThe data are unusable. The sample
- mg/kgmilligrams per kilogram

Sediment - HRS Benchmarks
Analytical Results Summary
Site Inspection- June/September 2019
Elkhorn Mining District

Table 7a

Analyte	Location:	Trumley Heap Leach					Skyline Mine		
	Sample ID:	THL-SD-BK01-2	Three Times Background Concentration	THL-SD-01-2	THL-SD-02-2	THL-SD-03-2	SM-SD-01	SM-SD-03	SM-SD-04
	Type:	Field Sample		Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
	Sample Date:	9/9/2019		9/9/2019	9/9/2019	9/9/2019	9/11/2019	9/11/2019	9/11/2019
Total Metals									
Aluminum	mg/kg	6,270	18,810	4,460	3,010	7,560	26600 J (44156)	22700 J	15000 J
Antimony	mg/kg	11.1 UJ	--	7.5 UJ	7.7 UJ	9.1 UJ	2.7 J (5.4)	10 U	1.1 J
Arsenic	mg/kg	4	12	11.6	6.2	16.2	253	106	53.6
Barium	mg/kg	37.4	112	16.8 J	17.5 J	67.4	87.5 J (349)	66.6 J	96 J
Beryllium	mg/kg	0.25 J (0.32)	0.96	0.14 J	0.089 J	0.21 J	1.1	0.78 J	0.78
Cadmium	mg/kg	0.92 UJ	--	0.14 J	0.12 J	0.4 J	12.7	4.2	10.8
Calcium	mg/kg	2,800	8,400	2,060	1,520	4,740	11,300	6,910	16,500
Chromium	mg/kg	14	42	13.2	5.9	22.3	70.7 J (91.2)	82.7 J	62.6 J
Cobalt	mg/kg	5.6 J (7)	21	3.6 J	2.1 J	7.6	16.1 J (20.1)	12.6 J	7.2 J
Copper	mg/kg	12.3 J (15)	45	15.7 J	13.8 J	29.3 J	72.7	34.5	46.3
Iron	mg/kg	12900 J (17286)	51,858	9900 J	6030 J	19100 J	26,100	22,400	11,800
Lead	mg/kg	5.7	17	4.8	3	6	307	73.6	83.8
Magnesium	mg/kg	2,120	6,360	2,770	1,050	2,630	6,490	5,830	3,440
Manganese	mg/kg	220 J (272.8)	818	163 J	200 J	807 J	694	401	490
Mercury	mg/kg	0.2 UJ	--	0.12 UJ	0.13 UJ	0.14 UJ	0.12 J (0.220)	0.023 J-	0.9 UJ
Nickel	mg/kg	6.3 J (8.5)	25.5	5.1	2.5 J	5.6 J	34.5 J (46.6)	35.7 J	22.8 J
Potassium	mg/kg	824 J (14412)	43,235	438 J	509 J	1,270	2,520	1,760	2,020
Selenium	mg/kg	6.5 U	--	4.4 U	4.5 U	5.3 U	3.2 R	5.8 R	1.8 J-
Silver	mg/kg	1.8 UJ	--	1.3 UJ	1.3 UJ	1.5 UJ	1.1	1.7 U	0.51 J
Sodium	mg/kg	924 U	--	628 U	642 U	175 J	153 J (3891)	831 U	117 J
Thallium	mg/kg	4.6 U	--	3.1 U	3.2 U	3.8 U	2.3 UJ	4.2 UJ	2.4 UJ
Vanadium	mg/kg	31.3	94	21.9	11.1	44.7	48 J (64.3)	47.3 J	26.8 J
Zinc	mg/kg	31 J (46.5)	139.5	19.4 J	12.7 J	40.7 J	521	280	438

Notes:

-
- No Benchmark Established
- Bold**
- The analyte was detected above the sample quantitation limit.
- Bold**
- The analyte concentration exceeds the three time background concentration
- J
- The associated value is an estimated quantity.
- J-
- The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a J
- U
- The material was
- analyzed for, but
- UJ
- The analyte was not
- deemed above the
- R
- The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality
- mg/kg
- milligrams per kilogram

Sediment - HRS Benchmarks
Analytical Results Summary
Site Inspection- June/September 2019
Elkhorn Mining District

Table 7a

Analyte	Location:	Boulaway Mine								Elkhorn Queen Mine					
	Sample ID:	BM-SD-BK01	Three Times Background Concentration	BM-SD-01	BM-SD-02	BM-SD-BK01-2	Three Times Background Concentration	BM-SD-01-2	BM-SD-02-2	EQ-SD-01	Three Times Background Concentration	EQ-SD-03	EQ-SD-01-2	Three Times Background Concentration	EQ-SD-03-2
	Type:	Field Sample		Field Sample	Field Sample	Field Sample		Field Sample	Field Sample	Field Sample		Field Sample	Field Sample		
	Sample Date:	6/4/2019		6/4/2019	6/4/2019	9/9/2019		9/9/2019	9/9/2019	6/4/2019		6/4/2019	9/9/2019		9/9/2019
Total Metals															
Aluminum	mg/kg	15400	46,200	16300	19200	5680 J (9429)	28,286	5850 J	14400 J	17600	52,800	20,400	24300 J (40338)	121,014	15,600
Antimony	mg/kg	1.1 UJ	--	1.7 UJ	1.7 UJ	6.6 U	--	7.9 U	9.3 U	1.2 UJ	--	1.3 UJ	11.1 U	--	7.2 UJ
Arsenic	mg/kg	25.1	75.3	28.5	46.4	4.9	15	20.1	19.9	40.6	122	41.3	33.2	100	16.1
Barium	mg/kg	60.9 J (243)	729	49.4 J	76.5 J	29.3 J (116.9)	350.7	26.9 J	69.4 J	70.6	212	79.6	83.3 J (332.4)	997	46.3
Beryllium	mg/kg	0.55 UJ	--	0.58 UJ	0.65 UJ	0.22 J (0.28)	0.85	0.29 J	0.51 J	0.59 U	--	0.91 U	0.74 J (0.95)	2.84	0.42 J
Cadmium	mg/kg	0.39 J (0.55)	1.65	0.44 J	0.77 J	0.22 J (0.31)	0.93	0.29 J	0.95	1.1	3	1.1	1	3	0.44 J
Calcium	mg/kg	9680	29,040	9350	11100	4,110	12,330	8,580	7,440	9300	27,900	14200	9,980	29,940	11,600
Chromium	mg/kg	22.4 J (28.9)	86.7	19.1 J	23.8 J	15.4 J (19.9)	59.6	18.9 J	20 J	17.4 J (22.5)	67.3	21.9 J	32.8 J (42.3)	126.9	8.1
Cobalt	mg/kg	8.1 J (10.1)	30.4	7.4 J	9.8 J	4.2 J (5.3)	15.8	10.8 J	6.5 J	8.2 J (10.3)	30.8	11.2 J	10.7 J (13.4)	40.1	8.7
Copper	mg/kg	14.3 J (17.5)	52.3	24.5 J	29.2 J	5.4	16	5.3	33	26.4 J (32.2)	96.6	24 J	31.3	94	7 J
Iron	mg/kg	22200	66,600	22400	25500	6,630	19,890	9,720	13,500	24500	73,500	29000	24,700	74,100	19100 J
Lead	mg/kg	29.6 J (42.6)	127.9	58 J	35.6 J	9.9	30	19.6	25.6	34.6 J (49.8)	149.5	58.3 J	33.8	101	12.5
Magnesium	mg/kg	6820	20,460	7610	7020	2,350	7,050	2,510	4,980	6520	19,560	7200	13,700	41,100	3,480
Manganese	mg/kg	460 J (570.4)	1711	622 J	564 J	306	918	343	435	580 J (719.2)	2158	690 J	668	2,004	386 J
Mercury	mg/kg	0.12 UJ	--	0.033 J-	0.044 J-	0.11 UJ	--	0.12 UJ	0.05 J-	0.037 J- (0.068)	0.203	0.16 UJ	0.018 J- (0.033)	0.099	0.016 J-
Nickel	mg/kg	23.4 J (31.6)	94.8	17.6 J	21.3 J	7 J (9.5)	28.4	14.6 J	11.3 J	16 J (21.6)	64.8	22.9 J	23.2 J (31.3)	94	15.1
Potassium	mg/kg	1550	4,650	1890	2160	1,070	3,210	634 J	1,960	1870	5,610	2190	2,340	7,020	1,450
Selenium	mg/kg	0.42 J (1)	3	0.49 J	0.64 J	3.8 R	--	4.6 R	5.5 R	0.65 J (1.55)	4.6	0.7 J	6.5 R	--	4.2 U
Silver	mg/kg	2 J (3.5)	10.4	2.1 J	2.4 J	1.1 U	--	1.3 U	0.38 J	2.2 J (3.8)	11.5	2.6 J	1.9 U	--	1.2 UJ
Sodium	mg/kg	278 J (7070)	21209	268 J	376 J	548 U	--	659 U	123 J	387 J (9841)	29524	377 J	272 J (6917)	20751	434 J
Thallium	mg/kg	0.55 UJ	--	0.58 UJ	0.65 UJ	2.7 UJ	--	3.3 UJ	3.9 UJ	0.59 U	--	0.91 U	4.6 UJ	--	3 U
Vanadium	mg/kg	29.3 J (39.3)	117.8	20.3 J	30.5 J	12.2 J (16.5)	49	18.9 J	25.3 J	23.8	71	34	51.1 J (68.5)	205.4	45.9
Zinc	mg/kg	70.9 J (106.4)	319.1	96.6 J	183 J	23.5	71	26.2	151	171 J (256.5)	769.5	167 J	166	498	76.1 J

Notes:

-
- No Benchmark Established
- Bold
- The analyte was detected above the sample quantitation limit.
- Bold
- The analyte concentration exceeds the three time background concentration
- J
- The associated value is an estimated quantity.
- J-
- The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential negative bias.
- U
- The material was analyzed for, but
- UJ
- The analyte was not deemed above
- R
- The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.
- mg/kg
- milligrams per kilogram

Analyte	Location:	Sediment		C&D Mine								Elkhorn Creek Tailings							
	Sample ID:	Benchmarks		CD-SD-BK01	CD-SD-BK01-2	CD-SD-01	CD-SD-01-2	ECT-SD-BK01	ECT-SD-BK01-2	ECT-SD-01	ECT-SD-01-2	ECT-SD-03	ECT-SD-03-2	ECT-SD-05	ECT-SD-05-2	ECT-SD-04	ECT-SD-04-2		
	Type:	TEC ⁽¹⁾	PEC ⁽²⁾	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Duplicate	Duplicate	Field Sample	Field Sample		
	Sample Date:			6/5/2019	9/10/2019	6/5/2019	9/10/2019	6/3/2019	9/10/2019	6/3/2019	9/10/2019	6/3/2019	9/10/2019	6/3/2019	9/10/2019	6/3/2019	9/10/2019	6/3/2019	9/10/2019
Total Metals																			
Aluminum	mg/kg	--	--	12400	20400 J	12700	16300 J	11300	19100 J (31706)	8780	12600 J	1360	2920 J	1360	2790 J	2800	6290 J		
Antimony	mg/kg	2	--	0.31 J-	2.6 J	0.42 J-	5.7 U	20.9 J	30.5	42.3 J	71.8	192 J	269	184 J	247	152 J	330		
Arsenic	mg/kg	9.79	33	62.7	63.3	47.5	19	62.12	270	62.8	410	62.9	229	62.11	207	62.10	510		
Barium	mg/kg	--	--	35.6	63.7 J	25.3	38 J	35.4	63.5 J (253.4)	60.1 J	43 J	10.4	14.8 J	10.6	13.8 J	16.3	57.4 J		
Beryllium	mg/kg	--	--	0.56 U	0.68	0.54 U	0.35 J	0.65 U	0.69 J (0.88)	0.58 UJ	0.6 J	0.61 U	0.85 U	0.6 U	0.79 U	0.61 U	0.24 J		
Cadmium	mg/kg	0.99	4.98	0.53 J	1.9	0.67	0.42 J	30.2	50.5	72.9 J	65	109	125	119	139	85.8	240		
Calcium	mg/kg	--	--	8530	12,300	5170	4,960	17800	25,600	19300	22,300	142000	85,900	138000	120,000	98100	122,000		
Chromium	mg/kg	43.4	111	32.2 J	49.4 J	12.2 J	82.3 J	10.8 J	22 J	8.8 J	14.3 J	1.4 J	4 J	1.5 J	3.9 J	2.9 J	8.3 J		
Cobalt	mg/kg	50	149	5.6 J	9.6 J	3.9 J	13.4 J	10 J	20 J	10.1 J	8.2 J	1.4 J	2.2 J	1.6 J	2.1 J	2.7 J	9 J		
Copper	mg/kg	31.6	--	33.3 J	38.7	17.4 J	13.3	276 J	397	1210 J	211	281 J	339	269 J	323	276 J	565		
Iron	mg/kg	20,000	--	21100	23,800	22000	22,400	37200	60,100	23700	39,100	9620	11,300	9440	11,500	12700	30,500		
Lead	mg/kg	35.8	128	70.2 J	198	65.5 J	35.5	645 J	800	1320 J	1780	3050 J	3940	2900 J	3880	2370 J	4870		
Magnesium	mg/kg	--	--	4530	7,520	4810	9,850	7800	12,400	10100	13,700	74800	47,000	72700	67,200	51300	66,600		
Manganese	mg/kg	460	1.06	368 J	482	422 J	355	618 J	757	631 J	1010	1780 J	1210	1690 J	1410	1780 J	4730		
Mercury	mg/kg	0.18	48.6	0.1 J	0.27 J	0.021 J-	0.0045 J-	8.4	9.4 J	11.1	171 J	2.5	4 J	2.1	2.4 J	3.4	14.3 J		
Nickel	mg/kg	22.7	--	27.8 J	38 J	16.9 J	73.9 J	10.1 J	13.3 J	10.3 J	5.9 J	4.2 J	3.7 J	4.5 J	3.4 J	4.7 J	7.4 J		
Potassium	mg/kg	--	--	1910	2,100	2550	2,110	1420	2,500	993	2,280	438 J	806 J	428 J	789	590 J	1,350		
Selenium	mg/kg	2	--	0.39 J	4.4 R	0.29 J	3.3 R	0.64 J	12.7 R	0.7 J	6.4 R	0.31 J	6 R	0.34 J	5.5 R	0.3 J	43.6 R		
Silver	mg/kg	1	--	2.2 J	2.6	2.2 J	0.95 U	12.8 J	14.5	19.3 J	21.1	56.4 J	68.1	53.4 J	60.7	52.6 J	107		
Sodium	mg/kg	--	--	352 J	397 J	234 J	161 J	300 J	444 J (11291)	283 J	310 J	32.6 J	854 U	37.2 J	786 U	115 J	257 J		
Thallium	mg/kg	--	--	0.56 U	3.1 UJ	0.54 U	2.4 UJ	0.65 U	4.6 UJ	0.58 UJ	4.5 UJ	0.61 U	4.3 UJ	0.6 U	3.9 UJ	0.61 U	31.1 UJ		
Vanadium	mg/kg	--	--	19	41.4 J	18.7	40.7 J	24.3	47.2 J (63.3)	32.2 J	39 J	8.8	13 J	9.1	12.9 J	12.7	26.3 J		
Zinc	mg/kg	121	459	92.6 J	198	108 J	107	3064 J	2250	3060 J	3200	3061 J	10100	3063 J	9850	3062 J	17900		

Notes:

- No Benchmark Established
- Bold**The analyte was detected above the sample quantitation limit.
- Bold**The analyte concentration exceeds the PEC benchmark.
- Bold**The analyte concentration exceeds the TEC benchmark.
- Bold**The analyte concentration exceeds both the TEC and PEC benchmarks.
- JThe associated value is an estimated quantity.
- J- The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential negative bias.
- UThe material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
- UJThe analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- RThe data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.
- mg/kgmilligrams per kilogram
- (1)U.S. EPA Region 3 Biological Technical Assistance Group (BTAG) Freshwater Sediment aquatic life benchmarks (U.S. EPA, 2006) as derived in Consensus-based Sediment Quality Guidelines for Freshwater Ecosystems (MacDonald et al., 2000).
- (2)Prediction of sediment toxicity using consensus-based freshwater sediment quality guidelines (EPA, 2000).

Analyte	Location:	Sediment		Union Elkhorn Mine						Greback Gulch			Trumley Heap Leach								
	Sample ID:	Benchmarks		UE-SD-BK01	UE-SD-BK01-2	UE-SD-01	UE-SD-01-2	UE-SD-03	UE-SD-03-2	GG-SD-01	GG-SD-02	GG-SD-03	THL-SD-BK01	THL-SD-BK01-2	THL-SD-01	THL-SD-01-2	THL-SD-04	THL-SD-02	THL-SD-02-2	THL-SD-03	THL-SD-03-2
	Type:	TEC ⁽¹⁾	PEC ⁽²⁾	Field Sample	Field Sample	Field Sample	Field Sample	Duplicate	Duplicate	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Duplicate	Field Sample	Field Sample	Field Sample	Field Sample
	Sample Date:			6/5/2019	9/10/2019	6/5/2019	9/10/2019	6/5/2019	9/10/2019	9/12/2019	9/12/2019	9/12/2019	6/4/2019	9/9/2019	6/4/2019	9/9/2019	6/4/2019	6/4/2019	9/9/2019	6/4/2019	9/9/2019
Total Metals																					
Aluminum	mg/kg	--	--	7040	3,990	5210	4270 J	5020	7180 J	7480 J (12417)	3650 J	4290 J	4130	6,270	3330	4,460	2450	3780	3,010	4050	7,560
Antimony	mg/kg	2	--	6.9 UJ	6.8 UJ	2.6 UJ	8 J	5.9 J	11.9 J	8.1 U	7.5 U	7 U	6.6 UJ	11.1 UJ	7 UJ	7.5 UJ	7.1 UJ	7.2 UJ	7.7 UJ	6.9 UJ	9.1 UJ
Arsenic	mg/kg	9.79	33	40.1	41.7	40.2	35	34.4	36.2	39.2	4.7	99.6	8.6	4	4.9	11.6	3.8	5.6	6.2	7.9	16.2
Barium	mg/kg	--	--	26.1	20.3 J (81)	23.6	19.4 J	20.8	29.2	37.9 J (151.2)	16.4 J	35 J	20	37.4	14.8	16.8 J	13.6	19.1	17.5 J	15.3	67.4
Beryllium	mg/kg	--	--	0.63 U	0.35 J (0.45)	0.59 U	0.28 J	0.65 U	0.47 J	0.27 J (0.35)	0.63 U	0.23 J	0.59 U	0.25 J (0.32)	0.56 U	0.14 J	0.58 U	0.52 U	0.089 J	0.58 U	0.21 J
Cadmium	mg/kg	0.99	4.98	0.86	0.89 J	1.7	2.3 J	1.8	4.7 J	0.51 J	0.63 U	0.75	0.59 U	0.92 UJ	0.56 U	0.14 J	0.58 U	0.52 U	0.12 J	0.58 U	0.4 J
Calcium	mg/kg	--	--	4880	4,280	3650 J	2480 J	11100 J	5060 J	3,380	2,290	2,460	1820	2,800	1500	2,060	1290	2340	1,520	2240	4,740
Chromium	mg/kg	43.4	111	10.5 J	9.2	8.4 J	10.2	7.3 J	13.9	25.9 J	24.8 J	15.6 J	8.6 J	14	5.3 J	13.2	4.9 J	6.3 J	5.9	5.5 J	22.3
Cobalt	mg/kg	50	149	3.2 J	2.1 J	3.1 J	3.1 J	2.7 J	3.7 J	8.7 J	3.1 J	8 J	2.4 J	5.6 J	1.5 J	3.6 J	1.6 J	2.5 J	2.1 J	1.6 J	7.6
Copper	mg/kg	31.6	--	20.9 J	12.6 J	29.7 J	26.9 J	22.8 J	28.7 J	91.2	14.3	75.4	14 J	12.3 J	12.3 J	15.7 J	10.8 J	8 J	13.8 J	7.4 J	29.3 J
Iron	mg/kg	20,000	--	16000	11300 J	13000	9330 J	11100	12400 J	14,600	9,190	11,300	7560	12900 J	6770	9900 J	4310	7360	6030 J	7340	19100 J
Lead	mg/kg	35.8	128	28.7 J	11.5	147 J	200 J	396 J	357 J	9.4	5.9	7.7	3.5 J	5.7	3.2 J	4.8	2.4 J	2.4 J	3	2.9 J	6
Magnesium	mg/kg	--	--	2780	1,740	1610	1,580	1530	2,450	4,290	2,170	2,530	1820	2,120	1520 J	2,770	673 J	1550	1,050	987	2,630
Manganese	mg/kg	460	1.06	208 J	248 J	236 J	193 J	260 J	212 J	468	148	528	142 J	220 J	195 J	163 J	90 J	202 J	200 J	285 J	807 J
Mercury	mg/kg	0.18	48.6	0.12 UJ	0.12 UJ	0.13 UJ	0.12 UJ	0.11 J	0.016 J-	0.13 UJ	0.12 UJ	0.12 UJ	0.11 UJ	0.2 UJ	0.13 UJ	0.12 UJ	0.11 UJ	0.11 UJ	0.13 UJ	0.11 UJ	0.14 UJ
Nickel	mg/kg	22.7	--	6 J	4 J	7.2 J	7.2	8.4 J	6.1	11.4 J	4.5 J	7.1 J	4.8 J	6.3 J	2.4 J	5.1	2.7 J	3.1 J	2.5 J	2.5 J	5.6 J
Potassium	mg/kg	--	--	1040	434 J (7591)	812	734	693	895	1,710	702	1,030	921	824 J (14412)	697	438 J	389 J	580 J	509 J	562 J	1,270
Selenium	mg/kg	2	--	0.41 J	4 U	0.74 J	3.8 U	0.71 J	4.7 U	4.7 R	4.4 R	4.1 R	0.28 J	6.5 U	0.25 J	4.4 U	0.22 J	0.23 J	4.5 U	2.9 U	5.3 U
Silver	mg/kg	1	--	1.4 J	1.1 UJ	3.1 J	4.8 J	3.2 J	1.8 J	1.3 U	1.3 U	1.2 U	1.1 UJ	1.8 UJ	1.2 UJ	1.3 UJ	1.2 UJ	1.2 UJ	1.3 UJ	1.2 UJ	1.5 UJ
Sodium	mg/kg	--	--	55 J	570 U	49.4 J	545 U	52.8 J	672 U	135 J (3433)	627 U	585 U	64.4 J	924 U	53.4 J	628 U	54.1 J	68.1 J	642 U	146 J	175 J
Thallium	mg/kg	--	--	0.63 U	2.8 U	0.59 U	2.7 U	0.65 U	3.4 U	3.4 UJ	3.1 UJ	2.9 UJ	0.59 U	4.6 U	0.56 U	3.1 U	0.58 U	0.52 U	3.2 U	0.58 U	3.8 U
Vanadium	mg/kg	--	--	25.7	18.6	20.3	16.3 J	16.4	28.9 J	33.6 J (45)	27.9 J	27.5 J	15.9	31.3	9.2	21.9	10.1	13.2	11.1	8.7	44.7
Zinc	mg/kg	121	459	74.4 J	32.2 J	90.6 J	130 J	184 J	227 J	47.4	14.7	29.6	18.7 J	31 J	14.2 J	19.4 J	8.3 J	15.1 J	12.7 J	14.2 J	40.7 J

- Notes:
- No Benchmark Established
 - Bold** The analyte was detected above the sample quantitation limit.
 - Bold** The analyte concentration exceeds the PEC benchmark.
 - Bold** The analyte concentration exceeds the TEC benchmark.
 - Bold** The analyte concentration exceeds both the TEC and PEC benchmarks.
 - J The associated value is an estimated quantity.
 - J- The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential negative bias.
 - U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
 - UJ The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
 - R The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.
 - mg/kg milligrams per kilogram
 - (1) U.S. EPA Region 3 Biological Technical Assistance Group (BTAG) Freshwater Sediment aquatic life benchmarks (U.S. EPA, 2006) as derived in Consensus-based Sediment Quality Guidelines for Freshwater Ecosystems (MacDonald et al., 2000).
 - (2) Prediction of sediment toxicity using consensus-based freshwater sediment quality guidelines (EPA, 2000).

Analyte	Location:	Sediment		Skyline Mine			Boulaway Mine						Elkhorn Queen			
	Sample ID:	Benchmarks		SM-SD-01	SM-SD-03	SM-SD-04	BM-SD-BK01	BM-SD-BK01-2	BM-SD-01	BM-SD-01-2	BM-SD-02	BM-SD-02-2	EQ-SD-01	EQ-SD-01-2	EQ-SD-03	EQ-SD-03-2
	Type:	TEC ⁽¹⁾	PEC ⁽²⁾	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
	Sample Date:			9/11/2019	9/11/2019	9/11/2019	6/4/2019	9/9/2019	6/4/2019	9/9/2019	6/4/2019	9/9/2019	6/4/2019	9/9/2019	6/4/2019	9/9/2019
Total Metals																
Aluminum	mg/kg	--	--	26600 J (44156)	22700 J	15000 J	15400	5680 J (9429)	16300	5850 J	19200	14400 J	17600	24300 J (40338)	20400	15,600
Antimony	mg/kg	2	--	2.7 J	10 U	1.1 J	1.1 UJ	6.6 U	1.7 UJ	7.9 U	1.7 UJ	9.3 U	1.2 UJ	11.1 U	1.3 UJ	7.2 UJ
Arsenic	mg/kg	9.79	33	253	106	53.6	25.1	4.9	28.5	20.1	46.4	19.9	40.6	33.2	41.3	16.1
Barium	mg/kg	--	--	87.5 J (349)	66.6 J	96 J	60.9 J	29.3 J (116.9)	49.4 J	26.9 J	76.5 J	69.4 J	70.6	83.3 J (332.4)	79.6	46.3
Beryllium	mg/kg	--	--	1.1	0.78 J	0.78	0.55 UJ	0.22 J (0.28)	0.58 UJ	0.29 J	0.65 UJ	0.51 J	0.59 U	0.74 J (0.95)	0.91 U	0.42 J
Cadmium	mg/kg	0.99	4.98	12.7	4.2	10.8	0.39 J	0.22 J	0.44 J	0.29 J	0.77 J	0.95	1.1	1	1.1	0.44 J
Calcium	mg/kg	--	--	11,300	6,910	16,500	9680	4,110	9350	8,580	11100	7,440	9300	9,980	14200	11,600
Chromium	mg/kg	43.4	111	70.7 J	82.7 J	62.6 J	22.4 J	15.4 J	19.1 J	18.9 J	23.8 J	20 J	17.4 J	32.8 J	21.9 J	8.1
Cobalt	mg/kg	50	149	16.1 J	12.6 J	7.2 J	8.1 J	4.2 J	7.4 J	10.8 J	9.8 J	6.5 J	8.2 J	10.7 J	11.2 J	8.7
Copper	mg/kg	31.6	--	72.7	34.5	46.3	14.3 J	5.4	24.5 J	5.3	29.2 J	33	26.4 J	31.3	24 J	7 J
Iron	mg/kg	20,000	--	26,100	22,400	11,800	22200	6,630	22400	9,720	25500	13,500	24500	24,700	29000	19100 J
Lead	mg/kg	35.8	128	307	73.6	83.8	29.6 J	9.9	58 J	19.6	35.6 J	25.6	34.6 J	33.8	58.3 J	12.5
Magnesium	mg/kg	--	--	6,490	5,830	3,440	6820	2,350	7610	2,510	7020	4,980	6520	13,700	7200	3,480
Manganese	mg/kg	460	1.06	694	401	490	460 J	306	622 J	343	564 J	435	580 J	668	690 J	386 J
Mercury	mg/kg	0.18	48.6	0.12 J	0.023 J-	0.9 UJ	0.12 UJ	0.11 UJ	0.033 J-	0.12 UJ	0.044 J-	0.05 J-	0.037 J-	0.018 J-	0.16 UJ	0.016 J-
Nickel	mg/kg	22.7	--	34.5 J	35.7 J	22.8 J	23.4 J	7 J	17.6 J	14.6 J	21.3 J	11.3 J	16 J	23.2 J	22.9 J	15.1
Potassium	mg/kg	--	--	2,520	1,760	2,020	1550	1,070	1890	634 J	2160	1,960	1870	2,340	2190	1,450
Selenium	mg/kg	2	--	3.2 R	5.8 R	1.8 J-	0.42 J	3.8 R	0.49 J	4.6 R	0.64 J	5.5 R	0.65 J	6.5 R	0.7 J	4.2 U
Silver	mg/kg	1	--	1.1	1.7 U	0.51 J	2 J	1.1 U	2.1 J	1.3 U	2.4 J	0.38 J	2.2 J	1.9 U	2.6 J	1.2 UJ
Sodium	mg/kg	--	--	153 J (3891)	831 U	117 J	278 J	548 U	268 J	659 U	376 J	123 J	387 J	272 J (6917)	377 J	434 J
Thallium	mg/kg	--	--	2.3 UJ	4.2 UJ	2.4 UJ	0.55 UJ	2.7 UJ	0.58 UJ	3.3 UJ	0.65 UJ	3.9 UJ	0.59 U	4.6 UJ	0.91 U	3 U
Vanadium	mg/kg	--	--	48 J (64.3)	47.3 J	26.8 J	29.3 J	12.2 J (16.5)	20.3 J	18.9 J	30.5 J	25.3 J	23.8	51.1 J (68.5)	34	45.9
Zinc	mg/kg	121	459	521	280	438	70.9 J	23.5	96.6 J	26.2	183 J	151	171 J	166	167 J	76.1 J

- Notes:
- No Benchmark Established
 - Bold** The analyte was detected above the sample quantitation limit.
 - Bold** The analyte concentration exceeds the PEC benchmark.
 - Bold** The analyte concentration exceeds the TEC benchmark.
 - Bold** The analyte concentration exceeds both the TEC and PEC benchmarks.
 - J The associated value is an estimated quantity.
 - J- The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may have a potential negative bias.
 - U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
 - UJ The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
 - R The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.
 - mg/kg milligrams per kilogram
- (1) U.S. EPA Region 3 Biological Technical Assistance Group (BTAG) Freshwater Sediment aquatic life benchmarks (U.S. EPA, 2006) as derived in Consensus-based Sediment Quality Guidelines for Freshwater Ecosystems (MacDonald et al., 2000).
- (2) Prediction of sediment toxicity using consensus-based freshwater sediment quality guidelines (EPA, 2000).

C & D Mine
XRF Field Screening Results Summary
Site Inspection- June 2019
Elkhorn Mining District

Table 8a

Analyte	Location:	C&D Mine																			
	Sample ID:	CD-SO-BK01					CD-WR-01/02					CD-WR-03/04					CD-WR-05/06				
	Reading #	23	24*	25	26	27	35	36*	37	38	39	2	3	4	5	6*	7	8*	9	10	11
	Date	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019
Copper	mg/kg	<LOD	35	36	<LOD	<LOD	1,681	914	983	1,230	1,999	91	<LOD	86	37	112	622	695	607	4,773	515
(+/-) Error	mg/kg	23	7	5	262	137	83	107	87	106	273	25	85	13	12	15	51	37	33	170	29
Zinc	mg/kg	155	165	112	<LOD	204	585	933	1,037	871	788	259	503	444	204	595	5,079	5,194	5,106	4,119	4,618
(+/-) Error	mg/kg	10	9	6	130	26	43	90	78	78	140	29	49	20	15	25	168	118	110	141	97
Arsenic	mg/kg	<LOD	<LOD	20	71	44	21,808	26,595	64,078	56,199	18,872	233	193	221	93	444	1,106	1,275	928	28,527	946
(+/-) Error	mg/kg	16	17	4	18	11	548	1,259	2,183	2,155	1,570	32	30	13	10	22	72	58	49	733	42
Mercury	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
(+/-) Error	mg/kg	20	16	12	71	42	130	249	263	269	372	46	72	29	28	34	79	57	50	163	42
Lead	mg/kg	106	224	97	106	163	3,039	926	4,132	2,696	737	813	397	359	174	1,074	4,918	6,408	5,710	2,746	4,286
(+/-) Error	mg/kg	7	9	5	18	13	99	76	171	135	112	45	36	15	11	30	153	132	113	96	84

Notes:
*Discrete Sample collected
BOLD - Analyte detected above the instrument detection limit
Des. - Description
ID - Identification
< - less than
LOD - Limit of Detection
mg/kg - milligrams per kilogram
ND - Non detect
NR - Not Reported

C & D Mine
XRF Field Screening Results Summary
Site Inspection- June 2019
Elkhorn Mining District

Table 8a

Analyte	Location:	C&D Mine																			
	Sample ID:	CD-WR-07/08					CD-WR-09/10														
	Reading #	12	13	14*	15	16	2	3	4	5	6	7	8	9	10*	11	12	13	14	15	16
	Date	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019
Copper	mg/kg	1,081	3,598	1,308	790	679	612	507	1,261	637	2,561	1,697	488	631	3,776	579	765	779	857	837	719
(+/-) Error	mg/kg	72	130	74	47	40	12	11	23	14	39	28	12	16	47	12	14	18	19	17	17
Zinc	mg/kg	1,027	1,892	965	1,209	908	4,303	2,566	1,419	511	1,365	1,270	559	677	1,460	492	551	723	780	709	1,162
(+/-) Error	mg/kg	60	77	55	51	40	34	25	22	11	24	21	11	14	23	9	10	15	15	13	19
Arsenic	mg/kg	12,384	13,708	20,035	14,422	11,599	1,329	4,408	8,319	8,482	16,880	19,145	7,563	17,670	13,215	2,932	4,386	21,656	16,783	12,495	9,282
(+/-) Error	mg/kg	364	344	524	316	236	19	33	70	60	146	156	56	137	114	23	33	164	131	91	76
Mercury	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
(+/-) Error	mg/kg	130	109	140	96	86	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/kg	10,236	8,896	16,287	5,707	5,462	5,168	2,657	3,100	688	2,470	4,881	4,497	4,419	15,976	1,514	2,066	4,557	7,440	5,128	5,967
(+/-) Error	mg/kg	306	233	431	140	123	36	23	33	11	30	49	37	43	134	16	20	43	65	43	53

Notes:
*Discrete Sample collected
BOLD - Analyte detected above the instrument detection limit
Des. - Description
ID - Identification
< - less than
LOD - Limit of Detection
mg/kg - milligrams per kilogram
ND - Non detect
NR - Not Reported

C & D Mine
XRF Field Screening Results Summary
Site Inspection- June 2019
Elkhorn Mining District

Table 8a

Analyte	Location:	C&D Mine				
	Sample ID:	CD-WR-11/12 - 13/14				
	Reading #	28	29*	30	31	32
	Date	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019
Copper	mg/kg	157	11,858	122	378	3,440
(+/-) Error	mg/kg	17	656	13	49	121
Zinc	mg/kg	461	17,360	501	2,868	6,899
(+/-) Error	mg/kg	21	895	19	128	191
Arsenic	mg/kg	103	10,790	136	1,160	4,970
(+/-) Error	mg/kg	9	559	9	60	137
Mercury	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD
(+/-) Error	mg/kg	28	200	23	79	78
Lead	mg/kg	129	8,355	168	1,015	4,956
(+/-) Error	mg/kg	10	436	9	55	136

Notes:
*Discrete Sample collected
BOLD - Analyte detected above the instrument detection limit
Des. - Description
ID - Identification
< - less than
LOD - Limit of Detection
mg/kg - milligrams per kilogram
ND - Non detect
NR - Not Reported

Elkhorn Creek Tailings
XRF Field Screening Results Summary
Site Inspection- June 2019
Elkhorn Mining District

Table 8b

Analyte	In-Situ Desc./ Sample ID	Elkhorn Creek Tailings																			
		ECT-SO-BK01					ECT-WR-01/02														
	Reading #	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61*	62	63	64	65
	Date	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019
Copper	mg/kg	118	104	80	92	107	<LOD	324	322	290	399	<LOD	348	548	438	584	733	3,519	529	<LOD	512
(+/-) Error	mg/kg	14	16	12	12	11	518	41	21	23	23	311	27	30	26	31	36	203	34	276	29
Zinc	mg/kg	693	842	1,204	1,040	948	11,478	9,109	10,309	7,659	12,499	15,556	12,412	16,258	14,103	14,918	18,709	18,138	13,851	14,852	15,612
(+/-) Error	mg/kg	24	24	34	28	25	827	284	164	145	196	716	235	276	229	261	325	720	276	568	262
Arsenic	mg/kg	49	49	56	85	53	<LOD	150	313	<LOD	273	360	165	273	334	331	503	527	355	509	278
(+/-) Error	mg/kg	8	8	11	10	9	384	50	29	98	33	92	41	41	37	40	48	89	44	78	40
Mercury	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
(+/-) Error	mg/kg	25	28	27	23	22	208	75	37	42	44	129	49	53	44	52	58	121	54	94	50
Lead	mg/kg	172	235	449	385	405	4,877	3,172	3,263	3,624	4,489	5,221	4,925	5,603	5,081	5,112	7,096	6,374	4,812	5,317	5,650
(+/-) Error	mg/kg	10	14	16	14	13	362	110	59	73	77	252	100	103	90	97	131	262	104	212	102

Notes:
*Discrete Sample collected
BOLD - Analyte detected above the instrument detection limit
Des. - Description
ID - Identification
< - less than
LOD - Limit of Detection
mg/kg - milligrams per kilogram
ND - Non detect
NR - Not Reported

Elkhorn Creek Tailings
XRF Field Screening Results Summary
Site Inspection- June 2019
Elkhorn Mining District

Table 8b

Elkhorn Creek Tailings																									
ECT-WR-05/06																									
2	3	4	6	8	9	10	11	12	13	14	15	16	17*	18	19	20	21	22	23	24	25	26	28	29	30
6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019
247	184	196	255	177	148	175	212	261	178	263	201	174	384	289	202	392	394	185	242	224	186	161	173	182	151
8	27	7	8	6	6	6	7	8	6	8	8	7	10	8	7	10	10	6	7	7	6	6	6	7	6
8,483	7,895	9,869	9,513	7,758	8,242	7,525	8,317	9,577	8,924	12,321	9,449	7,807	13,645	10,305	8,485	15,151	13,299	8,273	9,018	7,453	6,819	7,290	9,332	10,158	7,835
58	52	65	61	49	51	48	52	63	55	74	66	54	86	65	56	96	90	52	57	49	45	47	58	66	49
165	98	108	186	84	83	60	97	172	72	177	81	120	231	122	67	71	213	49	116	77	58	81	62	91	67
10	9	10	12	8	8	8	9	10	9	9	11	10	14	12	8	13	15	7	8	8	8	7	8	8	8
ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	14	ND	ND	ND	ND	ND	ND
NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	3	NR	NR	NR	NR	NR	NR
2,051	1,787	1,870	2,887	1,434	1,389	1,646	1,702	1,892	1,827	1,778	2,120	1,832	3,886	3,404	1,484	3,421	3,701	1,155	1,377	1,266	1,308	1,191	1,504	1,411	1,455
19	16	17	23	13	13	15	15	17	16	16	19	17	29	25	14	27	30	12	13	13	13	12	14	14	13

Notes:

*Discrete Sample collected

BOLD - Analyte detected above the instrument detection limit

Des. - Description

ID - Identification

< - less than

LOD - Limit of Detection

mg/kg - milligrams per kilogram

ND - Non detect

NR - Not Reported

Elkhorn Creek Tailings
XRF Field Screening Results Summary
Site Inspection- June 2019
Elkhorn Mining District

Table 8b

Elkhorn Creek Tailings																
ECT-WR-03/04*															Roadside	ECT-SO-
31	32	33	34	35	36	37	38	39	40*	41	42	43	44	46	47	48
6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019
453	1,325	1,033	417	432	790	764	479	700	1,812	2,292	1,535	584	1,124	699	370	2,678
12	18	17	9	10	14	14	9	13	25	29	22	12	18	13	10	34
13,479	21,543	30,588	9,009	12,678	25,565	25,608	15,205	22,782	46,615	54,733	35,028	1,511	29,326	22,156	8,923	66,690
96	132	192	58	82	155	158	84	137	311	363	229	97	189	132	65	473
182	369	312	218	209	408	271	150	147	583	586	676	259	337	334	189	539
16	24	19	12	14	20	20	13	18	32	22	32	16	24	18	13	25
17	ND	50	25	25	60	28	27	49	108	119	109	46	29	42	31	173
5	NR	6	4	5	6	6	4	6	10	9	9	5	7	6	5	10
4,390	11,134	6,155	3,217	3,986	7,365	7,520	4,617	6,740	15,673	6,756	16,918	4,887	9,467	6,444	2,649	7,954
36	71	45	24	30	50	52	29	45	110	52	114	36	66	43	24	65

Notes:

*Discrete Sample collected

BOLD - Analyte detected above the instrument detection limit

Des. - Description

ID - Identification

< - less than

LOD - Limit of Detection

mg/kg - milligrams per kilogram

ND - Non detect

NR - Not Reported

Union Elkhorn Mine
XRF Field Screening Results Summary
Site Inspection- June 2019
Elkhorn Mining District

Table 8c

Analyte	Location:	Union Elkhorn																									
	Sample ID:	UE-WR-01/02					UE-WR-03/04					UE-WR-05/06 - 07/08															
	Reading #	22	23	24	26	27	17	18	19	20*	21	28	29	30	31	32	33	34	35*	36	37	38	39	40	41	42	
	Date	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019	
Copper	mg/kg	2,076	1,950	1,314	1,898	1,058	383	737	678	672	729	645	<LOD	1,441	254	137	217	537	401	796	205	559	422	567	695	278	
(+/-) Error	mg/kg	60	96	66	89	91	25	41	33	37	47	28	380	92	34	19	17	35	126	43	25	45	57	41	42	34	
Zinc	mg/kg	16,557	19,603	25,620	10,381	7,945	5,207	10,778	5,675	6,371	9,536	2,455	2,435	14,495	3,073	2,329	1,146	2,999	18,229	13,210	3,433	5,376	6,454	4,956	6,536	2,399	
(+/-) Error	mg/kg	277	553	597	292	333	103	231	114	140	237	54	322	488	110	62	33	83	786	277	95	160	265	138	161	87	
Arsenic	mg/kg	1,905	486	455	988	678	637	740	831	1,048	510	468	445	358	164	468	144	654	789	400	409	314	401	369	534	344	
(+/-) Error	mg/kg	70	91	75	93	108	39	63	55	73	60	37	120	81	43	23	21	56	173	52	38	63	75	44	61	42	
Mercury	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
(+/-) Error	mg/kg	65	95	87	92	111	44	60	53	70	65	38	222	105	61	36	27	52	168	61	45	74	104	59	64	60	
Lead	mg/kg	12,874	10,904	10,057	11,516	8,127	4,504	8,839	8,738	12,595	6,371	5,359	1,265	6,622	2,529	891	1,638	6,713	21,900	6,268	2,637	6,243	4,353	3,263	7,527	2,423	
(+/-) Error	mg/kg	213	312	244	308	324	85	185	156	243	159	90	181	232	86	29	36	148	921	137	71	171	179	92	172	79	

Notes:

*Discrete Sample collected

BOLD - Analyte detected above the instrument detection limit

Des. - Description

ID - Identification

< - less than

LOD - Limit of Detection

mg/kg - milligrams per kilogram

ND - Non detect

Union Elkhorn Mine
XRF Field Screening Results Summary
Site Inspection- June 2019
Elkhorn Mining District

Table 8c

Union Elkhorn				
UE-SO-BK01				
43	44	45*	46	47
6/5/2019	6/5/2019	6/5/2019	6/5/2019	6/5/2019
32	<LOD	90	<LOD	66
8	69	11	39	8
125	211	358	178	169
9	26	16	17	9
55	58	131	95	45
5	12	8	10	4
<LOD	<LOD	<LOD	<LOD	<LOD
18	61	21	38	15
69	86	143	76	53
6	15	9	10	5

Notes:
*Discrete Sample collected
BOLD - Analyte detected above the instrument detection limit
Des. - Description
ID - Identification
< - less than
LOD - Limit of Detection
mg/kg - milligrams per kilogram
ND - Non detect

Trumley Heap Leach
XRF Field Screening Results Summary
Site Inspection- June 2019
Elkhorn Mining District

Table 8d

Analyte	Location:	Trumley Heap Leach																				
	Sample ID:	THL-WR-01/02																				
	Reading #	2	3	4	5	6	7	8	9	10	11	12*	13	14	15	16	17	18	19	20	21	22
	Date	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019
Copper	mg/kg	<LOD	70	43	26	<LOD	53	99	49	72	73	146	<LOD	22	45	66	98	<LOD	<LOD	50	<LOD	<LOD
(+/-) Error	mg/kg	39	13	10	7	42	14	15	11	15	12	18	77	7	9	11	25	39	33	15	21	39
Zinc	mg/kg	122	110	632	186	240	548	1,545	367	662	1,827	5,497	129	443	1,291	1,175	2,519	137	214	166	142	237
(+/-) Error	mg/kg	14	11	22	10	19	25	44	18	29	44	112	25	16	30	32	103	14	15	17	9	18
Arsenic	mg/kg	21	29	44	<LOD	<LOD	448	56	26	61	71	219	<LOD	17	22	32	120	<LOD	3	<LOD	15	<LOD
(+/-) Error	mg/kg	6	8	10	19	12	17	12	7	9	13	24	25	5	6	8	27	16	5	16	3	17
Mercury	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
(+/-) Error	mg/kg	36	27	24	37	37	35	27	27	29	28	36	69	18	21	25	46	28	23	31	19	33
Lead	mg/kg	27	174	382	57	162	165	412	133	163	573	1,636	<LOD	103	197	269	754	44	46	36	24	50
(+/-) Error	mg/kg	7	11	14	9	14	12	18	10	12	19	41	35	7	9	12	41	8	7	8	4	8

Notes:

*Discrete Sample collected

BOLD - Analyte detected above the instrument detection limit

Des. - Description

ID - Identification

< - less than

LOD - Limit of Detection

mg/kg - milligrams per kilogram

ND - Non detect

Boulaway Mine
XRF Field Screening Results Summary
Site Inspection- June 2019
Elkhorn Mining District

Table 8e

Analyte	In-Situ Desc./ Sample ID	Boulaway Mine																									
		BM-WR-01/02			BM-WR-03/04		BM-WR-05/06					BM-WR-07/08		BM-WR-11/12	BM-WR-13/14					BM-WR-15/16					Shaft Pile		
	Reading #	5	6	9	12	13	14	15*	16	17	18	19	20	21	22	23	24	25	26*	27*	28	29	30	31	32	33	
	Date	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	
Copper	mg/kg	270	232	175	964	1,054	747	1,033	1,041	487	306	906	3,015	145	557	1,756	718	935	740	3,471	3,797	2,674	446	5,007	104	57	
(+/-) Error	mg/kg	52	39	6	14	16	13	16	15	11	8	15	29	5	14	20	16	17	16	41	44	34	11	58	5	4	
Zinc	mg/kg	417	380	392	2,981	2,438	8,300	10,201	9,386	4,134	3,812	5,832	6,070	421	12,447	4,216	7,477	3,845	5,426	44,681	50,757	37,454	4,576	25,517	217	201	
(+/-) Error	mg/kg	43	33	7	24	23	55	69	60	35	30	43	43	7	100	32	66	37	51	328	373	268	39	215	5	5	
Arsenic	mg/kg	73	50	66	312	560	701	786	861	770	867	784	574	35	1,115	426	1,601	1,053	1,462	1,186	927	997	1,143	2,640	36	26	
(+/-) Error	mg/kg	14	10	3	5	7	8	9	9	9	9	8	7	2	14	6	18	12	17	15	13	12	12	27	2	3	
Mercury	mg/kg	ND	ND	ND	14	16	ND	13	18	ND	ND	17	29	10	ND	17	18	21	ND	ND	ND	ND	12	ND	13	15	
(+/-) Error	mg/kg	NR	NR	NR	3	3	NR	4	4	NR	NR	4	4	2	NR	3	5	5	NR	NR	NR	NR	4	NR	3	3	
Lead	mg/kg	98	101	75	103	84	120	221	158	126	128	130	90	39	628	128	656	247	684	482	371	140	191	157	29	132	
(+/-) Error	mg/kg	15	12	3	3	3	4	5	4	4	4	4	3	2	11	4	12	7	12	10	9	5	5	7	2	4	

Notes:
*Discrete Sample collected
BOLD - Analyte detected above the instrument detection limit
Des. - Description
ID - Identification
< - less than
LOD - Limit of Detection
mg/kg - milligrams per kilogram
ND - Non detect

Boulaway Mine
XRF Field Screening Results Summary
Site Inspection- June 2019
Elkhorn Mining District

Table 8e

Analyte	In-Situ Desc./ Sample ID	Boulaway Mine																					
		BM-WR-17/18 -19/20																BM-WR-OP-01/02					Adit Pile
	Reading #	34	35*	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53*	54	55*
	Date	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019	6/4/2019
Copper	mg/kg	7,271	8,093	501	100	193	502	652	944	301	523	2,798	1,679	4,232	3,473	3,959	11,350	12,987	8,553	17,215	12,361	13,689	35
(+/-) Error	mg/kg	57	67	13	4	7	12	13	17	9	12	27	18	38	34	37	79	100	52	117	100	104	2
Zinc	mg/kg	26,794	40,672	41,978	467	2,380	6,329	8,054	16,652	12,280	6,241	6,885	5,656	12,152	13,576	10,452	33,851	60,409	20,870	42,588	98,781	32,729	161
(+/-) Error	mg/kg	167	266	262	7	23	53	57	117	81	51	48	38	81	91	73	201	395	105	260	667	221	3
Arsenic	mg/kg	204	249	174	149	230	354	843	865	724	1,061	416	308	601	781	722	99	125	46	113	111	266	11
(+/-) Error	mg/kg	4	5	4	3	4	6	9	10	8	11	6	4	7	10	9	3	4	2	3	4	6	2
Mercury	mg/kg	ND	ND	ND	10	ND	12	14	ND	ND	ND	10	12	14	21	18	ND	ND	ND	ND	ND	ND	ND
(+/-) Error	mg/kg	NR	NR	NR	2	NR	4	NR	NR	NR	NR	3	3	4	4	4	NR	NR	NR	NR	NR	NR	NR
Lead	mg/kg	35	57	57	29	51	61	159	104	124	101	60	39	98	543	174	19	40	11	21	23	220	134
(+/-) Error	mg/kg	3	3	3	2	3	4	5	4	4	4	3	3	4	9	5	2	3	2	2	3	6	2

Notes:
*Discrete Sample collected
BOLD - Analyte detected above the instrument detection limit
Des. - Description
ID - Identification
< - less than
LOD - Limit of Detection
mg/kg - milligrams per kilogram
ND - Non detect

Elkhorn Queen
XRF Field Screening Results Summary
Site Inspection- June 2019
Elkhorn Mining District

Table 8f

Analyte	Location:	Elkhorn Queen Mine																	
	Sample ID:	EQ-WR-01/02					EQ-WR-03/04								EQ-WR-05/06				
	Reading #	5	8	9	12	16*	28	29	30	31	32	33	34*	35	17*	18	19	20	21
	Date	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019
Copper	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	73	49	129	<LOD	<LOD
(+/-) Error	mg/kg	144	167	263	280	111	87	675	658	67	86	143	706	303	22	16	41	92	53
Zinc	mg/kg	7,241	25,417	19,297	12,303	7,737	6,582	568	855	821	2,314	3,960	8,717	12,147	6,823	5,267	4,989	5,439	3,179
(+/-) Error	mg/kg	318	1,048	1,308	872	294	226	127	161	47	107	223	754	981	178	117	214	246	100
Arsenic	mg/kg	16,442	24,864	21,256	4,040	4,896	1,340	909	1,013	988	855	1,711	1,452	1,135	2,186	2,014	2,917	2,190	449
(+/-) Error	mg/kg	657	1,006	1,411	322	190	70	125	168	57	55	119	167	134	70	60	133	113	25
Mercury	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
(+/-) Error	mg/kg	202	240	300	235	101	77	163	248	61	83	131	234	223	61	57	106	104	53
Lead	mg/kg	21,815	13,687	13,409	6,773	5,066	2,636	2,355	2,920	2,578	1,582	3,267	1,979	1,724	2,809	4,645	3,418	2,412	402
(+/-) Error	mg/kg	850	571	908	488	193	100	207	294	89	73	178	194	172	81	99	146	119	23

Notes:
*Discrete Sample location
BOLD - Analyte detected above the instrument detection limit
Des. - Description
ID - Identification
< - less than
LOD - Limit of Detection
mg/kg - milligrams per kilogram
ND - Non detect

Elkhorn Queen
XRF Field Screening Results Summary
Site Inspection- June 2019
Elkhorn Mining District

Table 8f

Analyte	Location:	Elkhorn Queen Mine									
	Sample ID:	EQ-WR-07/08					EQ-SO-BK01				
	Reading #	22	23	24*	25	26	36	37	38	39*	40
	Date	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019
Copper	mg/kg	<LOD	<LOD	<LOD	148	<LOD	<LOD	<LOD	<LOD	<LOD	70
(+/-) Error	mg/kg	152	102	54	24	49	96	101	51	34	18
Zinc	mg/kg	771	433	954	4,971	2,880	88	186	172	85	153
(+/-) Error	mg/kg	72	48	46	143	80	24	31	18	11	17
Arsenic	mg/kg	346	297	387	205	319	59	99	65	45	95
(+/-) Error	mg/kg	44	28	28	14	16	19	20	12	7	12
Mercury	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
(+/-) Error	mg/kg	89	61	45	45	38	58	74	41	27	37
Lead	mg/kg	631	98	846	106	118	218	176	196	60	162
(+/-) Error	mg/kg	54	21	37	12	12	26	24	16	8	14

Notes:
*Discrete Sample location
BOLD - Analyte detected above the instrument detection limit
Des. - Description
ID - Identification
< - less than
LOD - Limit of Detection
mg/kg - milligrams per kilogram
ND - Non detect

Skyline Mine
XRF Field Screening Results Summary
Site Inspection- June 2019
Elkhorn Mining District

Table 8g

Analyte	Location:	Skyline Mine															
	Sample ID:	SM-WR-03/04						SM-WR-05/06 - 09/10					SM-WR-07/08				
	Reading #	14	15	17	18*	19	21	9	10	11	12*	13	4*	5	6	7	8
	Date	9/11/2019	9/11/2019	9/11/2019	9/11/2019	9/11/2019	9/11/2019	9/11/2019	9/11/2019	9/11/2019	9/11/2019	9/11/2019	9/11/2019	9/11/2019	9/11/2019	9/11/2019	9/11/2019
Copper	mg/kg	<LOD	66	57	67	<LOD	<LOD	104	144	352	332	425	82	<LOD	329	0	58
(+/-) Error	mg/kg	58	15	17	18	693	127	33	22	31	103	29	16	61	60	37	15
Zinc	mg/kg	124	408	320	386	0	99	157	591	1670	2613	1531	243	92	117	272	401
(+/-) Error	mg/kg	17	22	23	25	316	31	26	32	58	233	49	18	16	31	18	19
Arsenic	mg/kg	301	2733	12080	4323	1048	723	582	1602	9303	3647	4815	1743	1171	48	521	531
(+/-) Error	mg/kg	17	58	238	100	122	50	33	49	201	299	105	42	15	40	19	17
Mercury	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	115	<LOD	<LOD	71	<LOD	<LOD	<LOD	<LOD
(+/-) Error	mg/kg	35	40	69	60	183	100	72	51	30	216	68	17	56	70	32	28
Lead	mg/kg	56	544	991	1715	<LOD	66	90	1102	3977	6280	5668	370	150	0	155	282
(+/-) Error	mg/kg	10	22	34	51	88	22	17	39	99	461	117	18	16	54	12	13

Notes:
*Discrete Sample collected
BOLD - Analyte detected above the instrument detection limit
Des. - Description
ID - Identification
< - less than
LOD - Limit of Detection
mg/kg - milligrams per kilogram
ND - Non detect

Field Quality Control
Analytical Results Summary
Site Inspection- June 2019
Elkhorn Mining District

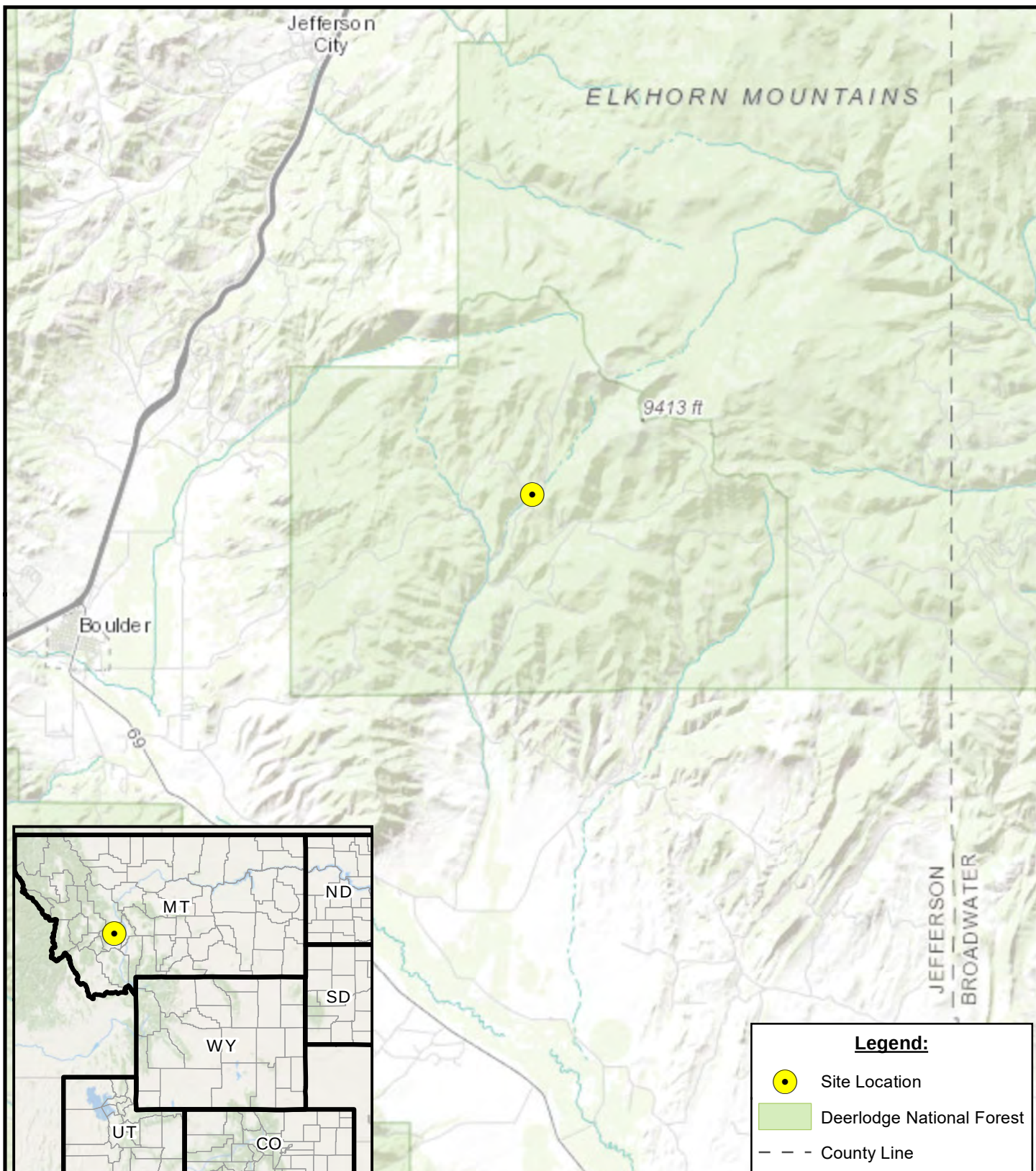
Table 9

Analyte	Units	Sample ID:	FB-01	FB-02	FB-03
		Sample Date:	6/3/19	6/4/19	6/5/19
Total Metals					
Aluminum	µg/L	--	20 U	20 U	74.5
Antimony	µg/L	--	2 U	2 U	2 U
Arsenic	µg/L	--	1 U	1 U	1.1
Barium	µg/L	--	10 U	10 U	7.4 J
Beryllium	µg/L	--	1 U	1 U	1 U
Cadmium	µg/L	--	1 U	1 U	1 U
Calcium	µg/L	--	500 U	500 U	8430
Chromium	µg/L	--	0.21 U	0.097 J	0.4 J
Cobalt	µg/L	--	1 U	1 U	1 U
Copper	µg/L	--	2 J	0.18 J	2
Iron	µg/L	--	200 U	200 U	150 J
Lead	µg/L	--	1 U	1 U	1 U
Magnesium	µg/L	--	500 UJ	500 U	2100
Manganese	µg/L	--	1 U	1 U	6.6
Mercury	µg/L	--	0.2 U	0.2 U	0.2 U
Nickel	µg/L	--	1 U	1 U	1 U
Potassium	µg/L	--	500 U	500 U	880
Selenium	µg/L	--	5 UJ	5 U	5 U
Silver	µg/L	--	1 U	1 U	1 U
Sodium	µg/L	--	500 UJ	500 U	2710
Thallium	µg/L	--	1 U	1 U	1 U
Vanadium	µg/L	--	5 U	5 U	1.3 J
Zinc	µg/L	--	5.4	4.1	7.4
Dissolved Metals					
Aluminum	µg/L	--	20 U	20 U	20 U
Antimony	µg/L	--	2 U	2 U	2 U
Arsenic	µg/L	--	1 U	1 U	1 U
Barium	µg/L	--	10 U	10 U	10 U
Beryllium	µg/L	--	1 U	1 U	1 U
Cadmium	µg/L	--	1 U	1 U	1 U
Calcium	µg/L	--	500 U	500 U	500 U
Chromium	µg/L	--	2 U	2 U	2 U
Cobalt	µg/L	--	1 U	1 U	1 U
Copper	µg/L	--	0.38 J	0.23 J	0.15 J
Iron	µg/L	--	200 U	200 U	200 U
Lead	µg/L	--	1 UJ	1 UJ	1 UJ
Magnesium	µg/L	--	500 U	500 U	500 U
Manganese	µg/L	--	1 U	1 U	1 U
Mercury	µg/L	--	0.2 U	0.2 U	0.2 U
Nickel	µg/L	--	1 U	1 U	1 U
Potassium	µg/L	--	500 U	500 U	500 U
Selenium	µg/L	--	5 UJ	5 UJ	5 UJ
Silver	µg/L	--	1 U	1 U	1 U
Sodium	µg/L	--	500 UJ	500 U	500 UJ
Thallium	µg/L	--	1 U	1 U	1 U
Vanadium	µg/L	--	5 U	5 U	5 U
Zinc	µg/L	--	10.3	8	8.7

Notes:

--	Not Applicable
Bold	The analyte was detected above the sample quantitation limit.
J	The associated value is an estimated quantity.
	The material was analyzed for, but was not detected above the level of the associated value.
U	The associated value is either the sample quantitation limit or the sample detection limit.
	The analyte was not deemed above the sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
UJ	
µg/L	micrograms per liter

FIGURES



Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
 Projection: Mercator Auxiliary Sphere
 Datum: WGS 1984

Source:
 Background: ESRI USA Topo Maps (2017)

0 2 4 8 Miles



Prepared for:
 U.S. EPA - Region 8



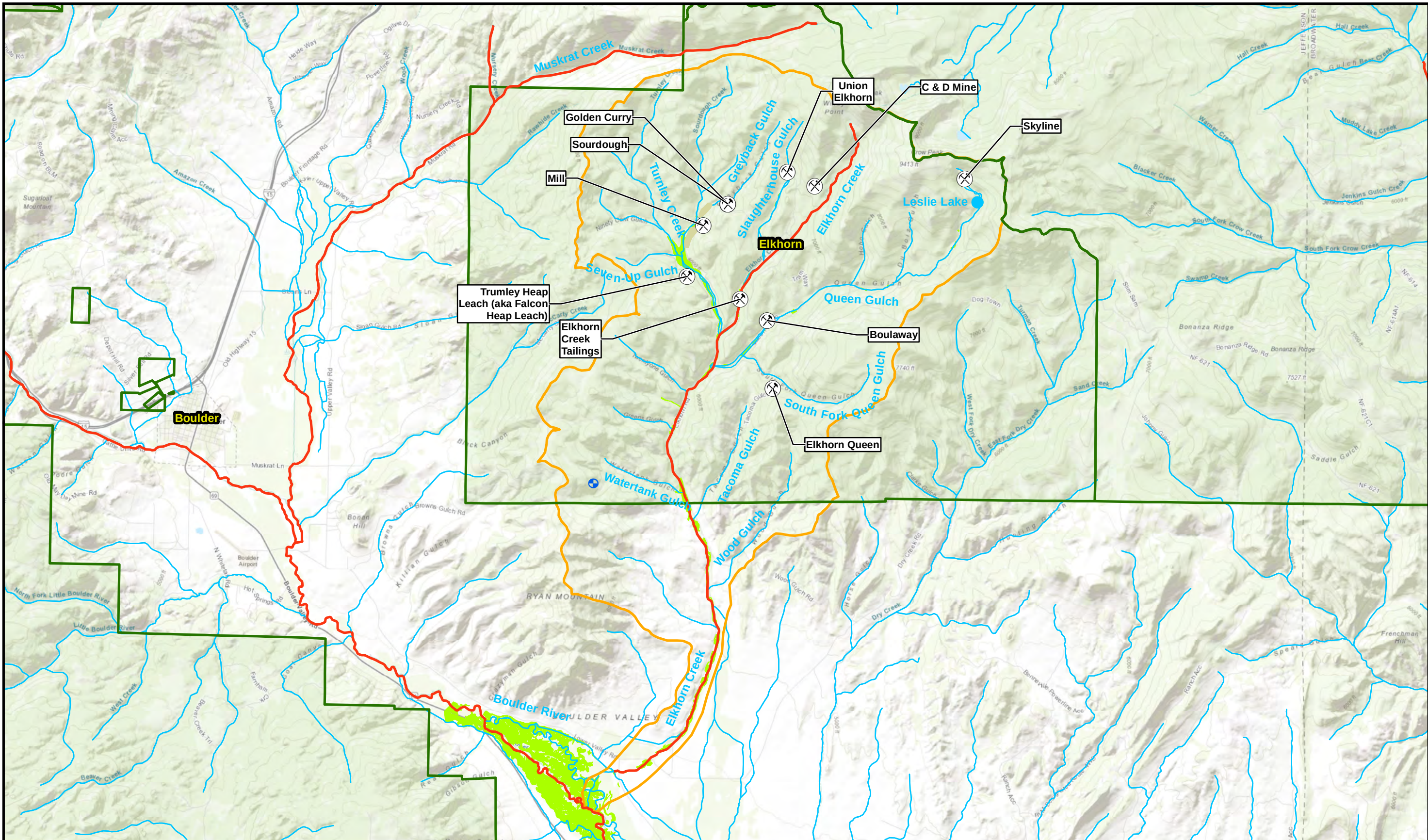
Contract: EP-S8-13-01
 TO/TDD: 0004/1807-06

Prepared By:
 Weston Solutions, Inc.
 START IV
 Suite 100
 1435 Garrison St.
 Lakewood, CO



FIGURE 1
INVESTIGATION AREA LOCATION MAP
ELKHORN MINING DISTRICT
SITE INSPECTION
JEFFERSON COUNTY, MONTANA

Date: 2/11/2020



Coordinate System: NAD 1983 UTM Zone 12N
Projection: Transverse Mercator
Datum: North American 1983
Source:
303(d) Listed Impaired Waters: EPA ATTAINS (2010)
Public Water Supply: GWIC (2017)
Rivers, Site Boundary: USGS NHD (2019)
National Forest Boundary: HSIP (2015)
Wetlands: US NWI Wetlands (2020)
Background: ESRI World Topographic Map (2019)
Mine Sites: Weston GPS (2017) *Access to Sourdough, Mill and Golden Curry mines were not accessible but the surface waters above and below these sites were evaluated to assess for potential impacts

0 0.75 1.5 3 Miles

Legend

- Mine Sites
- Waterbody
- Public Supply Well
- 303(d) Listed Impaired Waters
- National Forest Boundary
- Elkhorn Creek Subwatershed Boundary
- Rivers or Streams
- Wetlands

Prepared for:
U.S. EPA - Region 8

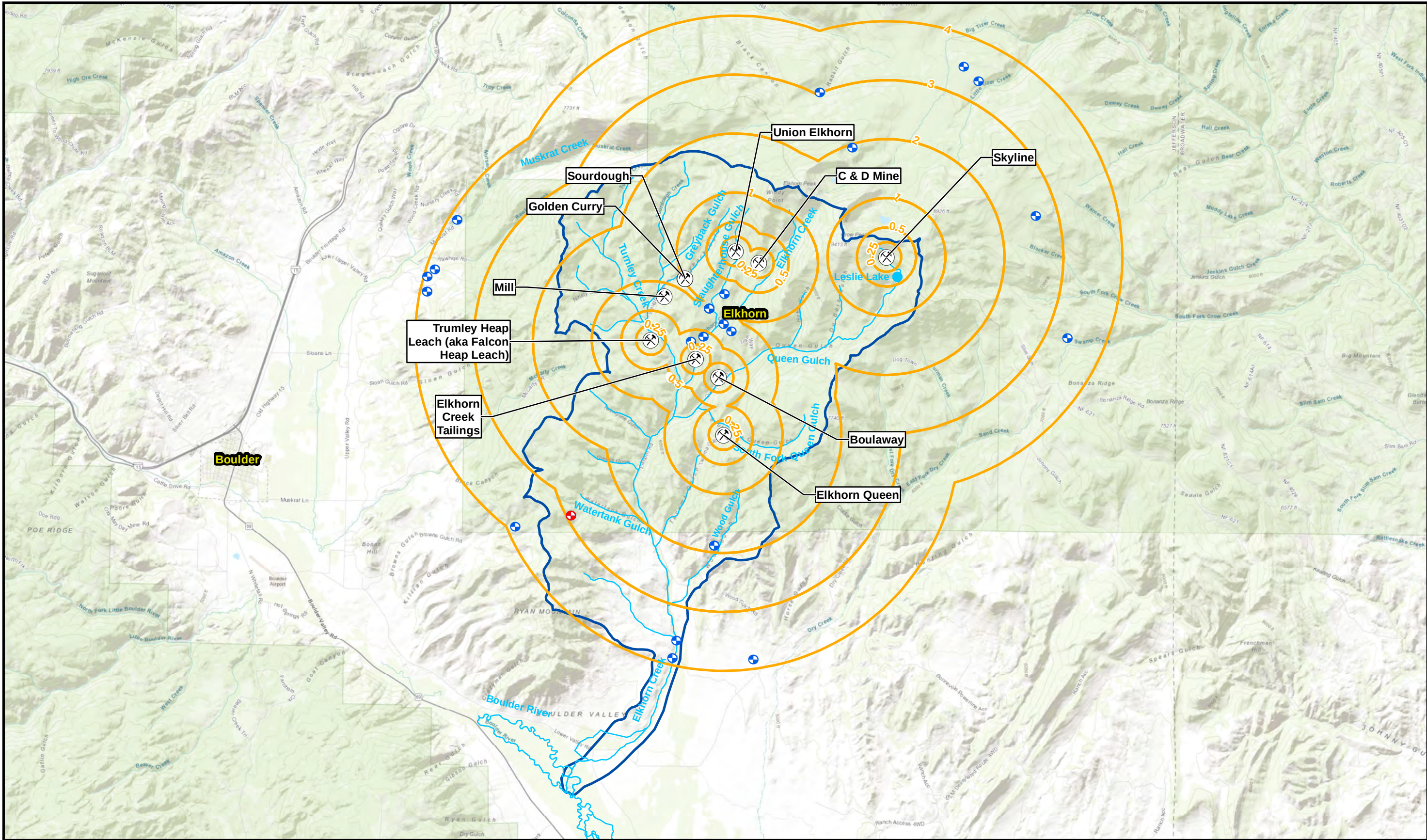
Contract: EP-S8-13-01
TO/TDD: 0004/1807-06

Prepared By:
Weston Solutions, Inc.
START IV
Suite 100
1435 Garrison St.
Lakewood, CO



FIGURE 2
INVESTIGATION AREA VICINITY
ELKHORN MINING DISTRICT SITE INSPECTION
JEFFERSON COUNTY, MONTANA

Date: 6/4/2020



Coordinate System: NAD 1983 UTM Zone 12N
Projection: Transverse Mercator
Datum: North American 1983
Source:
303(d) Listed Impaired Waters: EPA ATTAINS (2019)
Public Water Supply: GWIC (2019)
Rivers, Site Boundary: USGS NHD (2019)
Waterbodies: Digitized from ESRI Aerial Imagery (2019)
Wetlands: US NWI Wetlands (2020)
Background: ESRI World Topographic Map (2020)
Mine Sites: Weston GPS (2017) *Access to Sourdough, Mill and Golden Curry mines were not accessible but the surface waters above and below these sites were evaluated to assess for potential impacts

0 0.75 1.5 3 Miles

N

- Legend**
- Public Supply Well
 - Ground Water Wells
 - Mine Sites
 - Rivers or Streams
 - MultiRingBuffer_Quarterto4mil
 - Elkhorn Creek Subwatershed Boundary

Prepared for:
U.S. EPA - Region 8

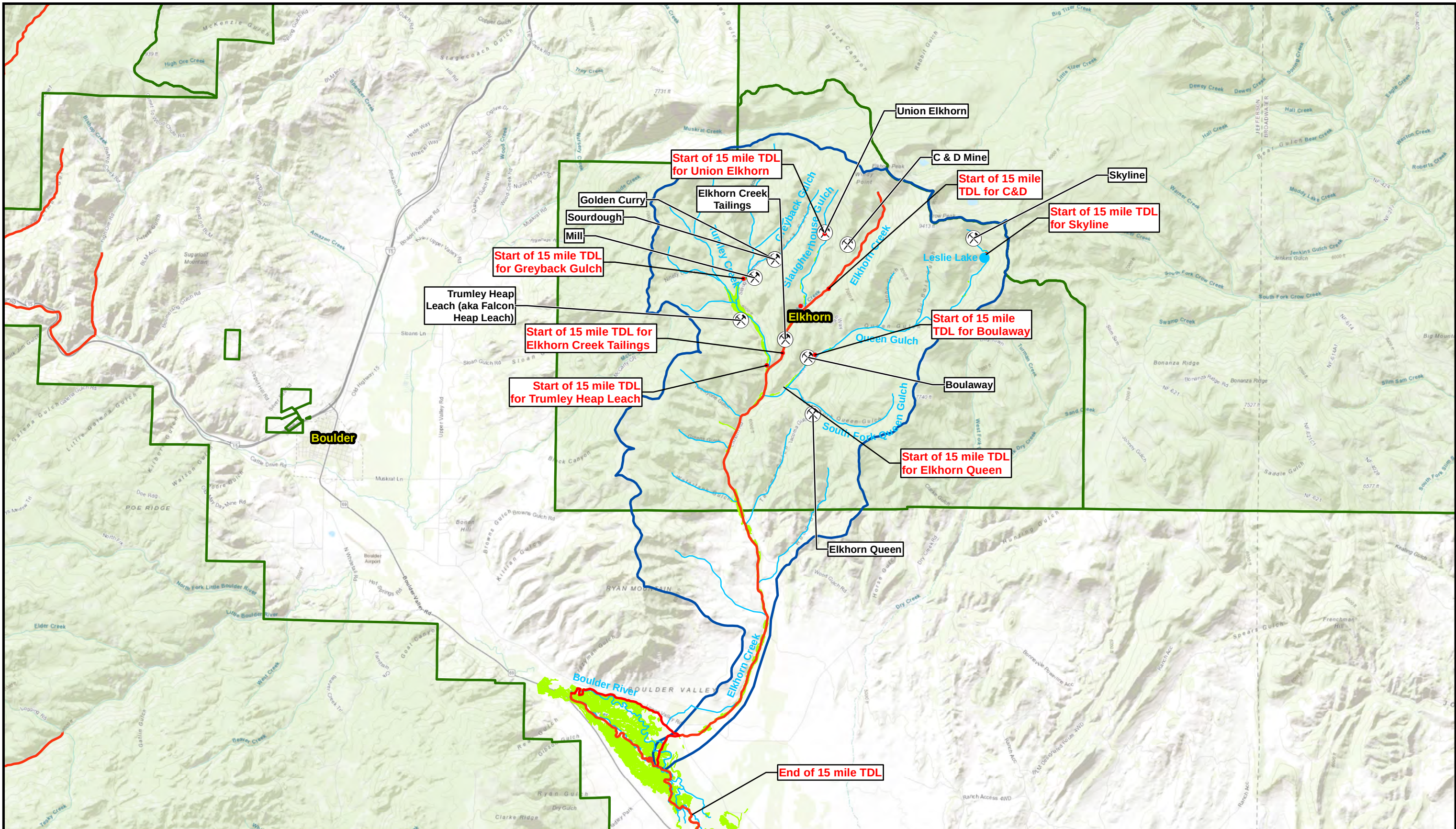
Contract: EP-S8-13-01
TO/TDD: 0004/1807-06

Prepared By:
Weston Solutions, Inc.
START IV
Suite 100
1435 Garrison St.
Lakewood, CO



FIGURE 3
GROUNDWATER PATHWAY 4-MILE RADIUS MAP
ELKHORN MINING DISTRICT SITE INSPECTION
JEFFERSON COUNTY, MONTANA

Date: 4/30/2020



Coordinate System: NAD 1983 UTM Zone 12N
Projection: Transverse Mercator
Datum: North American 1983
Source:
303(d) Listed Impaired Waters: EPA ATTAINS (2019)
Public Water Supply: GWIC (2019)
Rivers: USGS NHD (2019)
National Forest Boundary: HSIP (2015)
Wetlands: US NWI Wetlands (2020)
Background: ESRI World Topographic Map (2019)
Mine Sites: Weston GPS (2017) *Access to Sourdough, Mill and Golden Curry mines were not accessible but the surface waters above and below these sites were evaluated to assess for potential impacts

0 0.75 1.5 3 Miles



Legend

- Probable Point of Entry
- ⛏ Mine Sites
- 303(d) Listed Impaired Waters
- Rivers or Streams
- Elkhorn Creek Subwatershed Boundary
- Wetlands
- National Forest Boundary

Prepared for:
U.S. EPA - Region 8

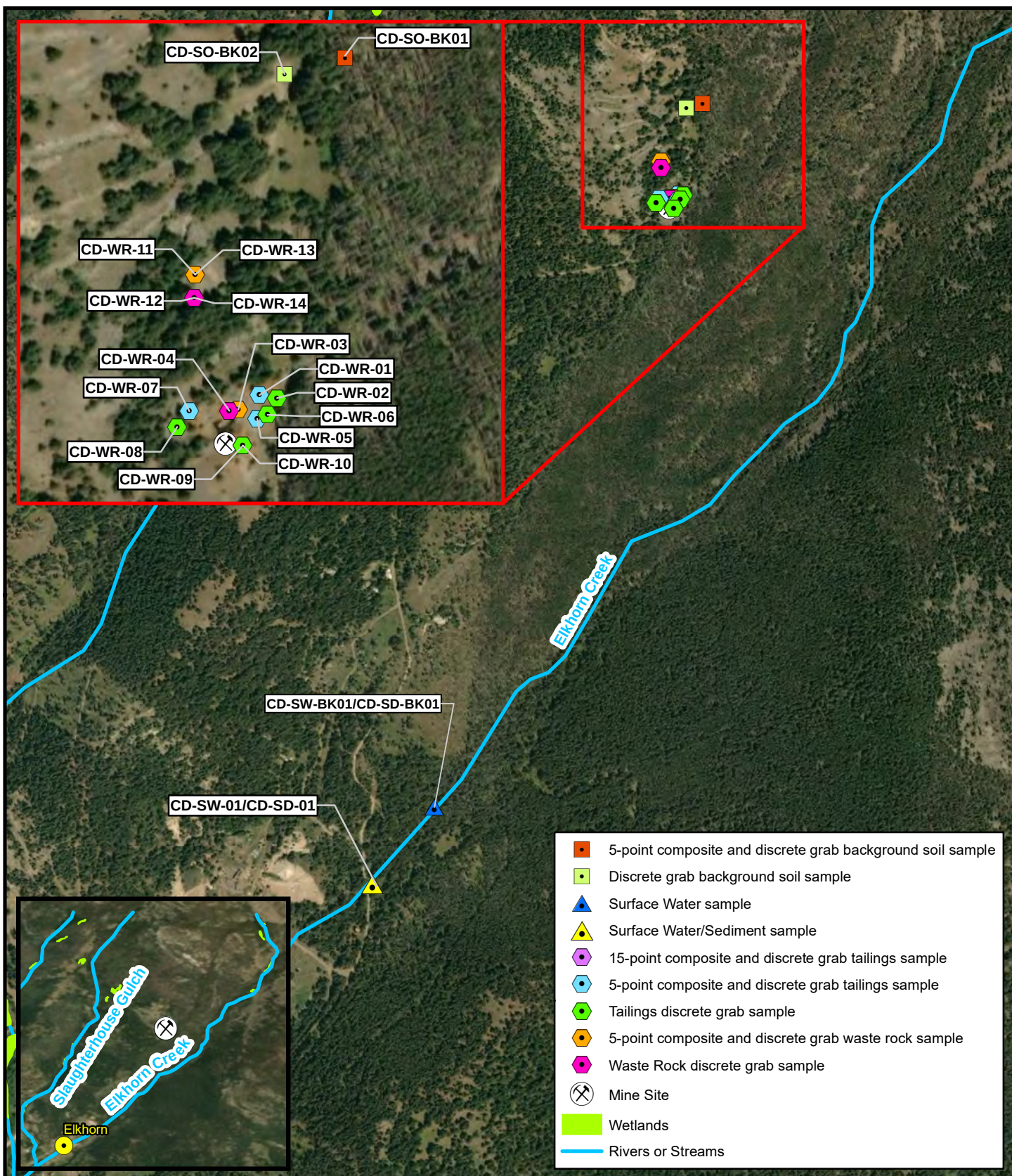
Contract: EP-S8-13-01
TO/TDD: 0004/1807-06

Prepared By:
Weston Solutions, Inc.
START IV
Suite 100
1435 Garrison St.
Lakewood, CO



FIGURE 4
SURFACE WATER PATHWAY 15-MILE TARGET DISTANCE MAP
ELKHORN MINING DISTRICT SITE INSPECTION
JEFFERSON COUNTY, MONTANA

Date: 4/27/2020



Coordinate System: NAD 1983 UTM Zone 12N
 Projection: Transverse Mercator
 Datum: North American 1983
 Units: Meter

Source:

Mine Sites: Weston GPS (2019)
 Rivers, Site Boundary: USGS NHD (2019)
 Wetlands: US NWI Wetlands (2020)
 Background: ESRI World Imagery (2019)

0 360 720 1,440 Feet



Prepared for:
 U.S. EPA - Region 8

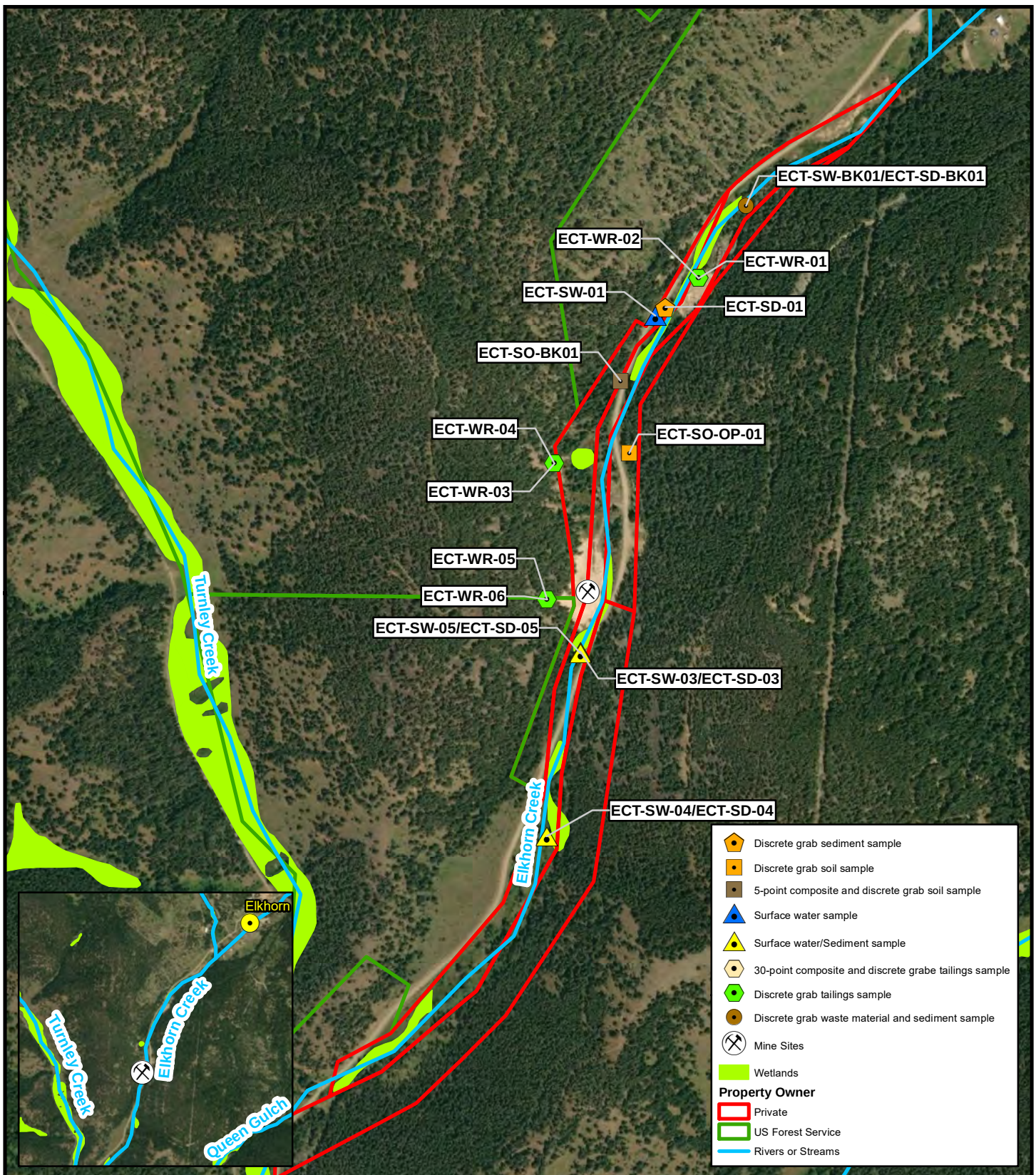
Contract: EP-S8-13-01
 TO/TDD: 0004/1807-06

Prepared By:
 Weston Solutions, Inc.
 START IV
 Suite 100
 1435 Garrison St.
 Lakewood, CO



FIGURE 5
C & D MINE
SAMPLE LOCATIONS MAP
ELKHORN MINING DISTRICT
SITE INSPECTION
JEFFERSON COUNTY, MONTANA

Date: 5/1/2020



Coordinate System: NAD 1983 UTM Zone 12N
 Projection: Transverse Mercator
 Datum: North American 1983
 Units: Meter

Source:
 Mine Sites: Weston GPS (2019)
 Rivers, Site Boundary: USGS NHD (2019)
 Wetlands: US NWI Wetlands (2020)
 Background: ESRI World Imagery (2019)

0 360 720 1,440 Feet



Prepared for:
 U.S. EPA - Region 8



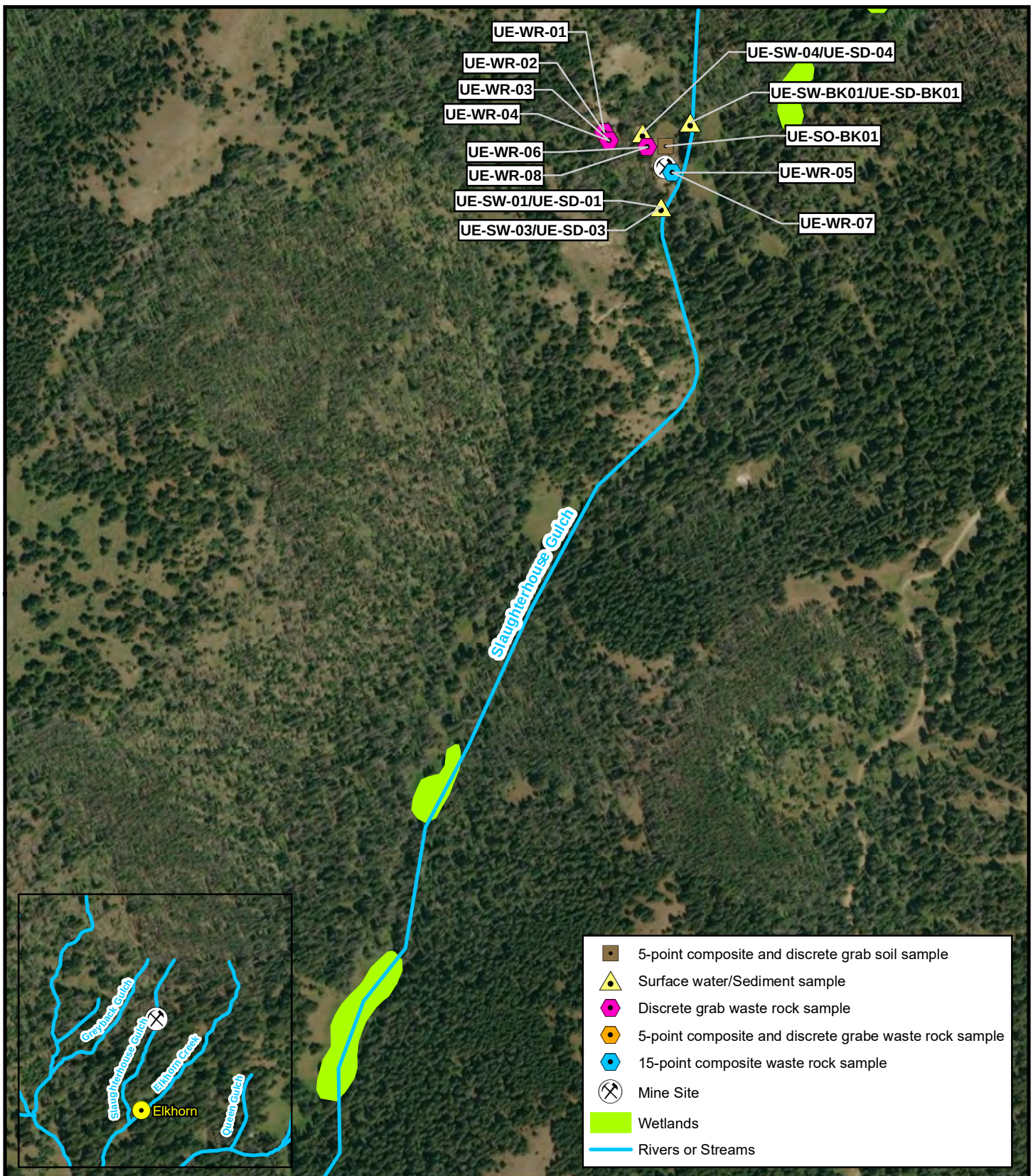
Contract: EP-S8-13-01
 TO/TDD: 0004/1807-06

Prepared By:
 Weston Solutions, Inc.
 START IV
 Suite 100
 1435 Garrison St.
 Lakewood, CO



FIGURE 6
ELKHORN CREEK TAILINGS
SAMPLE LOCATIONS MAP
ELKHORN MINING DISTRICT
SITE INSPECTION
JEFFERSON COUNTY, MONTANA

Date: 4/27/2020

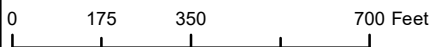


- 5-point composite and discrete grab soil sample
- Surface water/Sediment sample
- Discrete grab waste rock sample
- 5-point composite and discrete grab waste rock sample
- 15-point composite waste rock sample
- +

 Mine Site
- Wetlands
- Rivers or Streams

Coordinate System: NAD 1983 UTM Zone 12N
 Projection: Transverse Mercator
 Datum: North American 1983
 Units: Meter

Source:
 Mine Sites: Weston GPS (2019)
 Rivers, Site Boundary: USGS NHD (2019)
 Wetlands: US NWI Wetlands (2020)
 Background: ESRI World Imagery (2019)



Prepared for:
 U.S. EPA - Region 8

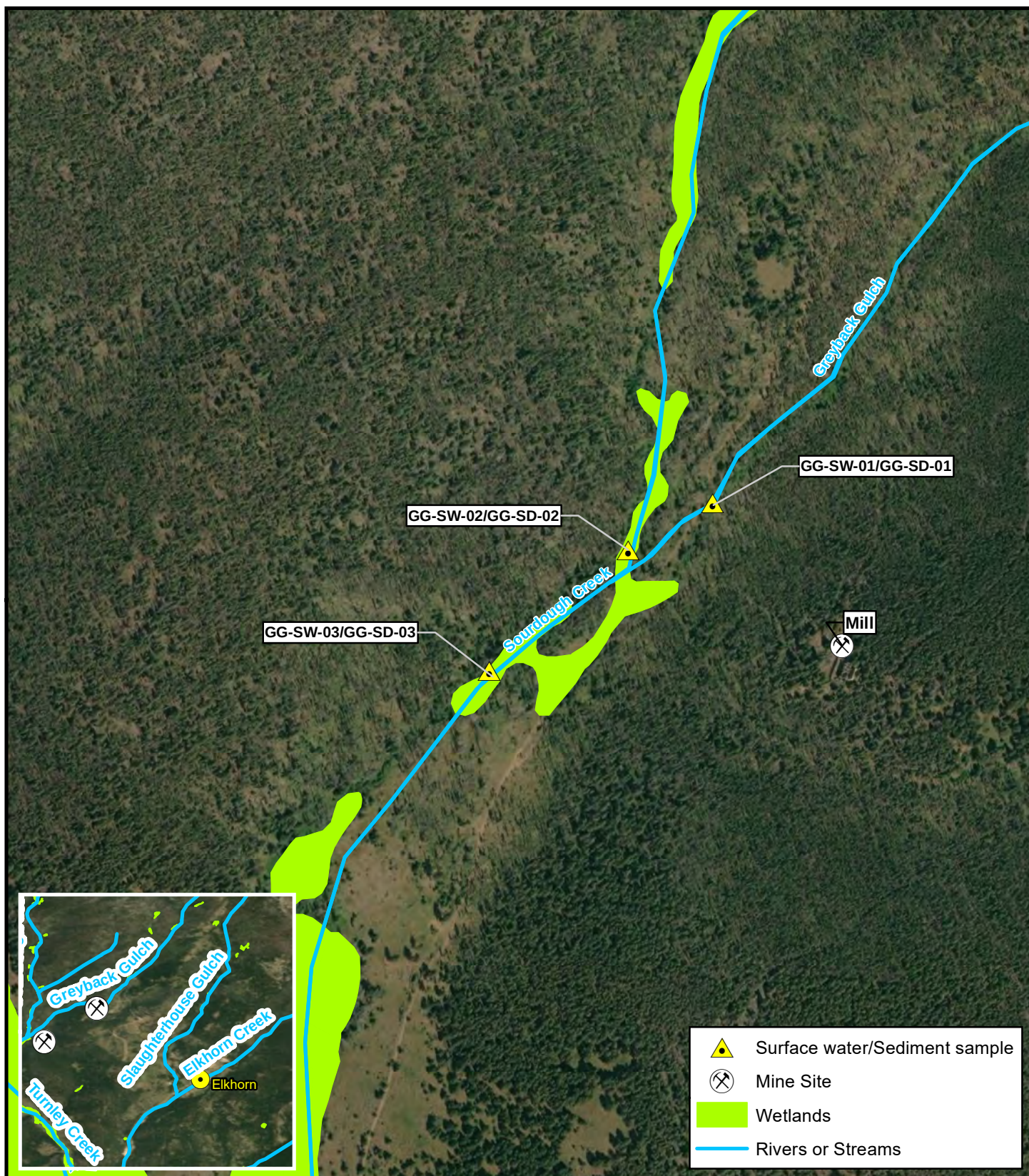
Contract: EP-S8-13-01
 TO/TDD: 0004/1807-06

Prepared By:
 Weston Solutions, Inc.
 START IV
 Suite 100
 1435 Garrison St.
 Lakewood, CO



**FIGURE 7
 UNION ELKHORN MINE
 SAMPLE LOCATIONS MAP
 ELKHORN MINING DISTRICT
 SITE INSPECTION
 JEFFERSON COUNTY, MONTANA**

Date: 5/1/2020



Coordinate System: NAD 1983 UTM Zone 12N
 Projection: Transverse Mercator
 Datum: North American 1983
 Units: Meter

Source:
 Rivers, Site Boundary: USGS NHD (2019)
 Wetlands: US NWI Wetlands (2020)
 Background: ESRI World Imagery (2019)
 Mine Sites: Weston GPS (2018) *Access to Sourdough, Mill and Golden Curry
 mines were not accessible but the surface waters above and
 below these sites were evaluated to assess for potential impacts

0 200 400 800 Feet



Prepared for:
 U.S. EPA - Region 8



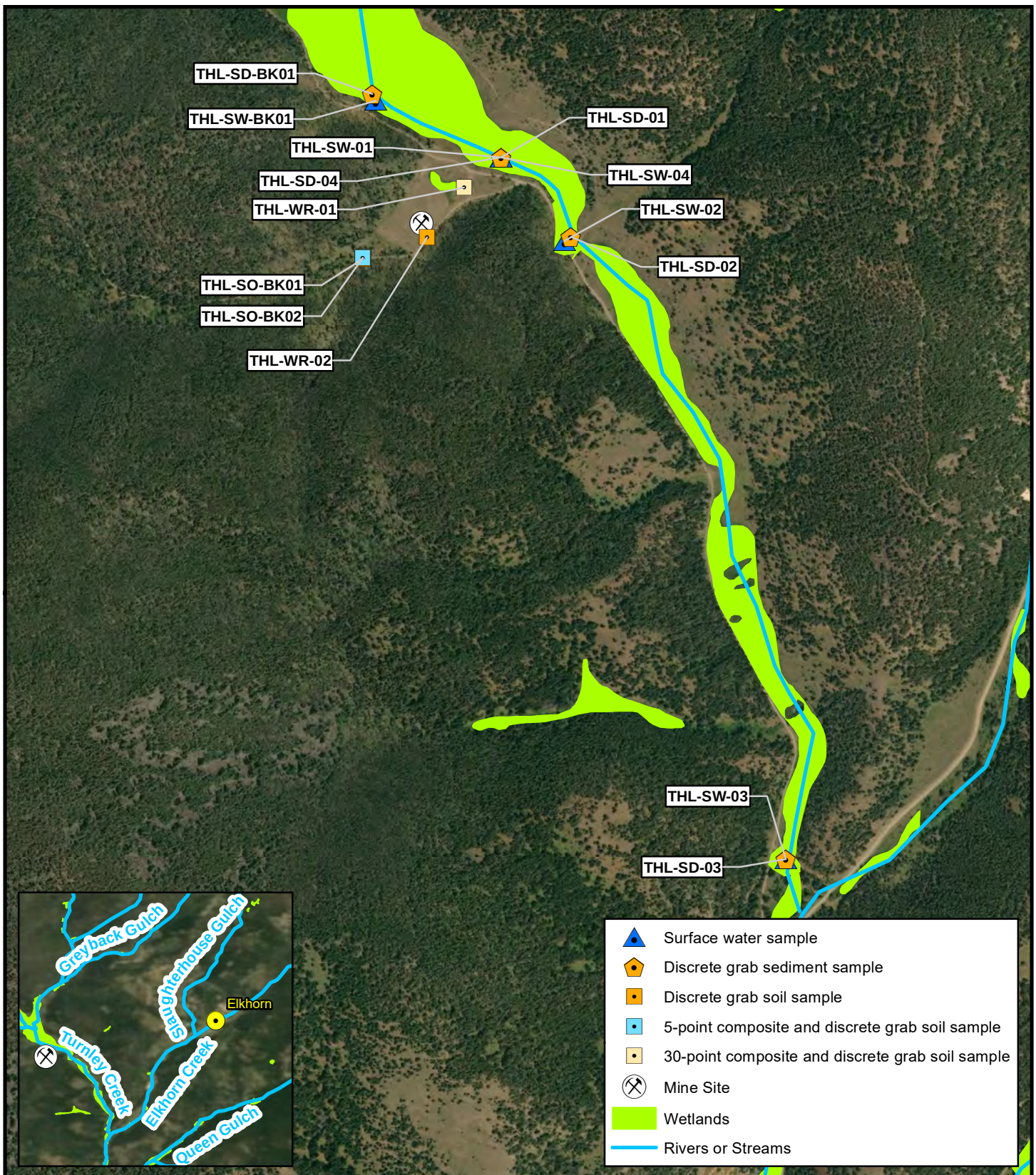
Contract: EP-S8-13-01
 TO/TDD: 0004/1807-06

Prepared By:
 Weston Solutions, Inc.
 START IV
 Suite 100
 1435 Garrison St.
 Lakewood, CO



**FIGURE 8
 GREYBACK GULCH
 SAMPLE LOCATIONS MAP
 ELKHORN MINING DISTRICT
 SITE INSPECTION
 JEFFERSON COUNTY, MONTANA**

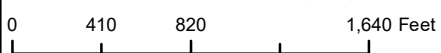
Date: 5/1/2020



- Surface water sample
- Discrete grab sediment sample
- Discrete grab soil sample
- 5-point composite and discrete grab soil sample
- 30-point composite and discrete grab soil sample
- Mine Site
- Wetlands
- Rivers or Streams

Coordinate System: NAD 1983 UTM Zone 12N
 Projection: Transverse Mercator
 Datum: North American 1983
 Units: Meter

Source:
 Mine Sites: Weston GPS (2019)
 Rivers, Site Boundary: USGS NHD (2019)
 Wetlands: US NWI Wetlands (2020)
 Background: ESRI World Imagery (2019)



Prepared for:
 U.S. EPA - Region 8

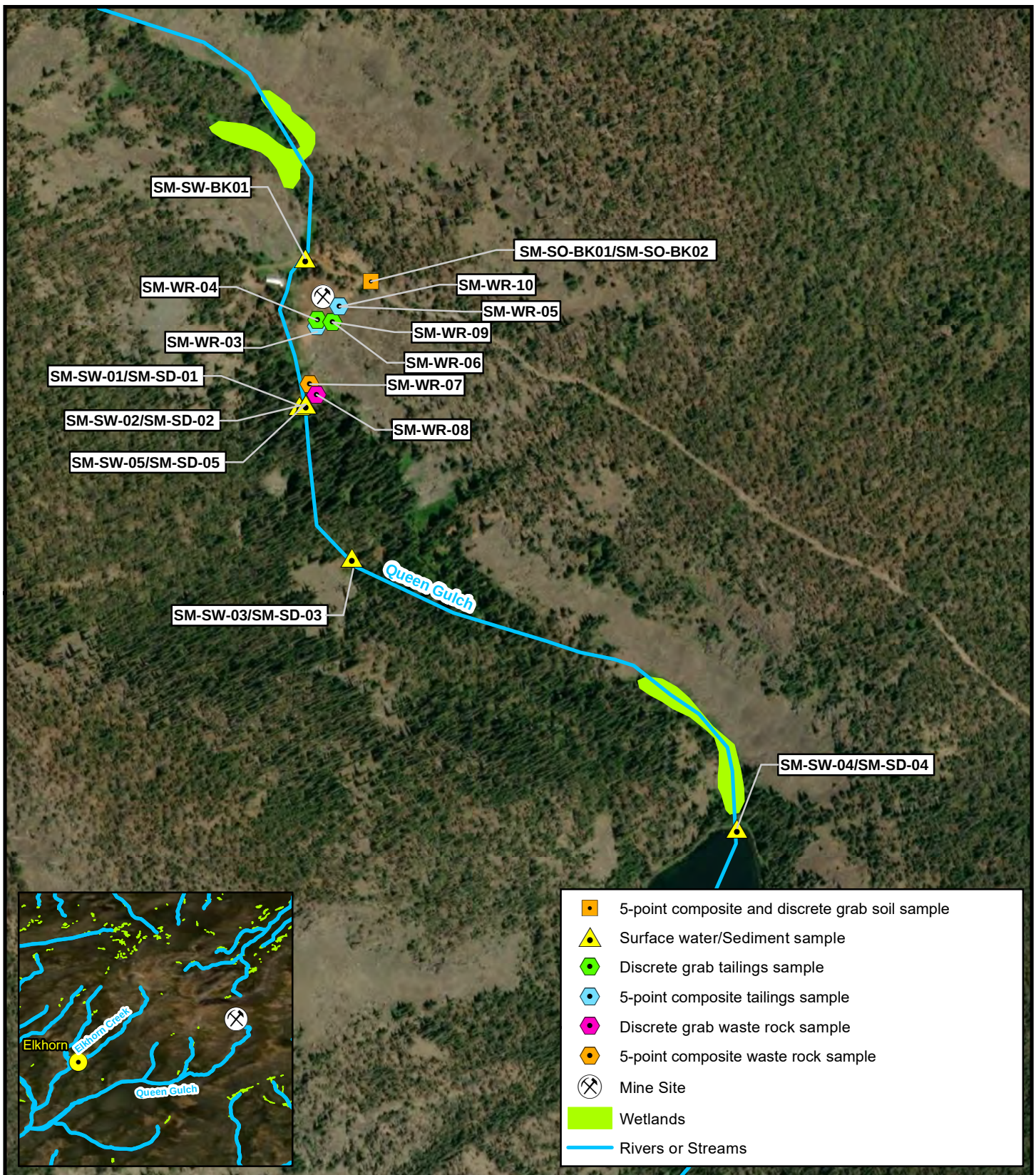
Contract: EP-S8-13-01
 TO/TDD: 0004/1807-06

Prepared By:
 Weston Solutions, Inc.
 START IV
 Suite 100
 1435 Garrison St.
 Lakewood, CO



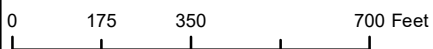
FIGURE 9
TRUMLEY HEAP LEACH
SAMPLE LOCATION MAP
ELKHORN MINING DISTRICT
SITE INSPECTION
JEFFERSON COUNTY, MONTANA

Date: 5/1/2020



- 5-point composite and discrete grab soil sample
- ▲ Surface water/Sediment sample
- Discrete grab tailings sample
- 5-point composite tailings sample
- Discrete grab waste rock sample
- 5-point composite waste rock sample
- ⛏ Mine Site
- Wetlands
- Rivers or Streams

Coordinate System: NAD 1983 UTM Zone 12N
 Projection: Transverse Mercator
 Datum: North American 1983
 Units: Meter
Source:
 Mine Sites: Weston GPS (2017)
 Rivers, Site Boundary: USGS NHD (2015)
 Wetlands: US NWI Wetlands (2017)
 Background: ESRI World Imagery (2017)



Prepared for:
 U.S. EPA - Region 8



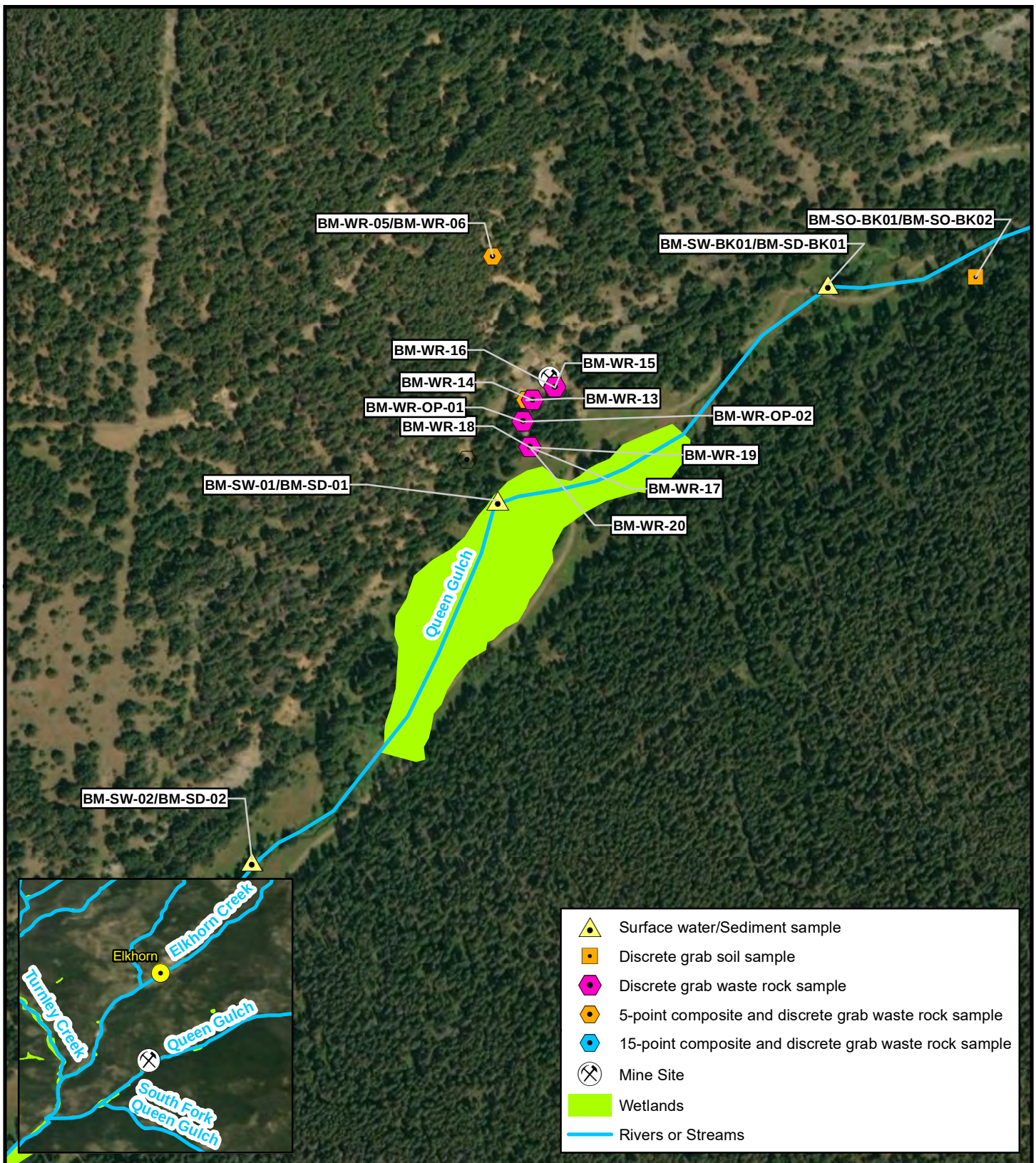
Contract: EP-S8-13-01
 TO/TDD: 0004/1807-06

Prepared By:
 Weston Solutions, Inc.
 START IV
 Suite 100
 1435 Garrison St.
 Lakewood, CO



FIGURE 10
SKYLINE MINE
SAMPLE LOCATION MAP
ELKHORN MINING DISTRICT
SITE INSPECTION
JEFFERSON COUNTY, MONTANA

Date: 6/4/2020



Coordinate System: NAD 1983 UTM Zone 12N
 Projection: Transverse Mercator
 Datum: North American 1983
 Units: Meter

Source:

Mine Sites: Weston GPS (2019)
 Rivers, Site Boundary: USGS NHD (2019)
 Wetlands: US NWI Wetlands (2020)
 Background: ESRI World Imagery (2019)

0 140 280 560 Feet



Prepared for:
 U.S. EPA - Region 8



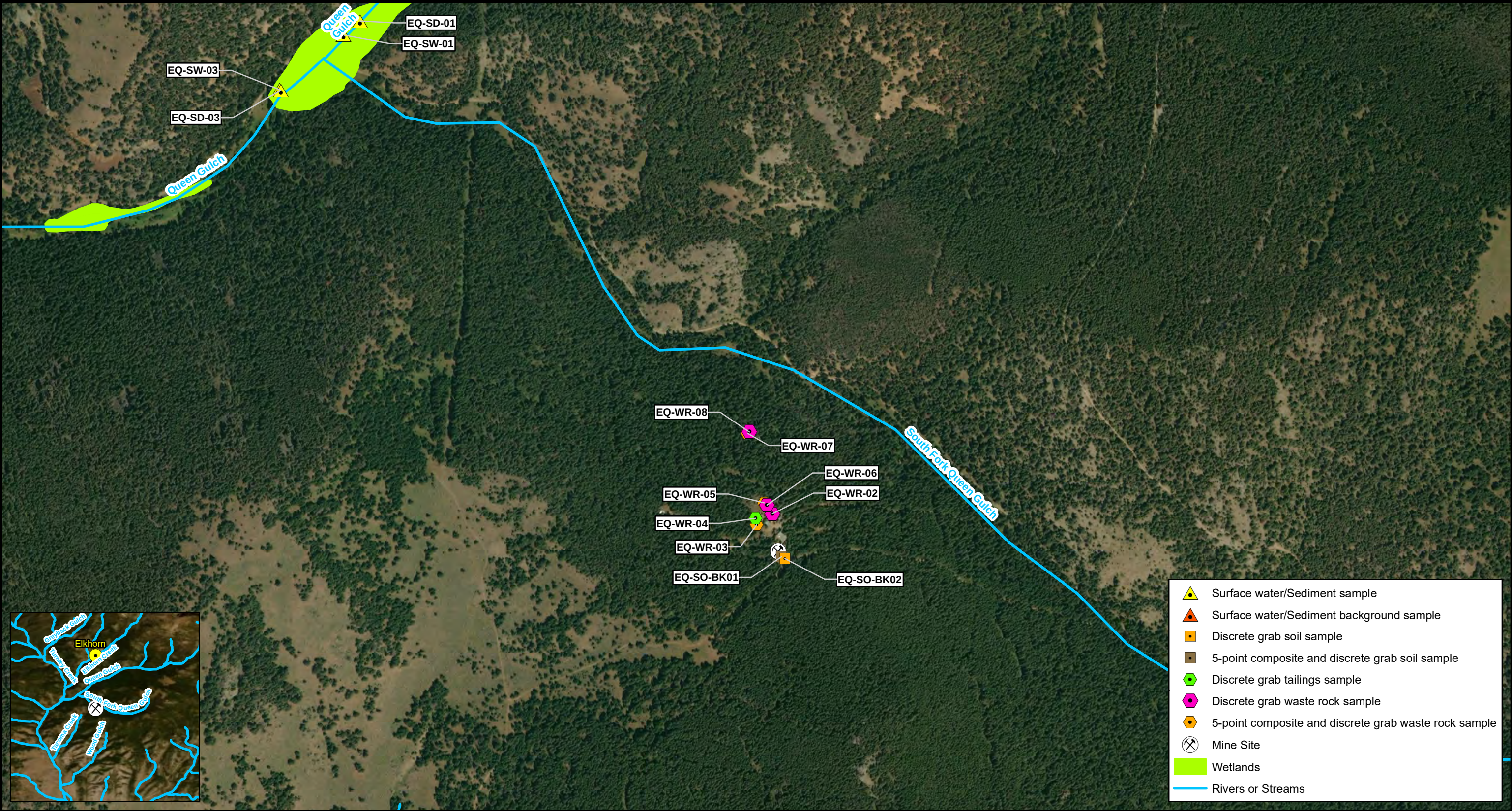
Contract: EP-S8-13-01
 TO/TDD: 0004/1807-06

Prepared By:
 Weston Solutions, Inc.
 START IV
 Suite 100
 1435 Garrison St.
 Lakewood, CO



**FIGURE 11
 BOULAWAY MINE
 SAMPLE LOCATIONS MAP
 ELKHORN MINING DISTRICT
 SITE INSPECTION
 JEFFERSON COUNTY, MONTANA**

Date: 5/1/2020



Coordinate System: NAD 1983 UTM Zone 12N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter

Source:
Mine Sites: Weston GPS (2019)
Rivers, Site Boundary: USGS NHD (2019)
Wetlands: US NWI Wetlands (2020)
Background: ESRI World Imagery (2019)

0 500 1,000 2,000 Feet



Prepared for:
U.S. EPA - Region 8



Contract: EP-S8-13-01
TO/TDD: 0004/1807-06

Prepared By:
Weston Solutions, Inc.
START IV
Suite 100
1435 Garrison St.
Lakewood, CO



FIGURE 12
ELKHORN QUEEN MINE
SAMPLE LOCATIONS MAP
ELKHORN MINING DISTRICT
SITE INSPECTION JEFFERSON COUNTY,
MONTANA

Date: 5/1/2020

APPENDIX A
Photograph Log

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 1</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.2786</td></tr> <tr> <td>Long</td><td>-111.939697</td></tr> <tr> <td colspan="2">Direction Photo Taken: 6.52655792555416</td></tr> <tr> <td colspan="2">Description: Location of sample CD-SW/SW-BK01</td></tr> </table>	Photo No. 1	Date: 06/05/2019	Photo Coordinates		Lat	46.2786	Long	-111.939697	Direction Photo Taken: 6.52655792555416		Description: Location of sample CD-SW/SW-BK01		
Photo No. 1	Date: 06/05/2019												
Photo Coordinates													
Lat	46.2786												
Long	-111.939697												
Direction Photo Taken: 6.52655792555416													
Description: Location of sample CD-SW/SW-BK01													
<table> <tr> <td>Photo No. 2</td><td>Date: 09/10/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.278917</td></tr> <tr> <td>Long</td><td>-111.939614</td></tr> <tr> <td colspan="2">Direction Photo Taken: 42.45266723116</td></tr> <tr> <td colspan="2">Description: Location of sample CD-SD-BK01</td></tr> </table>	Photo No. 2	Date: 09/10/2019	Photo Coordinates		Lat	46.278917	Long	-111.939614	Direction Photo Taken: 42.45266723116		Description: Location of sample CD-SD-BK01		
Photo No. 2	Date: 09/10/2019												
Photo Coordinates													
Lat	46.278917												
Long	-111.939614												
Direction Photo Taken: 42.45266723116													
Description: Location of sample CD-SD-BK01													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 3</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.277458</td></tr> <tr> <td>Long</td><td>-111.941108</td></tr> <tr> <td colspan="2">Direction Photo Taken: 13.2999114932356</td></tr> <tr> <td colspan="2">Description: Location of sample CD-SW/SD-01</td></tr> </table>	Photo No. 3	Date: 06/05/2019	Photo Coordinates		Lat	46.277458	Long	-111.941108	Direction Photo Taken: 13.2999114932356		Description: Location of sample CD-SW/SD-01		
Photo No. 3	Date: 06/05/2019												
Photo Coordinates													
Lat	46.277458												
Long	-111.941108												
Direction Photo Taken: 13.2999114932356													
Description: Location of sample CD-SW/SD-01													
<table> <tr> <td>Photo No. 4</td><td>Date: 09/10/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.277642</td></tr> <tr> <td>Long</td><td>-111.941008</td></tr> <tr> <td colspan="2">Direction Photo Taken: 338.838913148957</td></tr> <tr> <td colspan="2">Description: Location of sample CD-SD-01 – Note the dry creek bed</td></tr> </table>	Photo No. 4	Date: 09/10/2019	Photo Coordinates		Lat	46.277642	Long	-111.941008	Direction Photo Taken: 338.838913148957		Description: Location of sample CD-SD-01 – Note the dry creek bed		
Photo No. 4	Date: 09/10/2019												
Photo Coordinates													
Lat	46.277642												
Long	-111.941008												
Direction Photo Taken: 338.838913148957													
Description: Location of sample CD-SD-01 – Note the dry creek bed													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 5</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.290124</td></tr> <tr> <td>Long</td><td>-111.933673</td></tr> <tr> <td colspan="2">Direction Photo Taken: 161.3</td></tr> <tr> <td colspan="2"> Description: Screening for background location sample CD-SO-BK01 </td></tr> </table>	Photo No. 5	Date: 06/04/2019	Photo Coordinates		Lat	46.290124	Long	-111.933673	Direction Photo Taken: 161.3		Description: Screening for background location sample CD-SO-BK01		
Photo No. 5	Date: 06/04/2019												
Photo Coordinates													
Lat	46.290124												
Long	-111.933673												
Direction Photo Taken: 161.3													
Description: Screening for background location sample CD-SO-BK01													
<table> <tr> <td>Photo No. 6</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.290124</td></tr> <tr> <td>Long</td><td>-111.933673</td></tr> <tr> <td colspan="2">Direction Photo Taken: 127.3</td></tr> <tr> <td colspan="2"> Description: Collection of sample CD-SO-BK02 </td></tr> </table>	Photo No. 6	Date: 06/04/2019	Photo Coordinates		Lat	46.290124	Long	-111.933673	Direction Photo Taken: 127.3		Description: Collection of sample CD-SO-BK02		
Photo No. 6	Date: 06/04/2019												
Photo Coordinates													
Lat	46.290124												
Long	-111.933673												
Direction Photo Taken: 127.3													
Description: Collection of sample CD-SO-BK02													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table border="1"> <tr> <td>Photo No. 7</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.288625</td></tr> <tr> <td>Long</td><td>-111.933929</td></tr> <tr> <td colspan="2">Direction Photo Taken: 243.72</td></tr> <tr> <td colspan="2">Description: Showing 5-point composite locations for sample CD-WR-01</td></tr> </table>	Photo No. 7	Date: 06/04/2019	Photo Coordinates		Lat	46.288625	Long	-111.933929	Direction Photo Taken: 243.72		Description: Showing 5-point composite locations for sample CD-WR-01		
Photo No. 7	Date: 06/04/2019												
Photo Coordinates													
Lat	46.288625												
Long	-111.933929												
Direction Photo Taken: 243.72													
Description: Showing 5-point composite locations for sample CD-WR-01													
<table border="1"> <tr> <td>Photo No. 8</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.288618</td></tr> <tr> <td>Long</td><td>-111.933975</td></tr> <tr> <td colspan="2">Direction Photo Taken: 210.56</td></tr> <tr> <td colspan="2">Description: Location of sample CD-WR-02</td></tr> </table>	Photo No. 8	Date: 06/04/2019	Photo Coordinates		Lat	46.288618	Long	-111.933975	Direction Photo Taken: 210.56		Description: Location of sample CD-WR-02		
Photo No. 8	Date: 06/04/2019												
Photo Coordinates													
Lat	46.288618												
Long	-111.933975												
Direction Photo Taken: 210.56													
Description: Location of sample CD-WR-02													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 9</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.288669</td></tr> <tr> <td>Long</td><td>-111.934364</td></tr> <tr> <td colspan="2">Direction Photo Taken: 153.148139946856</td></tr> <tr> <td colspan="2"> Description: Showing 5-point composite locations for sample CD-WR-03 </td></tr> </table>	Photo No. 9	Date: 06/05/2019	Photo Coordinates		Lat	46.288669	Long	-111.934364	Direction Photo Taken: 153.148139946856		Description: Showing 5-point composite locations for sample CD-WR-03		
Photo No. 9	Date: 06/05/2019												
Photo Coordinates													
Lat	46.288669												
Long	-111.934364												
Direction Photo Taken: 153.148139946856													
Description: Showing 5-point composite locations for sample CD-WR-03													
<table> <tr> <td>Photo No. 10</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.288588</td></tr> <tr> <td>Long</td><td>-111.934292</td></tr> <tr> <td colspan="2">Direction Photo Taken: 103.23</td></tr> <tr> <td colspan="2"> Description: Location of sample CD-WR-04 </td></tr> </table>	Photo No. 10	Date: 06/05/2019	Photo Coordinates		Lat	46.288588	Long	-111.934292	Direction Photo Taken: 103.23		Description: Location of sample CD-WR-04		
Photo No. 10	Date: 06/05/2019												
Photo Coordinates													
Lat	46.288588												
Long	-111.934292												
Direction Photo Taken: 103.23													
Description: Location of sample CD-WR-04													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 11</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.288558</td></tr> <tr> <td>Long</td><td>-111.934128</td></tr> <tr> <td colspan="2">Direction Photo Taken: 115.256141763995</td></tr> <tr> <td colspan="2">Description: Showing 5-point composite locations for sample CD-WR-05</td></tr> </table>	Photo No. 11	Date: 06/05/2019	Photo Coordinates		Lat	46.288558	Long	-111.934128	Direction Photo Taken: 115.256141763995		Description: Showing 5-point composite locations for sample CD-WR-05		
Photo No. 11	Date: 06/05/2019												
Photo Coordinates													
Lat	46.288558												
Long	-111.934128												
Direction Photo Taken: 115.256141763995													
Description: Showing 5-point composite locations for sample CD-WR-05													
<table> <tr> <td>Photo No. 12</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.288517</td></tr> <tr> <td>Long</td><td>-111.93399</td></tr> <tr> <td colspan="2">Direction Photo Taken: 170.37</td></tr> <tr> <td colspan="2">Description: Location of sample CD-WR-06</td></tr> </table>	Photo No. 12	Date: 06/05/2019	Photo Coordinates		Lat	46.288517	Long	-111.93399	Direction Photo Taken: 170.37		Description: Location of sample CD-WR-06		
Photo No. 12	Date: 06/05/2019												
Photo Coordinates													
Lat	46.288517												
Long	-111.93399												
Direction Photo Taken: 170.37													
Description: Location of sample CD-WR-06													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 13</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.288536</td></tr> <tr> <td>Long</td><td>-111.934578</td></tr> <tr> <td colspan="2">Direction Photo Taken: 107.636213311286</td></tr> <tr> <td colspan="2"> Description: Showing 5-point composite locations for sample CD-WR-07 </td></tr> </table>	Photo No. 13	Date: 06/05/2019	Photo Coordinates		Lat	46.288536	Long	-111.934578	Direction Photo Taken: 107.636213311286		Description: Showing 5-point composite locations for sample CD-WR-07		
Photo No. 13	Date: 06/05/2019												
Photo Coordinates													
Lat	46.288536												
Long	-111.934578												
Direction Photo Taken: 107.636213311286													
Description: Showing 5-point composite locations for sample CD-WR-07													
<table> <tr> <td>Photo No. 14</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.288482</td></tr> <tr> <td>Long</td><td>-111.934593</td></tr> <tr> <td colspan="2">Direction Photo Taken: 96.45</td></tr> <tr> <td colspan="2"> Description: Location of sample CD-WR-08 </td></tr> </table>	Photo No. 14	Date: 06/05/2019	Photo Coordinates		Lat	46.288482	Long	-111.934593	Direction Photo Taken: 96.45		Description: Location of sample CD-WR-08		
Photo No. 14	Date: 06/05/2019												
Photo Coordinates													
Lat	46.288482												
Long	-111.934593												
Direction Photo Taken: 96.45													
Description: Location of sample CD-WR-08													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 15		Date: 06/05/2019	
Photo Coordinates			
Lat	46.288351		
Long	-111.934343		
Direction Photo Taken: 165.01			
Description: Screening of 5-point composite locations for sample CD-WR-09			

Photo No. 16		Date: 06/05/2019	
Photo Coordinates			
Lat	46.288422		
Long	-111.934255		
Direction Photo Taken: 129.79			
Description: Location of sample CD-WR-10			

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 17</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.289161</td></tr> <tr> <td>Long</td><td>-111.934494</td></tr> <tr> <td colspan="2">Direction Photo Taken: 107.900749208311</td></tr> <tr> <td colspan="2"> Description: Screening of 5-point composite locations for sample CD-WR-11 and duplicate sample CD-WR-13 </td></tr> </table>	Photo No. 17	Date: 06/04/2019	Photo Coordinates		Lat	46.289161	Long	-111.934494	Direction Photo Taken: 107.900749208311		Description: Screening of 5-point composite locations for sample CD-WR-11 and duplicate sample CD-WR-13		
Photo No. 17	Date: 06/04/2019												
Photo Coordinates													
Lat	46.289161												
Long	-111.934494												
Direction Photo Taken: 107.900749208311													
Description: Screening of 5-point composite locations for sample CD-WR-11 and duplicate sample CD-WR-13													
<table> <tr> <td>Photo No. 18</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.289122</td></tr> <tr> <td>Long</td><td>-111.934486</td></tr> <tr> <td colspan="2">Direction Photo Taken: 236.791580400276</td></tr> <tr> <td colspan="2"> Description: Location of grab sample CD-WR-12 and duplicate sample CD-WR-14 </td></tr> </table>	Photo No. 18	Date: 06/04/2019	Photo Coordinates		Lat	46.289122	Long	-111.934486	Direction Photo Taken: 236.791580400276		Description: Location of grab sample CD-WR-12 and duplicate sample CD-WR-14		
Photo No. 18	Date: 06/04/2019												
Photo Coordinates													
Lat	46.289122												
Long	-111.934486												
Direction Photo Taken: 236.791580400276													
Description: Location of grab sample CD-WR-12 and duplicate sample CD-WR-14													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 19	Date: 06/04/2019
Photo Coordinates	
Lat	46.290131
Long	-111.9336
Direction Photo Taken: 23.2333526626075	
Description: Mining claim near background soil samples CD-WR-BK01/02	



Photo No. 20	Date: 06/03/2019
Photo Coordinates	
Lat	46.264344
Long	-111.956008
Direction Photo Taken: 333.66383744856	
Description: Probable point of entry from Elkhorn Creek Tailings site	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 21	Date: 09/10/2019
Photo Coordinates	
Lat	46.2688
Long	-111.954644
Direction Photo Taken: 58.9137268599371	
Description: Elkhorn Creek Tailings pile	



Photo No. 22	Date: 09/10/2019
Photo Coordinates	
Lat	46.2688
Long	-111.954644
Direction Photo Taken: 46.525146484375	
Description: Elkhorn Creek Tailings pile near the creek	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 23</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.270182</td></tr> <tr> <td>Long</td><td>-111.953176</td></tr> <tr> <td colspan="2">Direction Photo Taken: 94.58</td></tr> <tr> <td colspan="2">Description: Location of sample ECT-SD-BK01</td></tr> </table>	Photo No. 23	Date: 06/03/2019	Photo Coordinates		Lat	46.270182	Long	-111.953176	Direction Photo Taken: 94.58		Description: Location of sample ECT-SD-BK01		
Photo No. 23	Date: 06/03/2019												
Photo Coordinates													
Lat	46.270182												
Long	-111.953176												
Direction Photo Taken: 94.58													
Description: Location of sample ECT-SD-BK01													
<table> <tr> <td>Photo No. 24</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.270186</td></tr> <tr> <td>Long</td><td>-111.95313</td></tr> <tr> <td colspan="2">Direction Photo Taken: 203.93</td></tr> <tr> <td colspan="2">Description: Location of sample ECT-SW-BK01</td></tr> </table>	Photo No. 24	Date: 06/03/2019	Photo Coordinates		Lat	46.270186	Long	-111.95313	Direction Photo Taken: 203.93		Description: Location of sample ECT-SW-BK01		
Photo No. 24	Date: 06/03/2019												
Photo Coordinates													
Lat	46.270186												
Long	-111.95313												
Direction Photo Taken: 203.93													
Description: Location of sample ECT-SW-BK01													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 25	Date: 09/10/2019
Photo Coordinates	
Lat	46.270061
Long	-111.953514
Direction Photo Taken: 130.385257806826	
Description: Location of sample ECT-SW/SD-BK01	



Photo No. 26	Date: 06/03/2019
Photo Coordinates	
Lat	46.268692
Long	-111.954755
Direction Photo Taken: 314.35	
Description: Location of sample ECT-SW-01	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table border="1"> <tr> <td>Photo No. 27</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.268684</td></tr> <tr> <td>Long</td><td>-111.954787</td></tr> <tr> <td colspan="2">Direction Photo Taken: 221.72</td></tr> <tr> <td colspan="2">Description: Location of sample ECT-SD-01</td></tr> </table>	Photo No. 27	Date: 06/03/2019	Photo Coordinates		Lat	46.268684	Long	-111.954787	Direction Photo Taken: 221.72		Description: Location of sample ECT-SD-01		
Photo No. 27	Date: 06/03/2019												
Photo Coordinates													
Lat	46.268684												
Long	-111.954787												
Direction Photo Taken: 221.72													
Description: Location of sample ECT-SD-01													
<table border="1"> <tr> <td>Photo No. 28</td><td>Date: 09/10/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.268569</td></tr> <tr> <td>Long</td><td>-111.954619</td></tr> <tr> <td colspan="2">Direction Photo Taken: 330.997268692386</td></tr> <tr> <td colspan="2">Description: Location of sample ECT-SW/SD-01</td></tr> </table>	Photo No. 28	Date: 09/10/2019	Photo Coordinates		Lat	46.268569	Long	-111.954619	Direction Photo Taken: 330.997268692386		Description: Location of sample ECT-SW/SD-01		
Photo No. 28	Date: 09/10/2019												
Photo Coordinates													
Lat	46.268569												
Long	-111.954619												
Direction Photo Taken: 330.997268692386													
Description: Location of sample ECT-SW/SD-01													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 29	Date: 06/03/2019
Photo Coordinates	
Lat	46.263669
Long	-111.956519
Direction Photo Taken: 356.836807320793	
Description: Location of sample ECT-SW/SD-03 in wetland below tailings pile and most downstream probably point of entry	



Photo No. 30	Date: 06/03/2019
Photo Coordinates	
Lat	46.263814
Long	-111.956519
Direction Photo Taken: 187.640868974881	
Description: Collecting sample ECT-SW/SD-03; downstream of tailings pile in wetland	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 31	Date: 09/10/2019
Photo Coordinates	
Lat	46.263775
Long	-111.956725
Direction Photo Taken: 351.075591985428	
Description: Location of ECT-SW/SD-03 and ECT-SW/SD-05 (duplicate sample)	



Photo No. 32	Date: 06/03/2019
Photo Coordinates	
Lat	46.260958
Long	-111.957314
Direction Photo Taken: 9.2065734910152	
Description: Location of sample ECT-SW/SD-04	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 33	Date: 09/10/2019
Photo Coordinates	
Lat	46.273728
Long	-111.975931
Direction Photo Taken: 35.720703125	
Description: Location of sample ECT-SW/SD-04	



Photo No. 34	Date: 06/03/2019
Photo Coordinates	
Lat	46.266372
Long	-111.956847
Direction Photo Taken: 228.247497725205	
Description: Location of background grab sample ECT-SO-BK02	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 35	Date: 06/04/2019
Photo Coordinates	
Lat	46.266664
Long	-111.955458
Direction Photo Taken: 272.106527093596	
Description: Location of opportunity grab sample ECT-SO-OP-01; photo taken standing on bank of Elkhorn Creek	



Photo No. 36	Date: 06/03/2019
Photo Coordinates	
Lat	46.269008
Long	-111.953925
Direction Photo Taken: 284.803973192915	
Description: Collecting aliquots for 30-point composite sample ECT-WR-01	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table border="1"> <tr> <td>Photo No. 37</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.269174</td></tr> <tr> <td>Long</td><td>-111.954446</td></tr> <tr> <td colspan="2">Direction Photo Taken: 18.62</td></tr> <tr> <td colspan="2"> Description: Showing 30-point composite locations for sample ECT-WR-01 </td></tr> </table>	Photo No. 37	Date: 06/03/2019	Photo Coordinates		Lat	46.269174	Long	-111.954446	Direction Photo Taken: 18.62		Description: Showing 30-point composite locations for sample ECT-WR-01		
Photo No. 37	Date: 06/03/2019												
Photo Coordinates													
Lat	46.269174												
Long	-111.954446												
Direction Photo Taken: 18.62													
Description: Showing 30-point composite locations for sample ECT-WR-01													
<table border="1"> <tr> <td>Photo No. 38</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.266369</td></tr> <tr> <td>Long</td><td>-111.956069</td></tr> <tr> <td colspan="2">Direction Photo Taken: 332.837658017299</td></tr> <tr> <td colspan="2"> Description: Location of sample ECT-WR-04 in the Elkhorn Creek Tailings impoundment </td></tr> </table>	Photo No. 38	Date: 06/03/2019	Photo Coordinates		Lat	46.266369	Long	-111.956069	Direction Photo Taken: 332.837658017299		Description: Location of sample ECT-WR-04 in the Elkhorn Creek Tailings impoundment		
Photo No. 38	Date: 06/03/2019												
Photo Coordinates													
Lat	46.266369												
Long	-111.956069												
Direction Photo Taken: 332.837658017299													
Description: Location of sample ECT-WR-04 in the Elkhorn Creek Tailings impoundment													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 39</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.264622</td></tr> <tr> <td>Long</td><td>-111.956628</td></tr> <tr> <td colspan="2">Direction Photo Taken: 353.141891476679</td></tr> <tr> <td colspan="2"> Description: Screening of 30-point composite location for sample ECT-WR-05 </td></tr> </table>	Photo No. 39	Date: 06/03/2019	Photo Coordinates		Lat	46.264622	Long	-111.956628	Direction Photo Taken: 353.141891476679		Description: Screening of 30-point composite location for sample ECT-WR-05		
Photo No. 39	Date: 06/03/2019												
Photo Coordinates													
Lat	46.264622												
Long	-111.956628												
Direction Photo Taken: 353.141891476679													
Description: Screening of 30-point composite location for sample ECT-WR-05													
<table> <tr> <td>Photo No. 40</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.29152</td></tr> <tr> <td>Long</td><td>-111.942376</td></tr> <tr> <td colspan="2">Direction Photo Taken: 329</td></tr> <tr> <td colspan="2"> Description: Location of UE-SW/SD-BK01; upstream of creek-road crossing </td></tr> </table>	Photo No. 40	Date: 06/05/2019	Photo Coordinates		Lat	46.29152	Long	-111.942376	Direction Photo Taken: 329		Description: Location of UE-SW/SD-BK01; upstream of creek-road crossing		
Photo No. 40	Date: 06/05/2019												
Photo Coordinates													
Lat	46.29152												
Long	-111.942376												
Direction Photo Taken: 329													
Description: Location of UE-SW/SD-BK01; upstream of creek-road crossing													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 41	Date: 09/10/2019
Photo Coordinates	
Lat	46.291436
Long	-111.942361
Direction Photo Taken: 47.6089171974522	
Description: Location of UE-SW/SD-BK01; upstream of creek-road crossing	



Photo No. 42	Date: 06/05/2019
Photo Coordinates	
Lat	46.290928
Long	-111.942629
Direction Photo Taken: 334.47	
Description: Location of sample UE-SW/SD-01	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 43	Date: 09/10/2019
Photo Coordinates	
Lat	46.290803
Long	-111.942514
Direction Photo Taken: 22.2747802734375	
Description: Location of sample UE-SW/SD-01	



Photo No. 44	Date: 09/10/2019
Photo Coordinates	
Lat	46.283333
Long	-111.944228
Direction Photo Taken: 330.779723991507	
Description: Top of steep terrain prior to the cliff for location UE-SW/SD-02	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table border="1"> <tr> <td>Photo No. 45</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.29145</td></tr> <tr> <td>Long</td><td>-111.942694</td></tr> <tr> <td colspan="2">Direction Photo Taken: 253.614593535749</td></tr> <tr> <td colspan="2"> Description: Collecting sample UE-SW-04 from the drain pipe exiting the adit. </td></tr> </table>	Photo No. 45	Date: 06/05/2019	Photo Coordinates		Lat	46.29145	Long	-111.942694	Direction Photo Taken: 253.614593535749		Description: Collecting sample UE-SW-04 from the drain pipe exiting the adit.		
Photo No. 45	Date: 06/05/2019												
Photo Coordinates													
Lat	46.29145												
Long	-111.942694												
Direction Photo Taken: 253.614593535749													
Description: Collecting sample UE-SW-04 from the drain pipe exiting the adit.													
<table border="1"> <tr> <td>Photo No. 46</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.291671</td></tr> <tr> <td>Long</td><td>-111.942393</td></tr> <tr> <td colspan="2">Direction Photo Taken: 277.33</td></tr> <tr> <td colspan="2"> Description: Screening 5-point background composite locations for sample UE-SO-BK01 </td></tr> </table>	Photo No. 46	Date: 06/05/2019	Photo Coordinates		Lat	46.291671	Long	-111.942393	Direction Photo Taken: 277.33		Description: Screening 5-point background composite locations for sample UE-SO-BK01		
Photo No. 46	Date: 06/05/2019												
Photo Coordinates													
Lat	46.291671												
Long	-111.942393												
Direction Photo Taken: 277.33													
Description: Screening 5-point background composite locations for sample UE-SO-BK01													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 47	Date: 06/05/2019
Photo Coordinates	
Lat	46.291592
Long	-111.943261
Direction Photo Taken: 137.904384574749	
Description: Screening of 5-point composite locations for sample UE-WR-01	



Photo No. 48	Date: 06/05/2019
Photo Coordinates	
Lat	46.291508
Long	-111.943208
Direction Photo Taken: 236.42	
Description: Location of sample UE-WR-02	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 49	Date: 06/05/2019
Photo Coordinates	
Lat	46.291408
Long	-111.943375
Direction Photo Taken: 152.935104364326	
Description: Screening 5-point composite locations for sample UE-WR-03	



Photo No. 50	Date: 06/05/2019
Photo Coordinates	
Lat	46.291454
Long	-111.943242
Direction Photo Taken: 21.15	
Description: Location of sample UE-WR-04	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table border="1"> <tr> <td>Photo No. 51</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.291178</td></tr> <tr> <td>Long</td><td>-111.942528</td></tr> <tr> <td colspan="2">Direction Photo Taken: 170.28</td></tr> <tr> <td colspan="2">Description: Showing 5-point composite location for sample UE-WR-05</td></tr> </table>	Photo No. 51	Date: 06/05/2019	Photo Coordinates		Lat	46.291178	Long	-111.942528	Direction Photo Taken: 170.28		Description: Showing 5-point composite location for sample UE-WR-05		
Photo No. 51	Date: 06/05/2019												
Photo Coordinates													
Lat	46.291178												
Long	-111.942528												
Direction Photo Taken: 170.28													
Description: Showing 5-point composite location for sample UE-WR-05													
<table border="1"> <tr> <td>Photo No. 52</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.291178</td></tr> <tr> <td>Long</td><td>-111.942527</td></tr> <tr> <td colspan="2">Direction Photo Taken: 305.3</td></tr> <tr> <td colspan="2">Description: Location of sample UE-WR-06</td></tr> </table>	Photo No. 52	Date: 06/05/2019	Photo Coordinates		Lat	46.291178	Long	-111.942527	Direction Photo Taken: 305.3		Description: Location of sample UE-WR-06		
Photo No. 52	Date: 06/05/2019												
Photo Coordinates													
Lat	46.291178												
Long	-111.942527												
Direction Photo Taken: 305.3													
Description: Location of sample UE-WR-06													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 53</td><td>Date: 09/12/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.279747</td></tr> <tr> <td>Long</td><td>-111.971419</td></tr> <tr> <td colspan="2">Direction Photo Taken: 18.8727722128268</td></tr> <tr> <td colspan="2">Description: Greyback Gulch confluence with an unnamed tributary</td></tr> </table>	Photo No. 53	Date: 09/12/2019	Photo Coordinates		Lat	46.279747	Long	-111.971419	Direction Photo Taken: 18.8727722128268		Description: Greyback Gulch confluence with an unnamed tributary		
Photo No. 53	Date: 09/12/2019												
Photo Coordinates													
Lat	46.279747												
Long	-111.971419												
Direction Photo Taken: 18.8727722128268													
Description: Greyback Gulch confluence with an unnamed tributary													
<table> <tr> <td>Photo No. 54</td><td>Date: 09/12/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.280731</td></tr> <tr> <td>Long</td><td>-111.969519</td></tr> <tr> <td colspan="2">Direction Photo Taken: 185.753082191781</td></tr> <tr> <td colspan="2">Description: The road to Greyback Gulch</td></tr> </table>	Photo No. 54	Date: 09/12/2019	Photo Coordinates		Lat	46.280731	Long	-111.969519	Direction Photo Taken: 185.753082191781		Description: The road to Greyback Gulch		
Photo No. 54	Date: 09/12/2019												
Photo Coordinates													
Lat	46.280731												
Long	-111.969519												
Direction Photo Taken: 185.753082191781													
Description: The road to Greyback Gulch													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 55	Date: 09/12/2019
Photo Coordinates	
Lat	46.280628
Long	-111.969392
Direction Photo Taken: 120.577802565533	
Description: Location of sample GG-SW/SD-01	



Photo No. 56	Date: 09/12/2019
Photo Coordinates	
Lat	46.280706
Long	-111.970214
Direction Photo Taken: 207.638794084187	
Description: Location of sample GG-SW/SD-02	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 57	Date: 09/12/2019
Photo Coordinates	
Lat	46.279628
Long	-111.971656
Direction Photo Taken: 17.4432983398438	
Description: Location of sample GG-SW/SD-03	



Photo No. 58	Date: 06/04/2019
Photo Coordinates	
Lat	46.271418
Long	-111.973614
Direction Photo Taken: 8.16	
Description: Location of Turnley Creek background sample THL-SW/SD-BK01	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table border="1"> <tr> <td>Photo No. 59</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.271468</td></tr> <tr> <td>Long</td><td>-111.973635</td></tr> <tr> <td colspan="2">Direction Photo Taken: 349.53</td></tr> <tr> <td colspan="2">Description: Collection of sample THL-SW-BK01</td></tr> </table>	Photo No. 59	Date: 06/04/2019	Photo Coordinates		Lat	46.271468	Long	-111.973635	Direction Photo Taken: 349.53		Description: Collection of sample THL-SW-BK01		
Photo No. 59	Date: 06/04/2019												
Photo Coordinates													
Lat	46.271468												
Long	-111.973635												
Direction Photo Taken: 349.53													
Description: Collection of sample THL-SW-BK01													
<table border="1"> <tr> <td>Photo No. 60</td><td>Date: 09/09/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.273708</td></tr> <tr> <td>Long</td><td>-111.975931</td></tr> <tr> <td colspan="2">Direction Photo Taken: 41.5195922989807</td></tr> <tr> <td colspan="2">Description: Collection of sample THL-SW-BK01</td></tr> </table>	Photo No. 60	Date: 09/09/2019	Photo Coordinates		Lat	46.273708	Long	-111.975931	Direction Photo Taken: 41.5195922989807		Description: Collection of sample THL-SW-BK01		
Photo No. 60	Date: 09/09/2019												
Photo Coordinates													
Lat	46.273708												
Long	-111.975931												
Direction Photo Taken: 41.5195922989807													
Description: Collection of sample THL-SW-BK01													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 61		Date: 06/04/2019	
Photo Coordinates			
Lat		46.270388	
Long		-111.970329	
Direction Photo Taken: 48.29			
Description: Location of sample THL-SW/SD-01			

Photo No. 62		Date: 09/09/2019	
Photo Coordinates			
Lat		46.270561	
Long		-111.970397	
Direction Photo Taken: 43.8460388183594			
Description: Location of sample THL-SW/SD-01			

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 63</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.268952</td></tr> <tr> <td>Long</td><td>-111.968611</td></tr> <tr> <td colspan="2">Direction Photo Taken: 33.62</td></tr> <tr> <td colspan="2">Description: Location of sample THL-SW/SD-02</td></tr> </table>	Photo No. 63	Date: 06/04/2019	Photo Coordinates		Lat	46.268952	Long	-111.968611	Direction Photo Taken: 33.62		Description: Location of sample THL-SW/SD-02		
Photo No. 63	Date: 06/04/2019												
Photo Coordinates													
Lat	46.268952												
Long	-111.968611												
Direction Photo Taken: 33.62													
Description: Location of sample THL-SW/SD-02													
<table> <tr> <td>Photo No. 64</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.268977</td></tr> <tr> <td>Long</td><td>-111.968595</td></tr> <tr> <td colspan="2">Direction Photo Taken: 49</td></tr> <tr> <td colspan="2">Description: Collection of sample THL-SD-02</td></tr> </table>	Photo No. 64	Date: 06/04/2019	Photo Coordinates		Lat	46.268977	Long	-111.968595	Direction Photo Taken: 49		Description: Collection of sample THL-SD-02		
Photo No. 64	Date: 06/04/2019												
Photo Coordinates													
Lat	46.268977												
Long	-111.968595												
Direction Photo Taken: 49													
Description: Collection of sample THL-SD-02													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 65</td><td>Date: 09/09/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.268739</td></tr> <tr> <td>Long</td><td>-111.968436</td></tr> <tr> <td colspan="2">Direction Photo Taken: 24.7331237590999</td></tr> <tr> <td colspan="2">Description: Location of sample THL-SW/SD-02</td></tr> </table>	Photo No. 65	Date: 09/09/2019	Photo Coordinates		Lat	46.268739	Long	-111.968436	Direction Photo Taken: 24.7331237590999		Description: Location of sample THL-SW/SD-02		
Photo No. 65	Date: 09/09/2019												
Photo Coordinates													
Lat	46.268739												
Long	-111.968436												
Direction Photo Taken: 24.7331237590999													
Description: Location of sample THL-SW/SD-02													
<table> <tr> <td>Photo No. 66</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.258436</td></tr> <tr> <td>Long</td><td>-111.962721</td></tr> <tr> <td colspan="2">Direction Photo Taken: 59.8</td></tr> <tr> <td colspan="2">Description: Location of sample THL-SW/SD-03</td></tr> </table>	Photo No. 66	Date: 06/04/2019	Photo Coordinates		Lat	46.258436	Long	-111.962721	Direction Photo Taken: 59.8		Description: Location of sample THL-SW/SD-03		
Photo No. 66	Date: 06/04/2019												
Photo Coordinates													
Lat	46.258436												
Long	-111.962721												
Direction Photo Taken: 59.8													
Description: Location of sample THL-SW/SD-03													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 67		Date: 06/04/2019	
Photo Coordinates			
Lat	46.258377		
Long	-111.962764		
Direction Photo Taken: 75.06			
Description: Collection of sample THL-SD-03			

Photo No. 68		Date: 09/09/2019	
Photo Coordinates			
Lat	46.258228		
Long	-111.962647		
Direction Photo Taken: 307.304092382496			
Description: Location of sample THL-SW/SD-03			

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 69</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.268573</td></tr> <tr> <td>Long</td><td>-111.973945</td></tr> <tr> <td colspan="2">Direction Photo Taken: 278.9</td></tr> <tr> <td colspan="2"> Description: Showing 5-point background composite locations for sample THL-SO-BK01 </td></tr> </table>	Photo No. 69	Date: 06/04/2019	Photo Coordinates		Lat	46.268573	Long	-111.973945	Direction Photo Taken: 278.9		Description: Showing 5-point background composite locations for sample THL-SO-BK01		
Photo No. 69	Date: 06/04/2019												
Photo Coordinates													
Lat	46.268573												
Long	-111.973945												
Direction Photo Taken: 278.9													
Description: Showing 5-point background composite locations for sample THL-SO-BK01													
<table> <tr> <td>Photo No. 70</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.268577</td></tr> <tr> <td>Long</td><td>-111.973972</td></tr> <tr> <td colspan="2">Direction Photo Taken: 277.36</td></tr> <tr> <td colspan="2"> Description: Showing 5-point background composite locations for sample THL-SO-BK01 </td></tr> </table>	Photo No. 70	Date: 06/04/2019	Photo Coordinates		Lat	46.268577	Long	-111.973972	Direction Photo Taken: 277.36		Description: Showing 5-point background composite locations for sample THL-SO-BK01		
Photo No. 70	Date: 06/04/2019												
Photo Coordinates													
Lat	46.268577												
Long	-111.973972												
Direction Photo Taken: 277.36													
Description: Showing 5-point background composite locations for sample THL-SO-BK01													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 71	Date: 06/04/2019	
Photo Coordinates		
Lat	46.268648	
Long	-111.972503	
Direction Photo Taken: 235.07		
Description: Showing 30-point composite locations for sample THL-WR-01		
Photo No. 72	Date: 06/04/2019	
Photo Coordinates		
Lat	46.268966	
Long	-111.972193	
Direction Photo Taken: 273.13		
Description: Location of sample THL-WR-02		

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 73	Date: 09/11/2019
Photo Coordinates	
Lat	46.289692
Long	-111.889389
Direction Photo Taken: 22.0534973097617	
Description: Skyline Mine adit and tailings pile	



Photo No. 74	Date: 09/11/2019
Photo Coordinates	
Lat	46.289517
Long	-111.889283
Direction Photo Taken: 348.09033203125	
Description: Skyline Mine adit, tailings pile, and the creek	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 75	Date: 09/11/2019
Photo Coordinates	
Lat	46.289714
Long	-111.889442
Direction Photo Taken: 330.173950299914	
Description: Skyline Mine upper adit	



Photo No. 76	Date: 09/11/2019
Photo Coordinates	
Lat	46.290433
Long	-111.890244
Direction Photo Taken: 129.084610027855	
Description: Skyline Mine upper tailings pile and mine adit	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 77	Date: 09/11/2019
Photo Coordinates	
Lat	46.290428
Long	-111.889161
Direction Photo Taken: 311.027496382055	
Description: The road to Skyline Mine cut through the tailings pile	



Photo No. 78	Date: 09/11/2019
Photo Coordinates	
Lat	46.290383
Long	-111.88865
Direction Photo Taken: 34.1156616297133	
Description: Location of sample SM-SD-BK01 and SM-SD-BK02	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 79	Date: 09/11/2019
Photo Coordinates	
Lat	46.2906
Long	-111.889367
Direction Photo Taken: 12.1148986889154	
Description: Location of sample SM-SW-BK01	



Photo No. 80	Date: 09/11/2019
Photo Coordinates	
Lat	46.289439
Long	-111.889153
Direction Photo Taken: 258.138168343039	
Description: Location of sample SM-SW/SD-01	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 81	Date: 09/11/2019
Photo Coordinates	
Lat	46.289422
Long	-111.889131
Direction Photo Taken: 316.475387727579	
Description: Location of sample SM-SW/SD-02	



Photo No. 82	Date: 09/11/2019
Photo Coordinates	
Lat	46.288575
Long	-111.888322
Direction Photo Taken: 44.306243902439	
Description: Location of sample SM-SW/SD-03	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 83</td><td>Date: 09/11/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.283342</td></tr> <tr> <td>Long</td><td>-111.944236</td></tr> <tr> <td colspan="2">Direction Photo Taken: 234.68338028169</td></tr> <tr> <td colspan="2">Description: Location of sample SM-SW/SD-04</td></tr> </table>	Photo No. 83	Date: 09/11/2019	Photo Coordinates		Lat	46.283342	Long	-111.944236	Direction Photo Taken: 234.68338028169		Description: Location of sample SM-SW/SD-04		
Photo No. 83	Date: 09/11/2019												
Photo Coordinates													
Lat	46.283342												
Long	-111.944236												
Direction Photo Taken: 234.68338028169													
Description: Location of sample SM-SW/SD-04													
<table> <tr> <td>Photo No. 84</td><td>Date: 09/11/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.289539</td></tr> <tr> <td>Long</td><td>-111.889228</td></tr> <tr> <td colspan="2">Direction Photo Taken: 108.904270164666</td></tr> <tr> <td colspan="2">Description: Location of sample SM-WR-08</td></tr> </table>	Photo No. 84	Date: 09/11/2019	Photo Coordinates		Lat	46.289539	Long	-111.889228	Direction Photo Taken: 108.904270164666		Description: Location of sample SM-WR-08		
Photo No. 84	Date: 09/11/2019												
Photo Coordinates													
Lat	46.289539												
Long	-111.889228												
Direction Photo Taken: 108.904270164666													
Description: Location of sample SM-WR-08													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 85	Date: 06/04/2019
Photo Coordinates	
Lat	46.259864
Long	-111.9479
Direction Photo Taken: 1.13213348331459	
Description: Waste pile located southwest of adit opening. Fire pit on top of pile.	



Photo No. 86	Date: 06/04/2019
Photo Coordinates	
Lat	46.260842
Long	-111.945625
Direction Photo Taken: 225.688201892744	
Description: Location of sample BM-SW/SD-BK01; upstream of creek-road crossing	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 87	Date: 09/09/2019
Photo Coordinates	
Lat	46.260722
Long	-111.945633
Direction Photo Taken: 320.865539452496	
Description: Location of sample BM-SW/SD-BK01	



Photo No. 88	Date: 06/04/2019
Photo Coordinates	
Lat	46.259419
Long	-111.948625
Direction Photo Taken: 353.359047078843	
Description: Location of sample BM-SW/SD-01; downstream of probable point of entry from Boulaway mine	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 89	Date: 06/04/2019
Photo Coordinates	
Lat	46.259369
Long	-111.948669
Direction Photo Taken: 15.2042007449219	
Description: Location of sample BM-SD-01; downstream of probable point of entry from Boulaway mine	



Photo No. 90	Date: 09/09/2019
Photo Coordinates	
Lat	46.259481
Long	-111.948075
Direction Photo Taken: 133.383857642199	
Description: Location of sample BM-SW/SD-01	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 91</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.257172</td></tr> <tr> <td>Long</td><td>-111.950583</td></tr> <tr> <td colspan="2">Direction Photo Taken: 291.154357950765</td></tr> <tr> <td colspan="2">Description: Location of sample BM-SW/SD-02</td></tr> </table>	Photo No. 91	Date: 06/04/2019	Photo Coordinates		Lat	46.257172	Long	-111.950583	Direction Photo Taken: 291.154357950765		Description: Location of sample BM-SW/SD-02		
Photo No. 91	Date: 06/04/2019												
Photo Coordinates													
Lat	46.257172												
Long	-111.950583												
Direction Photo Taken: 291.154357950765													
Description: Location of sample BM-SW/SD-02													
<table> <tr> <td>Photo No. 92</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.257256</td></tr> <tr> <td>Long</td><td>-111.9507</td></tr> <tr> <td colspan="2">Direction Photo Taken: 221.944213649852</td></tr> <tr> <td colspan="2">Description: Location of sample BM-SD-02</td></tr> </table>	Photo No. 92	Date: 06/04/2019	Photo Coordinates		Lat	46.257256	Long	-111.9507	Direction Photo Taken: 221.944213649852		Description: Location of sample BM-SD-02		
Photo No. 92	Date: 06/04/2019												
Photo Coordinates													
Lat	46.257256												
Long	-111.9507												
Direction Photo Taken: 221.944213649852													
Description: Location of sample BM-SD-02													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 93	Date: 06/04/2019
Photo Coordinates	
Lat	46.260925
Long	-111.944397
Direction Photo Taken: 157.278427205101	
Description: Showing 5-point background composite locations for sample BM-SO-BK01	



Photo No. 94	Date: 09/09/2019
Photo Coordinates	
Lat	46.257314
Long	-111.9505
Direction Photo Taken: 56.0015564202335	
Description: Location of sample BM-SW/SD-02	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 95	Date: 06/04/2019
Photo Coordinates	
Lat	46.260844
Long	-111.944367
Direction Photo Taken: 321.426052104208	
Description: Location of background grab sample BM-SO-BK02	



Photo No. 96	Date: 06/04/2019
Photo Coordinates	
Lat	46.260964
Long	-111.948744
Direction Photo Taken: 240.976806422837	
Description: Showing 5-point composite locations for sample BM-WR-05	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 97</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.260086</td></tr> <tr> <td>Long</td><td>-111.948167</td></tr> <tr> <td colspan="2">Direction Photo Taken: 273.874176153385</td></tr> <tr> <td colspan="2">Description: Location of sample BM-WR-14</td></tr> </table>	Photo No. 97	Date: 06/04/2019	Photo Coordinates		Lat	46.260086	Long	-111.948167	Direction Photo Taken: 273.874176153385		Description: Location of sample BM-WR-14		
Photo No. 97	Date: 06/04/2019												
Photo Coordinates													
Lat	46.260086												
Long	-111.948167												
Direction Photo Taken: 273.874176153385													
Description: Location of sample BM-WR-14													
<table> <tr> <td>Photo No. 98</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.260131</td></tr> <tr> <td>Long</td><td>-111.948111</td></tr> <tr> <td colspan="2">Direction Photo Taken: 350.005707038681</td></tr> <tr> <td colspan="2">Description: Location of sample BM-WR-16</td></tr> </table>	Photo No. 98	Date: 06/04/2019	Photo Coordinates		Lat	46.260131	Long	-111.948111	Direction Photo Taken: 350.005707038681		Description: Location of sample BM-WR-16		
Photo No. 98	Date: 06/04/2019												
Photo Coordinates													
Lat	46.260131												
Long	-111.948111												
Direction Photo Taken: 350.005707038681													
Description: Location of sample BM-WR-16													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 99		Date: 06/04/2019	
Photo Coordinates			
Lat	46.259805		
Long	-111.948484		
Direction Photo Taken: 299.75			
Description: Location of sample BM-WR-18			

Photo No. 100		Date: 06/04/2019	
Photo Coordinates			
Lat	46.25965		
Long	-111.948394		
Direction Photo Taken: 32.9329223543226			
Description: Showing 15-point composite locations for sample BM-WR-17 and duplicate sample BM-WR-19			

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 101</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.259986</td></tr> <tr> <td>Long</td><td>-111.948381</td></tr> <tr> <td colspan="2">Direction Photo Taken: 194.149337748344</td></tr> <tr> <td colspan="2">Description: Location of sample BM-WR-OP-02</td></tr> </table>	Photo No. 101	Date: 06/04/2019	Photo Coordinates		Lat	46.259986	Long	-111.948381	Direction Photo Taken: 194.149337748344		Description: Location of sample BM-WR-OP-02		
Photo No. 101	Date: 06/04/2019												
Photo Coordinates													
Lat	46.259986												
Long	-111.948381												
Direction Photo Taken: 194.149337748344													
Description: Location of sample BM-WR-OP-02													
<table> <tr> <td>Photo No. 102</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.245996</td></tr> <tr> <td>Long</td><td>-111.946057</td></tr> <tr> <td colspan="2">Direction Photo Taken: 86.7</td></tr> <tr> <td colspan="2">Description: Showing 5-point background composite locations for sample EQ-SO-BK01</td></tr> </table>	Photo No. 102	Date: 06/03/2019	Photo Coordinates		Lat	46.245996	Long	-111.946057	Direction Photo Taken: 86.7		Description: Showing 5-point background composite locations for sample EQ-SO-BK01		
Photo No. 102	Date: 06/03/2019												
Photo Coordinates													
Lat	46.245996												
Long	-111.946057												
Direction Photo Taken: 86.7													
Description: Showing 5-point background composite locations for sample EQ-SO-BK01													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table border="1"> <tr> <td>Photo No. 103</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.245967</td></tr> <tr> <td>Long</td><td>-111.945859</td></tr> <tr> <td colspan="2">Direction Photo Taken: 31.25</td></tr> <tr> <td colspan="2">Description: Location of background grab sample EQ-SO-BK02</td></tr> </table>	Photo No. 103	Date: 06/03/2019	Photo Coordinates		Lat	46.245967	Long	-111.945859	Direction Photo Taken: 31.25		Description: Location of background grab sample EQ-SO-BK02		
Photo No. 103	Date: 06/03/2019												
Photo Coordinates													
Lat	46.245967												
Long	-111.945859												
Direction Photo Taken: 31.25													
Description: Location of background grab sample EQ-SO-BK02													
<table border="1"> <tr> <td>Photo No. 104</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.253545</td></tr> <tr> <td>Long</td><td>-111.955428</td></tr> <tr> <td colspan="2">Direction Photo Taken: 173.01</td></tr> <tr> <td colspan="2">Description: Location of sample EQ-SW/SD-01</td></tr> </table>	Photo No. 104	Date: 06/04/2019	Photo Coordinates		Lat	46.253545	Long	-111.955428	Direction Photo Taken: 173.01		Description: Location of sample EQ-SW/SD-01		
Photo No. 104	Date: 06/04/2019												
Photo Coordinates													
Lat	46.253545												
Long	-111.955428												
Direction Photo Taken: 173.01													
Description: Location of sample EQ-SW/SD-01													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 105</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.253567</td></tr> <tr> <td>Long</td><td>-111.955391</td></tr> <tr> <td colspan="2">Direction Photo Taken: 181.11</td></tr> <tr> <td colspan="2">Description: Collection of sample EQ-SD-01</td></tr> </table>	Photo No. 105	Date: 06/04/2019	Photo Coordinates		Lat	46.253567	Long	-111.955391	Direction Photo Taken: 181.11		Description: Collection of sample EQ-SD-01		
Photo No. 105	Date: 06/04/2019												
Photo Coordinates													
Lat	46.253567												
Long	-111.955391												
Direction Photo Taken: 181.11													
Description: Collection of sample EQ-SD-01													
<table> <tr> <td>Photo No. 106</td><td>Date: 09/09/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.254197</td></tr> <tr> <td>Long</td><td>-111.954278</td></tr> <tr> <td colspan="2">Direction Photo Taken: 35.7450256410256</td></tr> <tr> <td colspan="2">Description: Location of sample EQ-SW/SD-01</td></tr> </table>	Photo No. 106	Date: 09/09/2019	Photo Coordinates		Lat	46.254197	Long	-111.954278	Direction Photo Taken: 35.7450256410256		Description: Location of sample EQ-SW/SD-01		
Photo No. 106	Date: 09/09/2019												
Photo Coordinates													
Lat	46.254197												
Long	-111.954278												
Direction Photo Taken: 35.7450256410256													
Description: Location of sample EQ-SW/SD-01													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table border="1"> <tr> <td>Photo No. 107</td> <td>Date: 09/09/2019</td> </tr> <tr> <td colspan="2">Photo Coordinates</td> </tr> <tr> <td>Lat</td> <td></td> </tr> <tr> <td>Long</td> <td></td> </tr> <tr> <td colspan="2">Direction Photo Taken:</td> </tr> <tr> <td colspan="2"> Description: Dry creek bed of EQ-SW/SD-02; no sample was collected </td> </tr> </table>	Photo No. 107	Date: 09/09/2019	Photo Coordinates		Lat		Long		Direction Photo Taken:		Description: Dry creek bed of EQ-SW/SD-02; no sample was collected		
Photo No. 107	Date: 09/09/2019												
Photo Coordinates													
Lat													
Long													
Direction Photo Taken:													
Description: Dry creek bed of EQ-SW/SD-02; no sample was collected													
<table border="1"> <tr> <td>Photo No. 108</td> <td>Date: 06/04/2019</td> </tr> <tr> <td colspan="2">Photo Coordinates</td> </tr> <tr> <td>Lat</td> <td>46.252735</td> </tr> <tr> <td>Long</td> <td>-111.956748</td> </tr> <tr> <td colspan="2">Direction Photo Taken: 73.56</td> </tr> <tr> <td colspan="2"> Description: Location of sample EQ-SW/SD-03 </td> </tr> </table>	Photo No. 108	Date: 06/04/2019	Photo Coordinates		Lat	46.252735	Long	-111.956748	Direction Photo Taken: 73.56		Description: Location of sample EQ-SW/SD-03		
Photo No. 108	Date: 06/04/2019												
Photo Coordinates													
Lat	46.252735												
Long	-111.956748												
Direction Photo Taken: 73.56													
Description: Location of sample EQ-SW/SD-03													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 109	Date: 06/04/2019
Photo Coordinates	
Lat	46.252721
Long	-111.956727
Direction Photo Taken: 59.46	
Description: Collection of sample EQ-SW-03	



Photo No. 110	Date: 09/09/2019
Photo Coordinates	
Lat	46.253364
Long	-111.955544
Direction Photo Taken: 48.1447143345878	
Description: Location of sample EQ-SW/SD-03	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 111</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.246561</td></tr> <tr> <td>Long</td><td>-111.946301</td></tr> <tr> <td colspan="2">Direction Photo Taken: 300.94</td></tr> <tr> <td colspan="2">Description: Collecting sample EQ-WR-01</td></tr> </table>	Photo No. 111	Date: 06/03/2019	Photo Coordinates		Lat	46.246561	Long	-111.946301	Direction Photo Taken: 300.94		Description: Collecting sample EQ-WR-01		
Photo No. 111	Date: 06/03/2019												
Photo Coordinates													
Lat	46.246561												
Long	-111.946301												
Direction Photo Taken: 300.94													
Description: Collecting sample EQ-WR-01													
<table> <tr> <td>Photo No. 112</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.246629</td></tr> <tr> <td>Long</td><td>-111.946321</td></tr> <tr> <td colspan="2">Direction Photo Taken: 239.48</td></tr> <tr> <td colspan="2">Description: Collecting sample EQ-WR-02</td></tr> </table>	Photo No. 112	Date: 06/03/2019	Photo Coordinates		Lat	46.246629	Long	-111.946321	Direction Photo Taken: 239.48		Description: Collecting sample EQ-WR-02		
Photo No. 112	Date: 06/03/2019												
Photo Coordinates													
Lat	46.246629												
Long	-111.946321												
Direction Photo Taken: 239.48													
Description: Collecting sample EQ-WR-02													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 113		Date: 06/03/2019	
Photo Coordinates			
Lat	46.246521		
Long	-111.94657		
Direction Photo Taken: 185.83			
Description: Showing 5-point composite locations for sample EQ-WR-03			

Photo No. 114		Date: 06/03/2019	
Photo Coordinates			
Lat	46.246519		
Long	-111.946684		
Direction Photo Taken: 167.43			
Description: Location of sample EQ-WR-04			

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 115</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.246839</td></tr> <tr> <td>Long</td><td>-111.946564</td></tr> <tr> <td colspan="2">Direction Photo Taken: 201.195640616693</td></tr> <tr> <td colspan="2"> Description: Showing 5-point composite locations for sample EQ-WR-05 </td></tr> </table>	Photo No. 115	Date: 06/03/2019	Photo Coordinates		Lat	46.246839	Long	-111.946564	Direction Photo Taken: 201.195640616693		Description: Showing 5-point composite locations for sample EQ-WR-05		
Photo No. 115	Date: 06/03/2019												
Photo Coordinates													
Lat	46.246839												
Long	-111.946564												
Direction Photo Taken: 201.195640616693													
Description: Showing 5-point composite locations for sample EQ-WR-05													
<table> <tr> <td>Photo No. 116</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.246746</td></tr> <tr> <td>Long</td><td>-111.946447</td></tr> <tr> <td colspan="2">Direction Photo Taken: 202.61</td></tr> <tr> <td colspan="2"> Description: Location of sample EQ-WR-06 </td></tr> </table>	Photo No. 116	Date: 06/03/2019	Photo Coordinates		Lat	46.246746	Long	-111.946447	Direction Photo Taken: 202.61		Description: Location of sample EQ-WR-06		
Photo No. 116	Date: 06/03/2019												
Photo Coordinates													
Lat	46.246746												
Long	-111.946447												
Direction Photo Taken: 202.61													
Description: Location of sample EQ-WR-06													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 117		Date: 06/03/2019	
Photo Coordinates			
Lat	46.247681		
Long	-111.946771		
Direction Photo Taken: 278.17			
Description: Showing 5-point composite locations for sample EQ-WR-07			

Photo No. 118		Date: 06/03/2019	
Photo Coordinates			
Lat	46.247769		
Long	-111.946815		
Direction Photo Taken: 110.48			
Description: Location of sample EQ-WR-08			

APPENDIX B
Laboratory Analytical Data and Data Validation Reports

**Due to size, Laboratory Analytical Reports are included in separate electronic file*



DATA VALIDATION REPORT

Elkhorn Mining Site Inspection

SAMPLE DELIVERY GROUP: MH00A6

Prepared by

MEC^x
12269 East Vassar Drive
Aurora, CO 80014



I. INTRODUCTION

Task Order Title: Elkhorn Mining Site Inspection
Contract Task Order: 20408.012.004.0621.00
Sample Delivery Group: MH00A6
Weston Project Manager: Natalie Quiet
EPA Project Manager: Joseph Chisholm
TDD No.: 0004/1807-06
Case No.: 48289
Matrix: Water
QC Level: Stage 2B
No. of Samples: 4
No. of Reanalyses/Dilutions: 0
Laboratory: Bonner Analytical Testing Co.

Table 1. Sample Identification

Sample No.	Lab Sample Name	Matrix Type	Collection Date	Method
MH0015	9060168-01	Surface Water	06/04/2019 12:31:00	Hg, ICP-MS
MH00A6	9060168-02	Surface Water	06/05/2019 15:45:00	Hg, ICP-MS
MH5017	9060168-03	Surface Water	06/04/2019 11:03:00	Hg, ICP-MS
MH5018	9060168-04	Surface Water	06/05/2019 15:53:00	Hg, ICP-MS



II. Sample Management

Anomalies with sample management are noted below. According to the Sample Receipt Forms the samples were received intact and properly preserved. All coolers were received at 0°C. The chains of custody (COC) were signed and dated by field and/or laboratory personnel. Custody seals were present and intact.

Two bottles were listed on the COC for sample MH5018, but only one bottle was received. The client directed that the sample be analyzed for total metals and total mercury.

Data Qualifier Reference Table

Qualifier	Organics	Inorganics
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit. The associated value is the quantitation limit or the estimated detection limit for dioxins or PCB congeners.	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit. The associated value is the sample detection limit or the quantitation limit for perchlorate only.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J+	Not applicable	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, and may have a potential positive bias.
J-	Not applicable	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, and may have a potential negative bias.
UJ	The analyte was not deemed above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.	The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."	Not applicable.



Qualifier	Organics	Inorganics
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.	Not applicable.
R	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.

Qualification Code Reference Table

Qualifier	Organics	Inorganics
H	Holding times were exceeded.	Holding times were exceeded.
S	Surrogate recovery was outside QC limits.	The sequence or number of standards used for the calibration was incorrect
C	Calibration %RSD or %D was noncompliant.	Correlation coefficient is <0.995 or calibration was noncompliant.
R	Calibration RRF was <0.05.	%R for calibration is not within control limits.
B	Presumed contamination as indicated by the preparation (method) blank results.	Presumed contamination as indicated by the preparation (method) or calibration blank results.
L	Laboratory Blank Spike/Blank Spike Duplicate %R was not within control limits.	Laboratory Control Sample %R was not within control limits.
L1	LCS/LCSD RPD was outside control limits.	LCS/LCSD RPD was outside control limits.
Q	MS/MSD recovery was poor.	MS recovery was poor.
Q1	MS/MSD RPD was outside control limits.	MS/MSD RPD was outside control limits.
E	Not applicable.	Duplicates showed poor agreement.
I	Internal standard performance was unsatisfactory.	ICP ICS results were unsatisfactory.
A	Not applicable.	ICP Serial Dilution %D were not within control limits.
M	Tuning (BFB or DFTPP) was noncompliant.	ICPMS tune was not compliant.
T	Presumed contamination as indicated by the trip blank results.	Not applicable.
+	False positive – reported compound was not present.	Not applicable.
-	False negative – compound was present but not reported.	Not applicable.
F	Presumed contamination as indicated by the FB or ER results.	Presumed contamination as indicated by the FB or ER results.
F1	Field duplicate results were outside the control limit.	Field duplicate results were outside the control limit.
\$	Reported result or other information was incorrect.	Reported result or other information was incorrect.
?	TIC identity or reported retention time has been changed.	Not applicable.



Qualifier	Organics	Inorganics
D	The analysis with this flag should not be used because another more technically sound analysis is available.	The analysis with this flag should not be used because another more technically sound analysis is available.
P	Instrument performance for pesticides was poor.	Post Digestion Spike recovery was not within control limits.
*II, *III	Unusual problems found with the data that have been described in Section II, "Sample Management," or Section III, "Method Analyses." The number following the asterisk (*) will indicate the report section where a description of the problem can be found.	Unusual problems found with the data that have been described in Section II, "Sample Management," or Section III, "Method Analyses." The number following the asterisk (*) will indicate the report section where a description of the problem can be found.

III. Method Analyses

A. **Methods 200.8 and 245.1—Metals and Mercury**

Reviewed By: M. Hilchey

Date Reviewed: July 10, 2019

The samples listed in Table 1 for these analyses were validated based on the guidelines outlined in the *Quality Assurance Project Plan for U. S. EPA Region 8 CERCLA Site Assessment* (Rev. 2015), *United States Environmental Protection Agency Methods 200.8 and 245.1* and the *National Functional Guidelines for Inorganic Superfund Methods Data Review* (January 2017).

- Holding Times: The analytical holding times, 28 days for mercury and six months for the remaining metals, were met.
- Instrument tune: According to summary reports, ICP-MS instrument tuning requirements were met.
- Calibration:
 - Initial calibration: According to the calibration summaries, correlation coefficients and %Ds met National Functional Guideline (NFG) acceptance requirements.
 - Initial (ICV) and continuing calibration (CCV) verification: ICV and CCV frequency requirements were met. ICV and CCV recoveries were within 90-110% for ICP-MS and 85-115% for mercury.
- Method Blanks: No target analytes were reported in the method blanks (MB) or calibration blanks (ICB/CCB) of sufficient concentration to qualify site sample results except as noted in the table below. Associated detected sample results that were below the reporting limit (RL) were qualified as nondetect (U) at the RL. Associated detected sample results that were below the RL and $>10\times$ the blank concentration were not qualified, based on professional judgment. Associated detected sample results that were greater than RL and $<5\times$ the blank concentration were qualified as estimated with high bias (J+). Nondetect results for selenium (negative blank concentration greater than absolute value of MDL) were qualified as estimated (UJ).

Analyte	Blank concentration (ug/L)	Qualified Samples
antimony	0.29 (ICB)	MH0015, MH5017, MH5018
chromium	0.086 (CCB)	MH0015, MH00A6, MH5017
cobalt	0.078 (CCB)	All site samples
iron	16.1 (ICB)	MH00A6
lead	0.18 (ICB)	MH0015, MH5017
nickel	0.13 (CCB)	MH0015, MH5017, MH5018
thallium	0.19 (ICB)	MH00A6
selenium	-0.34	MH0015, MH5017, MH5018

Analyte	Blank concentration (ug/L)	Qualified Samples
zinc	1.4 (CCB)	MH0015

- Interference Check Samples (ICSA/B): ICSA/B data are not reviewed at a Stage 2B validation.
- Laboratory Control Samples (LCS): The LCS recoveries were within 80-120% for ICP-MS.
- Laboratory Duplicates: Laboratory duplicate analysis was performed on sample MH0015 for both methods. All RPDs met the control limits of $\leq 20\%$ for sample results $> 5 \times$ RL and $\pm RL$ for sample results $< 5 \times$ RL
- Matrix Spike: Matrix spike (MS) analysis was performed on sample MH0015 for both methods. MS recoveries were not assessed when the parent sample concentrations were more than $4 \times$ the spike amount. Recoveries met control limits of 75-125% for all target analytes.
- Post Digestion Spike: Post digestion spike analyses were not performed.
- Serial Dilution: Serial dilution analysis was performed on sample MH0015 for ICP-MS. Results were not assessed unless the parent sample concentration was $> 50 \times$ the MDL. The control limit of $\leq 10\%$ difference (%D) of the original sample result was met for all target analytes except as noted in the table below. Associated results for samples of the sample matrix (surface water) were qualified as estimated (J).

Analyte	Serial dilution %D
barium	17%
iron	11%
manganese	11%

- Internal Standards: According to the summaries, all ICP-MS sample internal standard intensities were within the control limits of 60-125% of the calibration blank.
- Sample Result Verification: Sample results are not verified at a Stage 2B validation. Detects below the reporting limit were qualified as estimated (J). Nondetects are valid to the reporting limit.

Sample MH00A6 was diluted $2 \times$ for zinc due to over range concentration. All reporting limits were adjusted appropriately. Detected results for dilutions were flagged with "D" by the laboratory.
- Field QC Samples: MEC^x evaluated field QC samples, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. MEC^x used the remaining detects to evaluate the associated site samples. Findings associated with field QC samples are summarized below.

- o Field Blanks and Equipment Blanks: Samples MH0022 (from SDG MH0002, collected 6/4/19) and MH0023 (from SDG MH0002, collected 6/5/19) were identified as field blanks associated with field samples in this SDG by collection date. There were no detections in the field blanks of sufficient concentrations to warrant qualification of associated site samples except as noted in the table below. Associated sample results that were greater than MDL and less than RL were qualified as nondetect (U) at the RL. Associated site sample results that were greater than RL and $<10\times$ the field blank concentration were qualified as estimated with high potential bias (J+). Equipment blanks were not collected.

Field blank sample number	analyte	Field blank concentration (µg/L)	Associated qualified site samples
MH0022	zinc	4.1	MH0015, MH5017
MH0023	aluminum	74.5	MH5018
	calcium	8430	
	chromium	0.40	
	copper	2.0	
	iron	150	
	vanadium	1.3	
	zinc	7.4	MH00A6, MH5018
	arsenic	1.1	
	barium	7.4	
	magnesium	2100	
	manganese	6.6	
	potassium	880	
	sodium	2710	

- o Field Duplicates: Samples MH0019 (SDG MH0002) and MH5018 of this SDG were identified as a field duplicate pair, based on location IDs. The RPD control limit of $\leq 30\%$ for all target analytes greater than RL and $\pm RL$ for all results $< RL$ were met except as noted in the table below. Associated results for in the pair were qualified as estimated (J).

Field duplicate pair	Analyte	RPD/ $\pm RL$
MH0019 and MH5018	aluminum	116%
	manganese	106%
	zinc	54%
	arsenic	72%



Field duplicate pair	Analyte	RPD/ $\pm$ RL
	iron	>RL
	lead	156%
	copper	>RL

Validated Sample Result Forms MH00A6

Analysis Method Hg

Lab Sample Name: 9060168-01

Sample No: MH0015

Sample Date: 06/04/2019 12:31:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury	Total	7439-97-6	0.20	0.20	0.037	ug/L	U	U	
---------	-------	-----------	------	------	-------	------	---	---	--

Lab Sample Name: 9060168-02

Sample No: MH00A6

Sample Date: 06/05/2019 15:45:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury	Total	7439-97-6	0.20	0.20	0.037	ug/L	U	U	
---------	-------	-----------	------	------	-------	------	---	---	--

Lab Sample Name: 9060168-03

Sample No: MH5017

Sample Date: 06/04/2019 11:03:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury	Total	7439-97-6	0.20	0.20	0.037	ug/L	U	U	
---------	-------	-----------	------	------	-------	------	---	---	--

Lab Sample Name: 9060168-04

Sample No: MH5018

Sample Date: 06/05/2019 15:53:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury	Total	7439-97-6	0.20	0.20	0.037	ug/L	U	U	
---------	-------	-----------	------	------	-------	------	---	---	--

Analysis Method ICP_MS

Lab Sample Name: 9060168-01

Sample No: MH0015

Sample Date: 06/04/2019 12:31:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Aluminum	Total	7429-90-5	121	20.0	3.7	ug/L			
Antimony	Total	7440-36-0	2.0	2.0	0.093	ug/L	J	U	B
Arsenic	Total	7440-38-2	1.3	1.0	0.070	ug/L			
Barium	Total	7440-39-3	8.9	10.0	0.096	ug/L	J*	J	A
Beryllium	Total	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Total	7440-43-9	1.0	1.0	0.12	ug/L	U	U	
Calcium	Total	7440-70-2	9440	500	10.8	ug/L			
Chromium	Total	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Total	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Total	7440-50-8	2.9	2.0	0.12	ug/L			
Iron	Total	7439-89-6	272	200	3.0	ug/L	*	J	A
Lead	Total	7439-92-1	1.0	1.0	0.028	ug/L	J	U	B
Magnesium	Total	7439-95-4	2410	500	2.4	ug/L			

Analysis Method ICP_MS

Manganese	Total	7439-96-5	16.4	1.0	0.078	ug/L	*	J	A
Nickel	Total	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Total	7440-09-7	931	500	4.4	ug/L			
Selenium	Total	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Total	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Total	7440-23-5	2880	500	5.2	ug/L			
Thallium	Total	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Total	7440-62-2	1.4	5.0	0.42	ug/L	J	J	
Zinc	Total	7440-66-6	6.0	2.0	0.68	ug/L		J+	B, F

Lab Sample Name: 9060168-02 Sample No: MH00A6 Sample Date: 06/05/2019 15:45:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Total	7429-90-5	20.0	20.0	3.7	ug/L	U	U	
Antimony	Total	7440-36-0	99.2	2.0	0.093	ug/L			
Arsenic	Total	7440-38-2	2.5	1.0	0.070	ug/L		J+	F
Barium	Total	7440-39-3	10.0	10.0	0.096	ug/L	J*	UJ	A, F
Beryllium	Total	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Total	7440-43-9	102	1.0	0.12	ug/L			
Calcium	Total	7440-70-2	102000	500	10.8	ug/L			
Chromium	Total	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Total	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Total	7440-50-8	35.2	2.0	0.12	ug/L			
Iron	Total	7439-89-6	200	200	3.0	ug/L	J*	UJ	B, A
Lead	Total	7439-92-1	13.1	1.0	0.028	ug/L			
Magnesium	Total	7439-95-4	9290	500	2.4	ug/L		J+	F
Manganese	Total	7439-96-5	34.3	1.0	0.078	ug/L	*	J+	A, F
Nickel	Total	7440-02-0	121	1.0	0.043	ug/L			
Potassium	Total	7440-09-7	706	500	4.4	ug/L		J+	F
Selenium	Total	7782-49-2	3.8	5.0	0.32	ug/L	J	J	
Silver	Total	7440-22-4	0.26	1.0	0.088	ug/L	J	J	
Sodium	Total	7440-23-5	821	500	5.2	ug/L		J+	F
Thallium	Total	7440-28-0	1.0	1.0	0.051	ug/L	J	U	B
Vanadium	Total	7440-62-2	5.0	5.0	0.42	ug/L	U	U	
Zinc	Total	7440-66-6	5060	4.0	1.4	ug/L	D		

Lab Sample Name: 9060168-03 Sample No: MH5017 Sample Date: 06/04/2019 11:03:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Total	7429-90-5	130	20.0	3.7	ug/L			
Antimony	Total	7440-36-0	2.0	2.0	0.093	ug/L	J	U	B
Arsenic	Total	7440-38-2	1.3	1.0	0.070	ug/L			

Analysis Method ICP_MS

Barium	Total	7440-39-3	8.0	10.0	0.096	ug/L	J*	J	A
Beryllium	Total	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Total	7440-43-9	1.0	1.0	0.12	ug/L	U	U	
Calcium	Total	7440-70-2	9060	500	10.8	ug/L			
Chromium	Total	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Total	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Total	7440-50-8	2.2	2.0	0.12	ug/L			
Iron	Total	7439-89-6	206	200	3.0	ug/L	*	J	A
Lead	Total	7439-92-1	1.0	1.0	0.028	ug/L	J	U	B
Magnesium	Total	7439-95-4	2240	500	2.4	ug/L			
Manganese	Total	7439-96-5	12.2	1.0	0.078	ug/L	*	J	A
Nickel	Total	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Total	7440-09-7	921	500	4.4	ug/L			
Selenium	Total	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Total	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Total	7440-23-5	2720	500	5.2	ug/L			
Thallium	Total	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Total	7440-62-2	1.3	5.0	0.42	ug/L	J	J	
Zinc	Total	7440-66-6	8.0	2.0	0.68	ug/L		J+	F

Lab Sample Name: 9060168-04 Sample No: MH5018 Sample Date: 06/05/2019 15:53:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Total	7429-90-5	479	20.0	3.7	ug/L		J+	F, F1
Antimony	Total	7440-36-0	2.0	2.0	0.093	ug/L	J	U	B
Arsenic	Total	7440-38-2	4.7	1.0	0.070	ug/L		J+	F, F1
Barium	Total	7440-39-3	10.0	10.0	0.096	ug/L	J*	UJ	A, F
Beryllium	Total	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Total	7440-43-9	0.27	1.0	0.12	ug/L	J	J	
Calcium	Total	7440-70-2	19000	500	10.8	ug/L		J+	F
Chromium	Total	7440-47-3	2.0	2.0	0.055	ug/L	J	U	F
Cobalt	Total	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Total	7440-50-8	3.8	2.0	0.12	ug/L		J+	F, F1
Iron	Total	7439-89-6	603	200	3.0	ug/L	*	J+	A, F, F1
Lead	Total	7439-92-1	9.0	1.0	0.028	ug/L		J	F1
Magnesium	Total	7439-95-4	2410	500	2.4	ug/L		J+	F
Manganese	Total	7439-96-5	24.0	1.0	0.078	ug/L	*	J+	A, F
Nickel	Total	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Total	7440-09-7	580	500	4.4	ug/L		J+	F
Selenium	Total	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Total	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Total	7440-23-5	1920	500	5.2	ug/L		J+	F

Analysis Method *ICP_MS*

Thallium	Total	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Total	7440-62-2	5.0	5.0	0.42	ug/L	J	U	F
Zinc	Total	7440-66-6	15.1	2.0	0.68	ug/L		J+	F, F1



DATA VALIDATION REPORT

Elkhorn Mining Site Inspection

SAMPLE DELIVERY GROUP: MH00A7

Prepared by

MEC^x
12269 East Vassar Drive
Aurora, CO 80014



I. INTRODUCTION

Task Order Title: Elkhorn Mining Site Inspection
Contract Task Order: 20408.012.004.0621.00
Sample Delivery Group: MH00A7
Weston Project Manager: Natalie Quiet
EPA Project Manager: Joseph Chisholm
TDD No.: 0004/1807-06
Case No.: 48289
Matrix: Water
QC Level: Stage 2B
No. of Samples: 4
No. of Reanalyses/Dilutions: 0
Laboratory: Bonner Analytical Testing Co.

Table 1. Sample Identification

Sample No.	Lab Sample Name	Matrix Type	Collection Date	Method
MH00A7	9060173-01	Surface Water	06/05/2019 15:45:00	Hg, ICP-MS
MH5015	9060173-02	Surface Water	06/04/2019 12:31:00	Hg, ICP-MS
MH5022	9060173-03	Water	06/04/2019 12:15:00	Hg, ICP-MS
MH5023	9060173-04	Water	06/05/2019 08:05:00	Hg, ICP-MS

II. Sample Management

According to the Sample Receipt Forms the samples were received intact and properly preserved. All coolers were received at 0°C. The chains of custody (COC) were signed and dated by field and/or laboratory personnel. Custody seals were present and intact.

It should be noted that the information provided by the client and laboratory did not indicate whether sample MH00A7 was designated for total or dissolved metals analysis. Review of the sample results and consultation with the client indicated that this sample was most likely filtered; therefore, it was assumed that the results presented in this SDG for sample MH00A7 were for dissolved metals.

Data Qualifier Reference Table

Qualifier	Organics	Inorganics
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit. The associated value is the quantitation limit or the estimated detection limit for dioxins or PCB congeners.	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit. The associated value is the sample detection limit or the quantitation limit for perchlorate only.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J+	Not applicable	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, and may have a potential positive bias.
J-	Not applicable	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, and may have a potential negative bias.
UJ	The analyte was not deemed above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.	The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."	Not applicable.



Qualifier	Organics	Inorganics
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.	Not applicable.
R	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.

Qualification Code Reference Table

Qualifier	Organics	Inorganics
H	Holding times were exceeded.	Holding times were exceeded.
S	Surrogate recovery was outside QC limits.	The sequence or number of standards used for the calibration was incorrect
C	Calibration %RSD or %D was noncompliant.	Correlation coefficient is <0.995 or calibration was noncompliant.
R	Calibration RRF was <0.05.	%R for calibration is not within control limits.
B	Presumed contamination as indicated by the preparation (method) blank results.	Presumed contamination as indicated by the preparation (method) or calibration blank results.
L	Laboratory Blank Spike/Blank Spike Duplicate %R was not within control limits.	Laboratory Control Sample %R was not within control limits.
L1	LCS/LCSD RPD was outside control limits.	LCS/LCSD RPD was outside control limits.
Q	MS/MSD recovery was poor.	MS recovery was poor.
Q1	MS/MSD RPD was outside control limits.	MS/MSD RPD was outside control limits.
E	Not applicable.	Duplicates showed poor agreement.
I	Internal standard performance was unsatisfactory.	ICP ICS results were unsatisfactory.
A	Not applicable.	ICP Serial Dilution %D were not within control limits.
M	Tuning (BFB or DFTPP) was noncompliant.	ICPMS tune was not compliant.
T	Presumed contamination as indicated by the trip blank results.	Not applicable.
+	False positive – reported compound was not present.	Not applicable.
-	False negative – compound was present but not reported.	Not applicable.
F	Presumed contamination as indicated by the FB or ER results.	Presumed contamination as indicated by the FB or ER results.
F1	Field duplicate results were outside the control limit.	Field duplicate results were outside the control limit.
\$	Reported result or other information was incorrect.	Reported result or other information was incorrect.
?	TIC identity or reported retention time has been changed.	Not applicable.



Qualifier	Organics	Inorganics
D	The analysis with this flag should not be used because another more technically sound analysis is available.	The analysis with this flag should not be used because another more technically sound analysis is available.
P	Instrument performance for pesticides was poor.	Post Digestion Spike recovery was not within control limits.
*II, *III	Unusual problems found with the data that have been described in Section II, "Sample Management," or Section III, "Method Analyses." The number following the asterisk (*) will indicate the report section where a description of the problem can be found.	Unusual problems found with the data that have been described in Section II, "Sample Management," or Section III, "Method Analyses." The number following the asterisk (*) will indicate the report section where a description of the problem can be found.

III. Method Analyses

A. **Methods 200.8 and 245.1—Metals and Mercury**

Reviewed By: M. Hilchey

Date Reviewed: July 10, 2019

The samples listed in Table 1 for these analyses were validated based on the guidelines outlined in the *Quality Assurance Project Plan for U. S. EPA Region 8 CERCLA Site Assessment* (Rev. 2015), *United States Environmental Protection Agency Methods 200.8 and 245.1* and the *National Functional Guidelines for Inorganic Superfund Methods Data Review* (January 2017).

- o Holding Times: The analytical holding times, 28 days for mercury and six months for the remaining metals, were met.
- o Instrument tune: According to summary reports, ICP-MS instrument tuning requirements were met.
- o Calibration:
 - o Initial calibration: According to the calibration summaries, correlation coefficients and %Ds met National Functional Guideline (NFG) acceptance requirements.
 - o Initial (ICV) and continuing calibration (CCV) verification: ICV and CCV frequency requirements were met. ICV and CCV recoveries were within 90-110% for ICP-MS and 85-115% for mercury.
- o Method Blanks: No target analytes were reported in the method blanks (MB) or calibration blanks (ICB/CCB) of sufficient concentration to qualify site sample results except as noted in the table below. For positive blank concentrations, associated detected sample results that were below the reporting limit (RL) were qualified as nondetect (U) at the RL. Associated detected sample results that were below the RL and $>10\times$ the blank concentration were not qualified, based on professional judgment. Associated detected sample results that were greater than RL and $<5\times$ the blank concentration were qualified as estimated with high bias (J+). For negative blank concentrations greater than the absolute value of the MDL, associated nondetects were qualified as estimated (UJ).

Analyte	Blank concentration (ug/L)	Qualified Samples
antimony	0.29 (ICB)	MH5022, MH5023, MH5015
cobalt	0.069 (ICB)	
selenium	-0.34 (CCB)	
nickel	0.089 (CCB)	
arsenic	0.16 (ICB)	MH5022
sodium	16.3 (ICB)	
barium	0.40 (CCB)	MH5022, MH5023
calcium	20.3 (ICB)	

Analyte	Blank concentration (ug/L)	Qualified Samples
lead	-0.064 (MB)	
magnesium	18.4 (ICB)	
manganese	0.55 (CCB)	
potassium	24.9 (ICB)	
chromium	0.065 (ICB)	All site samples
iron	16.1 (ICB)	
lead	0.18 (ICB)	MH5015
sodium	-18.1 (CCB)	MH5023
thallium	0.19 (ICB)	MH00A7

- o Interference Check Samples (ICSA/B): ICSA/B data are not reviewed at a Stage 2B validation.
- o Laboratory Control Samples (LCS): The LCS recoveries were within 80-120% for ICP-MS.
- o Laboratory Duplicates: Laboratory duplicate analysis was performed on sample MH5015 for both methods. All RPDs met the control limits of $\leq 20\%$ for sample results $> 5 \times \text{RL}$ and $\pm \text{RL}$ for sample results $< 5 \times \text{RL}$ for all target analytes except zinc ($> \text{RL}$). Associated results for samples of the sample matrix (filtered surface water) were qualified as estimated (J).
- o Matrix Spike: Matrix spike (MS) analysis was performed on sample MH5015 for both methods. MS recoveries were not assessed when the parent sample concentrations were more than $4 \times$ the spike amount. Recoveries met control limits of 75-125% for all targets.
- o Post Digestion Spike: Post digestion spike (PDS) analyses were not performed.
- o Serial Dilution: Serial dilution analysis was performed on sample MH5015 for ICP-MS. Results were not assessed unless the parent sample concentration was $> 50 \times$ the MDL. The control limit of $\leq 10\%$ difference (%D) of the original sample result was met for all target analytes except barium (36%). Associated results for samples of the sample matrix (filtered surface water) were qualified as estimated (J).
- o Internal Standards: According to the summaries, all ICP-MS sample internal standard intensities were within the control limits of 60-125% of the calibration blank.
- o Sample Result Verification: Sample results are not verified at a Stage 2B validation. Detects below the reporting limit were qualified as estimated (J). Nondetects are valid to the reporting limit.

Sample MH00A7 was diluted $2 \times$ for zinc. All reporting limits were adjusted appropriately. Detected results for dilutions were flagged with "D" by the laboratory.

- o Field QC Samples: MEC^x evaluated field QC samples, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. MEC^x used the remaining detects to evaluate the associated site samples. Findings associated with field QC samples are summarized below.
- o Field Blanks and Equipment Blanks: Samples MH5022 (collected 6/4/19) and MH5023 (collected 6/5/19) were identified as field blanks associated with field samples in this SDG by collection date. There were no detections in the field blanks of sufficient concentrations to warrant qualification of associated site samples except as noted in the table below. Associated site sample results that were greater than RL and <10× the field blank concentration were qualified as estimated with high potential bias (J+).

Field blank sample number	analyte	Field blank concentration (µg/L)	Associated qualified site samples
MH5022	zinc	8.0	MH5015
	copper	0.23	

- o Field Duplicates: Field duplicate samples were not collected in this SDG.

Validated Sample Result Forms

MH00A7

Analysis Method Hg

Lab Sample Name: 9060173-01

Sample No: MH00A7

Sample Date: 06/05/2019 15:45:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Dissolved 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060173-02 Sample No: MH5015 Sample Date: 06/04/2019 12:31:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Dissolved 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060173-03 Sample No: MH5022 Sample Date: 06/04/2019 12:15:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Dissolved 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060173-04 Sample No: MH5023 Sample Date: 06/05/2019 08:05:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Dissolved 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Analysis Method ICP_MS

Lab Sample Name: 9060173-01

Sample No: MH00A7

Sample Date: 06/05/2019 15:45:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Aluminum	Dissolved	7429-90-5	14.5	20.0	3.7	ug/L	J	J	
Antimony	Dissolved	7440-36-0	98.4	2.0	0.093	ug/L			
Arsenic	Dissolved	7440-38-2	2.6	1.0	0.070	ug/L			
Barium	Dissolved	7440-39-3	7.3	10.0	0.096	ug/L	J*	J	A
Beryllium	Dissolved	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Dissolved	7440-43-9	99.1	1.0	0.12	ug/L			
Calcium	Dissolved	7440-70-2	100000	500	10.8	ug/L			
Chromium	Dissolved	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Dissolved	7440-48-4	1.4	1.0	0.051	ug/L			
Copper	Dissolved	7440-50-8	33.0	2.0	0.12	ug/L			
Iron	Dissolved	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Dissolved	7439-92-1	20.2	1.0	0.028	ug/L			
Magnesium	Dissolved	7439-95-4	8920	500	2.4	ug/L			

Analysis Method ICP_MS

Manganese	Dissolved	7439-96-5	36.5	1.0	0.078	ug/L			
Nickel	Dissolved	7440-02-0	122	1.0	0.043	ug/L			
Potassium	Dissolved	7440-09-7	706	500	4.4	ug/L			
Selenium	Dissolved	7782-49-2	3.9	5.0	0.32	ug/L	J	J	
Silver	Dissolved	7440-22-4	0.35	1.0	0.088	ug/L	J	J	
Sodium	Dissolved	7440-23-5	803	500	5.2	ug/L			
Thallium	Dissolved	7440-28-0	1.0	1.0	0.051	ug/L	J	U	B
Vanadium	Dissolved	7440-62-2	5.0	5.0	0.42	ug/L	U	U	
Zinc	Dissolved	7440-66-6	5800	4.0	1.4	ug/L	D*	J	E

Lab Sample Name: 9060173-02 Sample No: MH5015 Sample Date: 06/04/2019 12:31:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Dissolved	7429-90-5	9.1	20.0	3.7	ug/L	J	J	
Antimony	Dissolved	7440-36-0	2.0	2.0	0.093	ug/L	J	U	B
Arsenic	Dissolved	7440-38-2	1.2	1.0	0.070	ug/L			
Barium	Dissolved	7440-39-3	8.3	10.0	0.096	ug/L	J*	J	A
Beryllium	Dissolved	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Dissolved	7440-43-9	1.0	1.0	0.12	ug/L	U	U	
Calcium	Dissolved	7440-70-2	9720	500	10.8	ug/L			
Chromium	Dissolved	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Dissolved	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Dissolved	7440-50-8	2.0	2.0	0.12	ug/L		J+	F
Iron	Dissolved	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Dissolved	7439-92-1	1.0	1.0	0.028	ug/L	J	U	B
Magnesium	Dissolved	7439-95-4	2330	500	2.4	ug/L			
Manganese	Dissolved	7439-96-5	10.1	1.0	0.078	ug/L			
Nickel	Dissolved	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Dissolved	7440-09-7	944	500	4.4	ug/L			
Selenium	Dissolved	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Dissolved	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Dissolved	7440-23-5	2800	500	5.2	ug/L			
Thallium	Dissolved	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Dissolved	7440-62-2	0.99	5.0	0.42	ug/L	J	J	
Zinc	Dissolved	7440-66-6	11.3	2.0	0.68	ug/L	*	J+	E, F

Lab Sample Name: 9060173-03 Sample No: MH5022 Sample Date: 06/04/2019 12:15:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Dissolved	7429-90-5	20.0	20.0	3.7	ug/L	U	U	
Antimony	Dissolved	7440-36-0	2.0	2.0	0.093	ug/L	J	U	B
Arsenic	Dissolved	7440-38-2	1.0	1.0	0.070	ug/L	J	U	B

Analysis Method ICP_MS

Barium	Dissolved	7440-39-3	10.0	10.0	0.096	ug/L	J*	U	B
Beryllium	Dissolved	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Dissolved	7440-43-9	1.0	1.0	0.12	ug/L	U	U	
Calcium	Dissolved	7440-70-2	500	500	10.8	ug/L	J	U	B
Chromium	Dissolved	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Dissolved	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Dissolved	7440-50-8	0.23	2.0	0.12	ug/L	J	J	
Iron	Dissolved	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Dissolved	7439-92-1	1.0	1.0	0.028	ug/L	U	UJ	B
Magnesium	Dissolved	7439-95-4	500	500	2.4	ug/L	J	U	B
Manganese	Dissolved	7439-96-5	1.0	1.0	0.078	ug/L	J	U	B
Nickel	Dissolved	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Dissolved	7440-09-7	500	500	4.4	ug/L	J	U	B
Selenium	Dissolved	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Dissolved	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Dissolved	7440-23-5	500	500	5.2	ug/L	J	U	B
Thallium	Dissolved	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Dissolved	7440-62-2	5.0	5.0	0.42	ug/L	U	U	
Zinc	Dissolved	7440-66-6	8.0	2.0	0.68	ug/L	*		

Lab Sample Name: 9060173-04 Sample No: MH5023 Sample Date: 06/05/2019 08:05:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Dissolved	7429-90-5	20.0	20.0	3.7	ug/L	U	U	
Antimony	Dissolved	7440-36-0	2.0	2.0	0.093	ug/L	J	U	B
Arsenic	Dissolved	7440-38-2	1.0	1.0	0.070	ug/L	U	U	
Barium	Dissolved	7440-39-3	10.0	10.0	0.096	ug/L	J*	U	B
Beryllium	Dissolved	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Dissolved	7440-43-9	1.0	1.0	0.12	ug/L	U	U	
Calcium	Dissolved	7440-70-2	500	500	10.8	ug/L	J	U	B
Chromium	Dissolved	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Dissolved	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Dissolved	7440-50-8	0.15	2.0	0.12	ug/L	J	J	
Iron	Dissolved	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Dissolved	7439-92-1	1.0	1.0	0.028	ug/L	U	UJ	B
Magnesium	Dissolved	7439-95-4	500	500	2.4	ug/L	J	U	B
Manganese	Dissolved	7439-96-5	1.0	1.0	0.078	ug/L	J	U	B
Nickel	Dissolved	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Dissolved	7440-09-7	500	500	4.4	ug/L	J	U	B
Selenium	Dissolved	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Dissolved	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Dissolved	7440-23-5	500	500	5.2	ug/L	U	UJ	B

Analysis Method *ICP_MS*

Thallium	Dissolved	7440-28-0	1.0	1.0	0.051	ug/L	U	U
Vanadium	Dissolved	7440-62-2	5.0	5.0	0.42	ug/L	U	U
Zinc	Dissolved	7440-66-6	8.7	2.0	0.68	ug/L	*	



DATA VALIDATION REPORT

Elkhorn Mining Site Inspection

SAMPLE DELIVERY GROUP: MH0002

Prepared by

MEC^x
12269 East Vassar Drive
Aurora, CO 80014

I. INTRODUCTION

Task Order Title: Elkhorn Mining Site Inspection
Contract Task Order: 20408.012.004.0621.00
Sample Delivery Group: MH0002
Weston Project Manager: Natalie Quiet
EPA Project Manager: Joseph Chisholm
TDD No.: 0004/1807-06
Case No.: 48289
Matrix: Water
QC Level: Stage 2B
No. of Samples: 20
No. of Reanalyses/Dilutions: 0
Laboratory: Bonner Analytical Testing Co.

Table 1. Sample Identification

<i>Sample No.</i>	<i>Lab Sample Name</i>	<i>Matrix Type</i>	<i>Collection Date</i>	<i>Method</i>
MH0001	9060175-01	Surface Water	06/04/2019 15:55:00	Hg, ICP-MS
MH0002	9060175-02	Surface Water	06/04/2019 15:12:00	Hg, ICP-MS
MH0003	9060175-03	Surface Water	06/04/2019 16:26:00	Hg, ICP-MS
MH0004	9060175-04	Surface Water	06/05/2019 17:07:00	Hg, ICP-MS
MH0005	9060175-05	Surface Water	06/05/2019 16:49:00	Hg, ICP-MS
MH0006	9060175-06	Surface Water	06/03/2019 14:58:00	Hg, ICP-MS
MH0007	9060175-07	Surface Water	06/03/2019 11:24:00	Hg, ICP-MS
MH0008	9060175-08	Surface Water	06/03/2019 09:57:00	Hg, ICP-MS
MH0009	9060175-09	Surface Water	06/03/2019 11:27:00	Hg, ICP-MS
MH0010	9060175-10	Surface Water	06/03/2019 15:26:00	Hg, ICP-MS
MH0011	9060175-11	Surface Water	06/04/2019 13:16:00	Hg, ICP-MS
MH0012	9060175-12	Surface Water	06/04/2019 12:56:00	Hg, ICP-MS
MH0013	9060175-13	Surface Water	06/04/2019 11:32:00	Hg, ICP-MS
MH0016	9060175-14	Surface Water	06/04/2019 11:57:00	Hg, ICP-MS
MH0019	9060175-15	Surface Water	06/05/2019 15:53:00	Hg, ICP-MS
MH0020	9060175-16	Surface Water	06/05/2019 15:22:00	Hg, ICP-MS
MH0021	9060175-17	Water	06/03/2019 12:00:00	Hg, ICP-MS
MH0022	9060175-18	Water	06/04/2019 12:15:00	Hg, ICP-MS
MH0023	9060175-19	Water	06/05/2019 08:05:00	Hg, ICP-MS
MH5014	9060175-20	Surface Water	06/04/2019 12:05:00	Hg, ICP-MS

II. Sample Management

Anomalies with sample management are noted below. According to the Sample Receipt Forms the samples were received intact and properly preserved. All coolers were received at 0°C. The chains of custody (COC) were signed and dated by field and/or laboratory personnel. Custody seals were present and intact.

The following issue was noted:

- Sample MH0019 was listed twice on the COC, both with collection date of 6/5/19 and collection time of 15:53. Based on sample results and laboratory batching, it is assumed by the reviewer that sample MH0019 in this SDG was unfiltered, and the results are for total metals. A sample with this identification was also reported in SDG MH0014. The sample in SDG MH0014 is assumed to be filtered, and the results are for dissolved metals.

Data Qualifier Reference Table

Qualifier	Organics	Inorganics
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit. The associated value is the quantitation limit or the estimated detection limit for dioxins or PCB congeners.	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit. The associated value is the sample detection limit or the quantitation limit for perchlorate only.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J+	Not applicable	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, and may have a potential positive bias.
J-	Not applicable	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, and may have a potential negative bias.
UJ	The analyte was not deemed above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.	The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."	Not applicable.



Qualifier	Organics	Inorganics
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.	Not applicable.
R	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.

Qualification Code Reference Table

Qualifier	Organics	Inorganics
H	Holding times were exceeded.	Holding times were exceeded.
S	Surrogate recovery was outside QC limits.	The sequence or number of standards used for the calibration was incorrect
C	Calibration %RSD or %D was noncompliant.	Correlation coefficient is <0.995 or calibration was noncompliant.
R	Calibration RRF was <0.05.	%R for calibration is not within control limits.
B	Presumed contamination as indicated by the preparation (method) blank results.	Presumed contamination as indicated by the preparation (method) or calibration blank results.
L	Laboratory Blank Spike/Blank Spike Duplicate %R was not within control limits.	Laboratory Control Sample %R was not within control limits.
L1	LCS/LCSD RPD was outside control limits.	LCS/LCSD RPD was outside control limits.
Q	MS/MSD recovery was poor.	MS recovery was poor.
Q1	MS/MSD RPD was outside control limits.	MS/MSD RPD was outside control limits.
E	Not applicable.	Duplicates showed poor agreement.
I	Internal standard performance was unsatisfactory.	ICP ICS results were unsatisfactory.
A	Not applicable.	ICP Serial Dilution %D were not within control limits.
M	Tuning (BFB or DFTPP) was noncompliant.	ICPMS tune was not compliant.
T	Presumed contamination as indicated by the trip blank results.	Not applicable.
+	False positive – reported compound was not present.	Not applicable.
-	False negative – compound was present but not reported.	Not applicable.
F	Presumed contamination as indicated by the FB or ER results.	Presumed contamination as indicated by the FB or ER results.
F1	Field duplicate results were outside the control limit.	Field duplicate results were outside the control limit.
\$	Reported result or other information was incorrect.	Reported result or other information was incorrect.
?	TIC identity or reported retention time has been changed.	Not applicable.



Qualifier	Organics	Inorganics
D	The analysis with this flag should not be used because another more technically sound analysis is available.	The analysis with this flag should not be used because another more technically sound analysis is available.
P	Instrument performance for pesticides was poor.	Post Digestion Spike recovery was not within control limits.
*II, *III	Unusual problems found with the data that have been described in Section II, "Sample Management," or Section III, "Method Analyses." The number following the asterisk (*) will indicate the report section where a description of the problem can be found.	Unusual problems found with the data that have been described in Section II, "Sample Management," or Section III, "Method Analyses." The number following the asterisk (*) will indicate the report section where a description of the problem can be found.

III. Method Analyses

A. **Methods 200.8 and 245.1—Metals and Mercury**

Reviewed By: M. Hilchey

Date Reviewed: July 9, 2019

The samples listed in Table 1 for these analyses were validated based on the guidelines outlined in the *Quality Assurance Project Plan for U. S. EPA Region 8 CERCLA Site Assessment* (Rev. 2015), *United States Environmental Protection Agency Methods 200.8 and 245.1* and the *National Functional Guidelines for Inorganic Superfund Methods Data Review* (January 2017).

- Holding Times: The analytical holding times, 28 days for mercury and six months for the remaining metals, were met.
- Instrument tune: According to summary reports, ICP-MS instrument tuning requirements were met.
- Calibration:
 - Initial calibration: According to the calibration summaries, correlation coefficients and %Ds met National Functional Guideline (NFG) acceptance requirements.
 - Initial (ICV) and continuing calibration (CCV) verification: ICV and CCV frequency requirements were met. ICV and CCV recoveries were within 90-110% for ICP-MS and 85-115% for mercury.
- Method Blanks: No target analytes were reported in the method blanks (MB) or calibration blanks (ICB/CCB) of sufficient concentration to qualify site sample results except as noted in the table below. Associated detected sample results that were below the reporting limit (RL) were qualified as nondetect (U) at the RL. Associated detected sample results that were below the RL and >10× the blank concentration were not qualified, based on professional judgment. Associated detected sample results that were greater than RL and <5× the blank concentration were qualified as estimated with high bias (J+).

Analyte	Blank concentration (ug/L)	Qualified Samples
antimony	0.29 (ICB)	MH0021, MH0022, MH0023, MH0001, MH0002, MH0003, MH0004, MH0005, MH0011, MH0012, MH0013, MH0016, MH0019, MH0020, MH5014
manganese	0.086 (ICB)	MH0021, MH0004, MH0005, MH5014
sodium	32.6 (MB)	MH0021, MH0022, MH5014
aluminum	3.8 (CCB)	MH0004, MH0005
calcium	15.7 (CCB)	MH0021, MH0022, MH5014
iron	16.6 (CCB)	MH0001, MH0002, MH0003, MH0004, MH0005, MH0008
lead	0.34 (CCB)	MH0001, MH0002, MH0003, MH0004, MH0005, MH0011, MH0012, MH0013, MH0016, MH0022, MH0023

Analyte	Blank concentration (ug/L)	Qualified Samples
magnesium	7.2 (CCB)	MH0022, MH5014
nickel	0.049 (MB)	MH0021, MH0023, MH0001, MH0002, MH0003, MH0004, MH0005, MH0006, MH0007, MH0008, MH0010, MH0011, MH0012, MH0013, MH0016, MH0019, MH0020, MH5014
	0.089 (CCB)	MH0009
chromium	0.07 (CCB)	MH0001, MH0002, MH0004, MH0005, MH0006, MH0007, MH0008, MH0009, MH0010
cobalt	0.055 (CCB)	MH0011, MH0012, MH0019, MH0020

- Interference Check Samples (ICSA/B): ICSA/B data are not reviewed at a Stage 2B validation.
- Laboratory Control Samples (LCS): The LCS recoveries were within 80-120% for ICP-MS.
- Laboratory Duplicates: Laboratory duplicate analysis was performed on sample MH0008 for both methods. All RPDs met the control limits of $\leq 20\%$ for sample results $> 5 \times \text{RL}$ and $\pm \text{RL}$ for sample results $< 5 \times \text{RL}$.
- Matrix Spike: Matrix spike (MS) analysis was performed on sample MH0008 for both methods. MS recoveries were not assessed when the parent sample concentrations were more than $4 \times$ the spike amount. Recoveries met control limits of 75-125% for all target analytes.
- Post Digestion Spike: Post digestion spike (PDS) analyses were not performed.
- Serial Dilution: Serial dilution analysis was performed on sample MH0008 for ICP-MS. Results were not assessed unless the parent sample concentration was $> 50 \times$ the MDL. The control limit of $\leq 10\%$ difference (%D) of the original sample result was met for all target analytes except as noted in the table below. Associated results for samples of the sample matrix (surface water) were qualified as estimated (J).

Analyte	Serial dilution %D
antimony	19%
arsenic	16%
barium	19%
cadmium	19%
calcium	26%
copper	13%
lead	19%
magnesium	24%

Analyte	Serial dilution %D
manganese	21%
potassium	20%
sodium	18%
zinc	17%

- Internal Standards: According to the summary, all ICP-MS sample internal standard intensities were within the control limits of 60-125% of the calibration blank.
- Sample Result Verification: Sample results are not verified at a Stage 2B validation. Detects below the reporting limit were qualified as estimated (J). Nondetects are valid to the reporting limit.
- Field QC Samples: MEC^x evaluated field QC samples, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. MEC^x used the remaining detects to evaluate the associated site samples. Findings associated with field QC samples are summarized below.
 - o Field Blanks and Equipment Blanks: Samples MH0021 (collected 6/3/19), MH0022 (collected 6/4/19) and MH0023 (collected 6/5/19) were identified as field blanks associated with field samples in this SDG by collection date. There were no detections in the field blanks of sufficient concentrations to warrant qualification of associated site samples except as noted in the table below. Associated sample results that were greater than MDL and less than RL were qualified as nondetect (U) at the RL. Associated site sample results that were greater than RL and <10× the field blank concentration were qualified as estimated with high potential bias (J+). Equipment blanks were not collected.

Field blank sample number	analyte	Field blank concentration (µg/L)	Associated qualified site samples
MH0022	zinc	4.1	MH0001, MH0002, MH0003, MH0011, MH0012, MH0013, MH0016, MH5014
	copper	0.18	MH0001, MH0002, MH0003, MH0011, MH0012, MH5014
	chromium	0.097	MH0003, MH0011, MH0012, MH0013, MH0016, MH5014
MH0023		0.40	MH0019, MH0020
	aluminum	74.5	
	iron	150	
	manganese	6.6	
	barium	7.4	MH0004, MH0005, MH0019, MH0020
	calcium	8430	

Field blank sample number	analyte	Field blank concentration (µg/L)	Associated qualified site samples
	copper	2.0	
	magnesium	2100	
	sodium	2710	
	vanadium	1.3	
	zinc	7.4	
	arsenic	1.1	
	potassium	880	

- o Field Duplicates: Samples MH0007 and MH0009, samples MH0013 and MH0016, and samples MH0019 in this SDG and MH5018 in SDG MH00A6 were identified as field duplicate (FD) pairs, based on location IDs. The RPD control limit of $\leq 30\%$ for all target analytes greater than RL and $\pm RL$ for all results $< RL$ were met except as noted in the table below. Associated results for in these pairs were qualified as estimated (J for detects, UJ for nondetects).

Field duplicate pair	Analyte	RPD/ $\pm RL$
MH0013 and MH0016	aluminum	>RL
	zinc	
MH0019 and MH5018	aluminum	116%
	manganese	106%
	zinc	54%
	arsenic	72%
	iron	>RL
	lead	156%
	copper	>RL

Validated Sample Result Forms MH0002

Analysis Method Hg

Lab Sample Name: 9060175-01 Sample No: MH0001 Sample Date: 06/04/2019 15:55:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Mercury	Total	7439-97-6	0.20	0.20	0.037	ug/L	U	U	

Lab Sample Name: 9060175-02 Sample No: MH0002 Sample Date: 06/04/2019 15:12:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury	Total	7439-97-6	0.20	0.20	0.037	ug/L	U	U	
---------	-------	-----------	------	------	-------	------	---	---	--

Lab Sample Name: 9060175-03 Sample No: MH0003 Sample Date: 06/04/2019 16:26:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury	Total	7439-97-6	0.20	0.20	0.037	ug/L	U	U	
---------	-------	-----------	------	------	-------	------	---	---	--

Lab Sample Name: 9060175-04 Sample No: MH0004 Sample Date: 06/05/2019 17:07:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury	Total	7439-97-6	0.20	0.20	0.037	ug/L	U	U	
---------	-------	-----------	------	------	-------	------	---	---	--

Lab Sample Name: 9060175-05 Sample No: MH0005 Sample Date: 06/05/2019 16:49:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury	Total	7439-97-6	0.20	0.20	0.037	ug/L	U	U	
---------	-------	-----------	------	------	-------	------	---	---	--

Lab Sample Name: 9060175-06 Sample No: MH0006 Sample Date: 06/03/2019 14:58:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury	Total	7439-97-6	0.071	0.20	0.037	ug/L	J	J	
---------	-------	-----------	-------	------	-------	------	---	---	--

Lab Sample Name: 9060175-07 Sample No: MH0007 Sample Date: 06/03/2019 11:24:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury	Total	7439-97-6	0.080	0.20	0.037	ug/L	J	J	
---------	-------	-----------	-------	------	-------	------	---	---	--

Analysis Method Hg

Lab Sample Name: 9060175-08 Sample No: MH0008 Sample Date: 06/03/2019 09:57:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Total 7439-97-6 0.043 0.20 0.037 ug/L J **J**

Lab Sample Name: 9060175-09 Sample No: MH0009 Sample Date: 06/03/2019 11:27:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Total 7439-97-6 0.11 0.20 0.037 ug/L J **J**

Lab Sample Name: 9060175-10 Sample No: MH0010 Sample Date: 06/03/2019 15:26:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Total 7439-97-6 0.062 0.20 0.037 ug/L J **J**

Lab Sample Name: 9060175-11 Sample No: MH0011 Sample Date: 06/04/2019 13:16:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Total 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060175-12 Sample No: MH0012 Sample Date: 06/04/2019 12:56:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Total 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060175-13 Sample No: MH0013 Sample Date: 06/04/2019 11:32:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Total 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060175-14 Sample No: MH0016 Sample Date: 06/04/2019 11:57:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Total 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060175-15 Sample No: MH0019 Sample Date: 06/05/2019 15:53:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Total 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Analysis Method Hg

Lab Sample Name: 9060175-16 Sample No: MH0020 Sample Date: 06/05/2019 15:22:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Total 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060175-17 Sample No: MH0021 Sample Date: 06/03/2019 12:00:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Total 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060175-18 Sample No: MH0022 Sample Date: 06/04/2019 12:15:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Total 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060175-19 Sample No: MH0023 Sample Date: 06/05/2019 08:05:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Total 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060175-20 Sample No: MH5014 Sample Date: 06/04/2019 12:05:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Total 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Analysis Method ICP_MS

Lab Sample Name: 9060175-01 Sample No: MH0001 Sample Date: 06/04/2019 15:55:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Aluminum	Total	7429-90-5	182	20.0	3.7	ug/L	*		
Antimony	Total	7440-36-0	2.0	2.0	0.093	ug/L	J*	UJ	B, A
Arsenic	Total	7440-38-2	1.4	1.0	0.070	ug/L	*	J	A
Barium	Total	7440-39-3	10.0	10.0	0.096	ug/L	J*	J	A
Beryllium	Total	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Total	7440-43-9	1.0	1.0	0.12	ug/L	U*	UJ	A
Calcium	Total	7440-70-2	6000	500	10.8	ug/L	*	J	A
Chromium	Total	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Total	7440-48-4	0.054	1.0	0.051	ug/L	J	J	
Copper	Total	7440-50-8	2.0	2.0	0.12	ug/L	J*	UJ	A, F

Analysis Method ICP_MS

Iron	Total	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Total	7439-92-1	1.0	1.0	0.028	ug/L	J*	UJ	B, A
Magnesium	Total	7439-95-4	1200	500	2.4	ug/L	*	J	A
Manganese	Total	7439-96-5	5.8	1.0	0.078	ug/L	*	J	A
Nickel	Total	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Total	7440-09-7	333	500	4.4	ug/L	J*	J	A
Selenium	Total	7782-49-2	5.0	5.0	0.32	ug/L	U	U	
Silver	Total	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Total	7440-23-5	1480	500	5.2	ug/L	*	J	A
Thallium	Total	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Total	7440-62-2	1.0	5.0	0.42	ug/L	J	J	
Zinc	Total	7440-66-6	5.4	2.0	0.68	ug/L	*	J+	A, F

Lab Sample Name: 9060175-02 Sample No: MH0002 Sample Date: 06/04/2019 15:12:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Total	7429-90-5	205	20.0	3.7	ug/L	*		
Antimony	Total	7440-36-0	2.0	2.0	0.093	ug/L	J*	UJ	B, A
Arsenic	Total	7440-38-2	1.5	1.0	0.070	ug/L	*	J	A
Barium	Total	7440-39-3	4.0	10.0	0.096	ug/L	J*	J	A
Beryllium	Total	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Total	7440-43-9	1.0	1.0	0.12	ug/L	U*	UJ	A
Calcium	Total	7440-70-2	6180	500	10.8	ug/L	*	J	A
Chromium	Total	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Total	7440-48-4	0.073	1.0	0.051	ug/L	J	J	
Copper	Total	7440-50-8	1.1	2.0	0.12	ug/L	J*	UJ	A, F
Iron	Total	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Total	7439-92-1	1.0	1.0	0.028	ug/L	J*	UJ	B, A
Magnesium	Total	7439-95-4	1300	500	2.4	ug/L	*	J	A
Manganese	Total	7439-96-5	6.8	1.0	0.078	ug/L	*	J	A
Nickel	Total	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Total	7440-09-7	341	500	4.4	ug/L	J*	J	A
Selenium	Total	7782-49-2	5.0	5.0	0.32	ug/L	U	U	
Silver	Total	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Total	7440-23-5	1490	500	5.2	ug/L	*	J	A
Thallium	Total	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Total	7440-62-2	1.1	5.0	0.42	ug/L	J	J	
Zinc	Total	7440-66-6	4.7	2.0	0.68	ug/L	*	J+	A, F

Lab Sample Name: 9060175-03 Sample No: MH0003 Sample Date: 06/04/2019 16:26:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Analysis Method ICP_MS

Aluminum	Total	7429-90-5	197	20.0	3.7	ug/L	*		
Antimony	Total	7440-36-0	2.0	2.0	0.093	ug/L	J*	UJ	B, A
Arsenic	Total	7440-38-2	1.4	1.0	0.070	ug/L	*	J	A
Barium	Total	7440-39-3	3.6	10.0	0.096	ug/L	J*	J	A
Beryllium	Total	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Total	7440-43-9	1.0	1.0	0.12	ug/L	U*	UJ	A
Calcium	Total	7440-70-2	5620	500	10.8	ug/L	*	J	A
Chromium	Total	7440-47-3	2.0	2.0	0.055	ug/L	J	U	F
Cobalt	Total	7440-48-4	0.055	1.0	0.051	ug/L	J	J	
Copper	Total	7440-50-8	2.0	2.0	0.12	ug/L	J*	UJ	A, F
Iron	Total	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Total	7439-92-1	1.0	1.0	0.028	ug/L	J*	UJ	B, A
Magnesium	Total	7439-95-4	1060	500	2.4	ug/L	*	J	A
Manganese	Total	7439-96-5	5.2	1.0	0.078	ug/L	*	J	A
Nickel	Total	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Total	7440-09-7	328	500	4.4	ug/L	J*	J	A
Selenium	Total	7782-49-2	5.0	5.0	0.32	ug/L	U	U	
Silver	Total	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Total	7440-23-5	1480	500	5.2	ug/L	*	J	A
Thallium	Total	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Total	7440-62-2	1.0	5.0	0.42	ug/L	J	J	
Zinc	Total	7440-66-6	5.2	2.0	0.68	ug/L	*	J+	A, F

Lab Sample Name: 9060175-04

Sample No: MH0004

Sample Date: 06/05/2019 17:07:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Total	7429-90-5	20.0	20.0	3.7	ug/L	J*	U	B
Antimony	Total	7440-36-0	2.0	2.0	0.093	ug/L	J*	UJ	B, A
Arsenic	Total	7440-38-2	5.6	1.0	0.070	ug/L	*	J+	A, F
Barium	Total	7440-39-3	10.0	10.0	0.096	ug/L	J*	UJ	A, F
Beryllium	Total	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Total	7440-43-9	1.0	1.0	0.12	ug/L	U*	UJ	A
Calcium	Total	7440-70-2	7780	500	10.8	ug/L	*	J+	A, F
Chromium	Total	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Total	7440-48-4	1.0	1.0	0.051	ug/L	U	U	
Copper	Total	7440-50-8	2.0	2.0	0.12	ug/L	J*	UJ	A, F
Iron	Total	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Total	7439-92-1	1.0	1.0	0.028	ug/L	J*	UJ	B, A
Magnesium	Total	7439-95-4	500	500	2.4	ug/L	J*	UJ	A, F
Manganese	Total	7439-96-5	1.0	1.0	0.078	ug/L	J*	UJ	B, A
Nickel	Total	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Total	7440-09-7	500	500	4.4	ug/L	J*	UJ	A, F

Analysis Method ICP_MS

Selenium	Total	7782-49-2	5.0	5.0	0.32	ug/L	U	U	
Silver	Total	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Total	7440-23-5	977	500	5.2	ug/L	*	J+	A, F
Thallium	Total	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Total	7440-62-2	5.0	5.0	0.42	ug/L	J	U	F
Zinc	Total	7440-66-6	5.5	2.0	0.68	ug/L	*	J+	A, F

Lab Sample Name: 9060175-05

Sample No: MH0005

Sample Date: 06/05/2019 16:49:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Total	7429-90-5	20.0	20.0	3.7	ug/L	J*	U	B
Antimony	Total	7440-36-0	2.0	2.0	0.093	ug/L	J*	UJ	B, A
Arsenic	Total	7440-38-2	5.5	1.0	0.070	ug/L	*	J+	A, F
Barium	Total	7440-39-3	10.0	10.0	0.096	ug/L	J*	UJ	A, F
Beryllium	Total	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Total	7440-43-9	1.0	1.0	0.12	ug/L	U*	UJ	A
Calcium	Total	7440-70-2	7920	500	10.8	ug/L	*	J+	A, F
Chromium	Total	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Total	7440-48-4	1.0	1.0	0.051	ug/L	U	U	
Copper	Total	7440-50-8	2.0	2.0	0.12	ug/L	J*	UJ	A, F
Iron	Total	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Total	7439-92-1	1.0	1.0	0.028	ug/L	J*	UJ	B, A
Magnesium	Total	7439-95-4	500	500	2.4	ug/L	J*	UJ	A, F
Manganese	Total	7439-96-5	1.0	1.0	0.078	ug/L	J*	UJ	B, A
Nickel	Total	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Total	7440-09-7	500	500	4.4	ug/L	J*	UJ	A, F
Selenium	Total	7782-49-2	5.0	5.0	0.32	ug/L	U	U	
Silver	Total	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Total	7440-23-5	1010	500	5.2	ug/L	*	J+	A, F
Thallium	Total	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Total	7440-62-2	5.0	5.0	0.42	ug/L	J	U	F
Zinc	Total	7440-66-6	6.6	2.0	0.68	ug/L	*	J+	A, F

Lab Sample Name: 9060175-06

Sample No: MH0006

Sample Date: 06/03/2019 14:58:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Total	7429-90-5	130	20.0	3.7	ug/L	*		
Antimony	Total	7440-36-0	4.5	2.0	0.093	ug/L	*	J	A
Arsenic	Total	7440-38-2	9.7	1.0	0.070	ug/L	*	J	A
Barium	Total	7440-39-3	16.5	10.0	0.096	ug/L	*	J	A
Beryllium	Total	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Total	7440-43-9	12.2	1.0	0.12	ug/L	*	J	A

Analysis Method ICP_MS

Calcium	Total	7440-70-2	41000	500	10.8	ug/L	*	J	A
Chromium	Total	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Total	7440-48-4	1.1	1.0	0.051	ug/L			
Copper	Total	7440-50-8	6.5	2.0	0.12	ug/L	*	J	A
Iron	Total	7439-89-6	385	200	3.0	ug/L			
Lead	Total	7439-92-1	12.0	1.0	0.028	ug/L	*	J	A
Magnesium	Total	7439-95-4	7140	500	2.4	ug/L	*	J	A
Manganese	Total	7439-96-5	7.7	1.0	0.078	ug/L	*	J	A
Nickel	Total	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Total	7440-09-7	1340	500	4.4	ug/L	*	J	A
Selenium	Total	7782-49-2	5.0	5.0	0.32	ug/L	U	U	
Silver	Total	7440-22-4	0.12	1.0	0.088	ug/L	J	J	
Sodium	Total	7440-23-5	3060	500	5.2	ug/L	*	J	A
Thallium	Total	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Total	7440-62-2	1.0	5.0	0.42	ug/L	J	J	
Zinc	Total	7440-66-6	135	2.0	0.68	ug/L	*	J	A

Lab Sample Name: 9060175-07

Sample No: MH0007

Sample Date: 06/03/2019 11:24:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Total	7429-90-5	86.0	20.0	3.7	ug/L	*		
Antimony	Total	7440-36-0	13.4	2.0	0.093	ug/L	*	J	A
Arsenic	Total	7440-38-2	10.9	1.0	0.070	ug/L	*	J	A
Barium	Total	7440-39-3	20.2	10.0	0.096	ug/L	*	J	A
Beryllium	Total	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Total	7440-43-9	12.9	1.0	0.12	ug/L	*	J	A
Calcium	Total	7440-70-2	44200	500	10.8	ug/L	*	J	A
Chromium	Total	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Total	7440-48-4	1.1	1.0	0.051	ug/L			
Copper	Total	7440-50-8	9.3	2.0	0.12	ug/L	*	J	A
Iron	Total	7439-89-6	304	200	3.0	ug/L			
Lead	Total	7439-92-1	58.8	1.0	0.028	ug/L	*	J	A
Magnesium	Total	7439-95-4	8570	500	2.4	ug/L	*	J	A
Manganese	Total	7439-96-5	34.8	1.0	0.078	ug/L	*	J	A
Nickel	Total	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Total	7440-09-7	1530	500	4.4	ug/L	*	J	A
Selenium	Total	7782-49-2	5.0	5.0	0.32	ug/L	U	U	
Silver	Total	7440-22-4	0.73	1.0	0.088	ug/L	J	J	
Sodium	Total	7440-23-5	3690	500	5.2	ug/L	*	J	A
Thallium	Total	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Total	7440-62-2	0.92	5.0	0.42	ug/L	J	J	
Zinc	Total	7440-66-6	417	2.0	0.68	ug/L	*	J	A

Analysis Method ICP_MS

Lab Sample Name: 9060175-08 Sample No: MH0008 Sample Date: 06/03/2019 09:57:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Total	7429-90-5	24.1	20.0	3.7	ug/L	*		
Antimony	Total	7440-36-0	11.4	2.0	0.093	ug/L	*	J	A
Arsenic	Total	7440-38-2	9.1	1.0	0.070	ug/L	*	J	A
Barium	Total	7440-39-3	20.1	10.0	0.096	ug/L	*	J	A
Beryllium	Total	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Total	7440-43-9	10.7	1.0	0.12	ug/L	*	J	A
Calcium	Total	7440-70-2	42700	500	10.8	ug/L	*	J	A
Chromium	Total	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Total	7440-48-4	0.99	1.0	0.051	ug/L	J	J	
Copper	Total	7440-50-8	6.1	2.0	0.12	ug/L	*	J	A
Iron	Total	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Total	7439-92-1	28.0	1.0	0.028	ug/L	*	J	A
Magnesium	Total	7439-95-4	7670	500	2.4	ug/L	*	J	A
Manganese	Total	7439-96-5	19.1	1.0	0.078	ug/L	*	J	A
Nickel	Total	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Total	7440-09-7	1520	500	4.4	ug/L	*	J	A
Selenium	Total	7782-49-2	5.0	5.0	0.32	ug/L	U	U	
Silver	Total	7440-22-4	0.56	1.0	0.088	ug/L	J	J	
Sodium	Total	7440-23-5	3830	500	5.2	ug/L	*	J	A
Thallium	Total	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Total	7440-62-2	0.62	5.0	0.42	ug/L	J	J	
Zinc	Total	7440-66-6	348	2.0	0.68	ug/L	*	J	A

Lab Sample Name: 9060175-09 Sample No: MH0009 Sample Date: 06/03/2019 11:27:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Total	7429-90-5	84.2	20.0	3.7	ug/L	*		
Antimony	Total	7440-36-0	13.4	2.0	0.093	ug/L	*	J	A
Arsenic	Total	7440-38-2	10.4	1.0	0.070	ug/L	*	J	A
Barium	Total	7440-39-3	19.9	10.0	0.096	ug/L	*	J	A
Beryllium	Total	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Total	7440-43-9	12.9	1.0	0.12	ug/L	*	J	A
Calcium	Total	7440-70-2	44400	500	10.8	ug/L	*	J	A
Chromium	Total	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Total	7440-48-4	1.1	1.0	0.051	ug/L			
Copper	Total	7440-50-8	9.4	2.0	0.12	ug/L	*	J	A
Iron	Total	7439-89-6	265	200	3.0	ug/L			
Lead	Total	7439-92-1	61.9	1.0	0.028	ug/L	*	J	A

Analysis Method ICP_MS

Magnesium	Total	7439-95-4	8760	500	2.4	ug/L	*	J	A
Manganese	Total	7439-96-5	34.1	1.0	0.078	ug/L	*	J	A
Nickel	Total	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Total	7440-09-7	1520	500	4.4	ug/L	*	J	A
Selenium	Total	7782-49-2	5.0	5.0	0.32	ug/L	U	U	
Silver	Total	7440-22-4	0.68	1.0	0.088	ug/L	J	J	
Sodium	Total	7440-23-5	3620	500	5.2	ug/L	*	J	A
Thallium	Total	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Total	7440-62-2	0.94	5.0	0.42	ug/L	J	J	
Zinc	Total	7440-66-6	425	2.0	0.68	ug/L	*	J	A

Lab Sample Name: 9060175-10 Sample No: MH0010 Sample Date: 06/03/2019 15:26:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Total	7429-90-5	217	20.0	3.7	ug/L	*		
Antimony	Total	7440-36-0	2.4	2.0	0.093	ug/L	*	J	A
Arsenic	Total	7440-38-2	11.3	1.0	0.070	ug/L	*	J	A
Barium	Total	7440-39-3	14.5	10.0	0.096	ug/L	*	J	A
Beryllium	Total	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Total	7440-43-9	10.1	1.0	0.12	ug/L	*	J	A
Calcium	Total	7440-70-2	39900	500	10.8	ug/L	*	J	A
Chromium	Total	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Total	7440-48-4	1.1	1.0	0.051	ug/L			
Copper	Total	7440-50-8	8.9	2.0	0.12	ug/L	*	J	A
Iron	Total	7439-89-6	719	200	3.0	ug/L			
Lead	Total	7439-92-1	11.2	1.0	0.028	ug/L	*	J	A
Magnesium	Total	7439-95-4	6230	500	2.4	ug/L	*	J	A
Manganese	Total	7439-96-5	12.2	1.0	0.078	ug/L	*	J	A
Nickel	Total	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Total	7440-09-7	1040	500	4.4	ug/L	*	J	A
Selenium	Total	7782-49-2	5.0	5.0	0.32	ug/L	U	U	
Silver	Total	7440-22-4	0.29	1.0	0.088	ug/L	J	J	
Sodium	Total	7440-23-5	2490	500	5.2	ug/L	*	J	A
Thallium	Total	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Total	7440-62-2	1.1	5.0	0.42	ug/L	J	J	
Zinc	Total	7440-66-6	103	2.0	0.68	ug/L	*	J	A

Lab Sample Name: 9060175-11 Sample No: MH0011 Sample Date: 06/04/2019 13:16:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Total	7429-90-5	249	20.0	3.7	ug/L	*		
Antimony	Total	7440-36-0	2.0	2.0	0.093	ug/L	J*	UJ	B, A

Analysis Method ICP_MS

Arsenic	Total	7440-38-2	1.7	1.0	0.070	ug/L	*	J	A
Barium	Total	7440-39-3	4.4	10.0	0.096	ug/L	J*	J	A
Beryllium	Total	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Total	7440-43-9	1.0	1.0	0.12	ug/L	U*	UJ	A
Calcium	Total	7440-70-2	6210	500	10.8	ug/L	*	J	A
Chromium	Total	7440-47-3	2.0	2.0	0.055	ug/L	J	U	F
Cobalt	Total	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Total	7440-50-8	1.1	2.0	0.12	ug/L	J*	UJ	A, F
Iron	Total	7439-89-6	187	200	3.0	ug/L	J	J	
Lead	Total	7439-92-1	1.0	1.0	0.028	ug/L	J*	UJ	B, A
Magnesium	Total	7439-95-4	1280	500	2.4	ug/L	*	J	A
Manganese	Total	7439-96-5	6.5	1.0	0.078	ug/L	*	J	A
Nickel	Total	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Total	7440-09-7	345	500	4.4	ug/L	J*	J	A
Selenium	Total	7782-49-2	5.0	5.0	0.32	ug/L	U	U	
Silver	Total	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Total	7440-23-5	1430	500	5.2	ug/L	*	J	A
Thallium	Total	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Total	7440-62-2	0.96	5.0	0.42	ug/L	J	J	
Zinc	Total	7440-66-6	7.6	2.0	0.68	ug/L	*	J+	A, F

Lab Sample Name: 9060175-12

Sample No: MH0012

Sample Date: 06/04/2019 12:56:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Total	7429-90-5	268	20.0	3.7	ug/L	*		
Antimony	Total	7440-36-0	2.0	2.0	0.093	ug/L	J*	UJ	B, A
Arsenic	Total	7440-38-2	1.8	1.0	0.070	ug/L	*	J	A
Barium	Total	7440-39-3	4.3	10.0	0.096	ug/L	J*	J	A
Beryllium	Total	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Total	7440-43-9	1.0	1.0	0.12	ug/L	U*	UJ	A
Calcium	Total	7440-70-2	6350	500	10.8	ug/L	*	J	A
Chromium	Total	7440-47-3	2.0	2.0	0.055	ug/L	J	U	F
Cobalt	Total	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Total	7440-50-8	1.1	2.0	0.12	ug/L	J*	UJ	A, F
Iron	Total	7439-89-6	202	200	3.0	ug/L			
Lead	Total	7439-92-1	1.0	1.0	0.028	ug/L	J*	UJ	B, A
Magnesium	Total	7439-95-4	1320	500	2.4	ug/L	*	J	A
Manganese	Total	7439-96-5	7.6	1.0	0.078	ug/L	*	J	A
Nickel	Total	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Total	7440-09-7	353	500	4.4	ug/L	J*	J	A
Selenium	Total	7782-49-2	5.0	5.0	0.32	ug/L	U	U	
Silver	Total	7440-22-4	1.0	1.0	0.088	ug/L	U	U	

Analysis Method ICP_MS

Sodium	Total	7440-23-5	1440	500	5.2	ug/L	*	J	A
Thallium	Total	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Total	7440-62-2	0.97	5.0	0.42	ug/L	J	J	
Zinc	Total	7440-66-6	6.6	2.0	0.68	ug/L	*	J+	A, F

Lab Sample Name: 9060175-13

Sample No: MH0013

Sample Date: 06/04/2019 11:32:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Total	7429-90-5	74.9	20.0	3.7	ug/L	*	J	F1
Antimony	Total	7440-36-0	2.0	2.0	0.093	ug/L	J*	UJ	B, A
Arsenic	Total	7440-38-2	1.1	1.0	0.070	ug/L	*	J	A
Barium	Total	7440-39-3	7.6	10.0	0.096	ug/L	J*	J	A
Beryllium	Total	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Total	7440-43-9	1.0	1.0	0.12	ug/L	U*	UJ	A
Calcium	Total	7440-70-2	8760	500	10.8	ug/L	*	J	A
Chromium	Total	7440-47-3	2.0	2.0	0.055	ug/L	J	U	F
Cobalt	Total	7440-48-4	1.0	1.0	0.051	ug/L	U	U	
Copper	Total	7440-50-8	2.6	2.0	0.12	ug/L	*	J	A
Iron	Total	7439-89-6	148	200	3.0	ug/L	J	J	
Lead	Total	7439-92-1	1.0	1.0	0.028	ug/L	J*	UJ	B, A
Magnesium	Total	7439-95-4	2240	500	2.4	ug/L	*	J	A
Manganese	Total	7439-96-5	7.3	1.0	0.078	ug/L	*	J	A
Nickel	Total	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Total	7440-09-7	918	500	4.4	ug/L	*	J	A
Selenium	Total	7782-49-2	5.0	5.0	0.32	ug/L	U	U	
Silver	Total	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Total	7440-23-5	2910	500	5.2	ug/L	*	J	A
Thallium	Total	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Total	7440-62-2	1.2	5.0	0.42	ug/L	J	J	
Zinc	Total	7440-66-6	8.7	2.0	0.68	ug/L	*	J+	A, F, F1

Lab Sample Name: 9060175-14

Sample No: MH0016

Sample Date: 06/04/2019 11:57:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Total	7429-90-5	42.2	20.0	3.7	ug/L	*	J	F1
Antimony	Total	7440-36-0	2.0	2.0	0.093	ug/L	J*	UJ	B, A
Arsenic	Total	7440-38-2	1.0	1.0	0.070	ug/L	*	J	A
Barium	Total	7440-39-3	7.4	10.0	0.096	ug/L	J*	J	A
Beryllium	Total	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Total	7440-43-9	1.0	1.0	0.12	ug/L	U*	UJ	A
Calcium	Total	7440-70-2	8610	500	10.8	ug/L	*	J	A
Chromium	Total	7440-47-3	2.0	2.0	0.055	ug/L	J	U	F

Analysis Method ICP_MS

Cobalt	Total	7440-48-4	1.0	1.0	0.051	ug/L	U	U	
Copper	Total	7440-50-8	1.9	2.0	0.12	ug/L	J*	J	A
Iron	Total	7439-89-6	136	200	3.0	ug/L	J	J	
Lead	Total	7439-92-1	1.0	1.0	0.028	ug/L	J*	UJ	B, A
Magnesium	Total	7439-95-4	2180	500	2.4	ug/L	*	J	A
Manganese	Total	7439-96-5	6.4	1.0	0.078	ug/L	*	J	A
Nickel	Total	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Total	7440-09-7	902	500	4.4	ug/L	*	J	A
Selenium	Total	7782-49-2	5.0	5.0	0.32	ug/L	U	U	
Silver	Total	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Total	7440-23-5	2830	500	5.2	ug/L	*	J	A
Thallium	Total	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Total	7440-62-2	1.1	5.0	0.42	ug/L	J	J	
Zinc	Total	7440-66-6	5.8	2.0	0.68	ug/L	*	J+	A, F, F1

Lab Sample Name: 9060175-15

Sample No: MH0019

Sample Date: 06/05/2019 15:53:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Total	7429-90-5	128	20.0	3.7	ug/L	*	J+	F, F1
Antimony	Total	7440-36-0	2.0	2.0	0.093	ug/L	J*	UJ	B, A
Arsenic	Total	7440-38-2	2.2	1.0	0.070	ug/L	*	J+	A, F, F1
Barium	Total	7440-39-3	10.0	10.0	0.096	ug/L	J*	UJ	A, F
Beryllium	Total	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Total	7440-43-9	1.0	1.0	0.12	ug/L	U*	UJ	A
Calcium	Total	7440-70-2	18400	500	10.8	ug/L	*	J+	A, F
Chromium	Total	7440-47-3	2.0	2.0	0.055	ug/L	J	U	F
Cobalt	Total	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Total	7440-50-8	1.7	2.0	0.12	ug/L	J*	UJ	A, F, F1
Iron	Total	7439-89-6	200	200	3.0	ug/L	J	UJ	F, F1
Lead	Total	7439-92-1	1.1	1.0	0.028	ug/L	*	J	A, F1
Magnesium	Total	7439-95-4	2230	500	2.4	ug/L	*	J+	A, F
Manganese	Total	7439-96-5	7.4	1.0	0.078	ug/L	*	J+	A, F, F1
Nickel	Total	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Total	7440-09-7	535	500	4.4	ug/L	*	J+	A, F
Selenium	Total	7782-49-2	5.0	5.0	0.32	ug/L	U	U	
Silver	Total	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Total	7440-23-5	2030	500	5.2	ug/L	*	J+	A, F
Thallium	Total	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Total	7440-62-2	5.0	5.0	0.42	ug/L	J	U	F
Zinc	Total	7440-66-6	8.7	2.0	0.68	ug/L	*	J+	A, F, F1

Analysis Method ICP_MS

Lab Sample Name: 9060175-16 Sample No: MH0020 Sample Date: 06/05/2019 15:22:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Total	7429-90-5	120	20.0	3.7	ug/L	*	J+	F
Antimony	Total	7440-36-0	2.0	2.0	0.093	ug/L	J*	UJ	B, A
Arsenic	Total	7440-38-2	2.2	1.0	0.070	ug/L	*	J+	A, F
Barium	Total	7440-39-3	10.0	10.0	0.096	ug/L	J*	UJ	A, F
Beryllium	Total	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Total	7440-43-9	1.0	1.0	0.12	ug/L	U*	UJ	A
Calcium	Total	7440-70-2	18500	500	10.8	ug/L	*	J+	A, F
Chromium	Total	7440-47-3	2.0	2.0	0.055	ug/L	J	U	F
Cobalt	Total	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Total	7440-50-8	2.0	2.0	0.12	ug/L	J*	UJ	A, F
Iron	Total	7439-89-6	200	200	3.0	ug/L	J	U	F
Lead	Total	7439-92-1	0.84	1.0	0.028	ug/L	J*	J	A
Magnesium	Total	7439-95-4	2220	500	2.4	ug/L	*	J+	A, F
Manganese	Total	7439-96-5	7.0	1.0	0.078	ug/L	*	J+	A, F
Nickel	Total	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Total	7440-09-7	513	500	4.4	ug/L	*	J+	A, F
Selenium	Total	7782-49-2	5.0	5.0	0.32	ug/L	U	U	
Silver	Total	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Total	7440-23-5	1940	500	5.2	ug/L	*	J+	A, F
Thallium	Total	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Total	7440-62-2	5.0	5.0	0.42	ug/L	J	U	F
Zinc	Total	7440-66-6	5.5	2.0	0.68	ug/L	*	J+	A, F

Lab Sample Name: 9060175-17 Sample No: MH0021 Sample Date: 06/03/2019 12:00:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Total	7429-90-5	20.0	20.0	3.7	ug/L	U*	U	
Antimony	Total	7440-36-0	2.0	2.0	0.093	ug/L	J*	U	B
Arsenic	Total	7440-38-2	1.0	1.0	0.070	ug/L	U*	U	
Barium	Total	7440-39-3	10.0	10.0	0.096	ug/L	U*	U	
Beryllium	Total	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Total	7440-43-9	1.0	1.0	0.12	ug/L	U*	U	
Calcium	Total	7440-70-2	500	500	10.8	ug/L	J*	U	B
Chromium	Total	7440-47-3	0.21	2.0	0.055	ug/L	J	J	
Cobalt	Total	7440-48-4	1.0	1.0	0.051	ug/L	U	U	
Copper	Total	7440-50-8	2.0	2.0	0.12	ug/L	U*	U	
Iron	Total	7439-89-6	200	200	3.0	ug/L	U	U	
Lead	Total	7439-92-1	1.0	1.0	0.028	ug/L	U*	U	

Analysis Method ICP_MS

Magnesium	Total	7439-95-4	500	500	2.4	ug/L	U*	U	
Manganese	Total	7439-96-5	1.0	1.0	0.078	ug/L	J*	U	B
Nickel	Total	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Total	7440-09-7	500	500	4.4	ug/L	U*	U	
Selenium	Total	7782-49-2	5.0	5.0	0.32	ug/L	U	U	
Silver	Total	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Total	7440-23-5	500	500	5.2	ug/L	J*	U	B
Thallium	Total	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Total	7440-62-2	5.0	5.0	0.42	ug/L	U	U	
Zinc	Total	7440-66-6	5.4	2.0	0.68	ug/L	*		

Lab Sample Name: 9060175-18 Sample No: MH0022 Sample Date: 06/04/2019 12:15:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Total	7429-90-5	20.0	20.0	3.7	ug/L	U*	U	
Antimony	Total	7440-36-0	2.0	2.0	0.093	ug/L	J*	U	B
Arsenic	Total	7440-38-2	1.0	1.0	0.070	ug/L	U*	U	
Barium	Total	7440-39-3	10.0	10.0	0.096	ug/L	U*	U	
Beryllium	Total	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Total	7440-43-9	1.0	1.0	0.12	ug/L	U*	U	
Calcium	Total	7440-70-2	500	500	10.8	ug/L	J*	U	B
Chromium	Total	7440-47-3	0.097	2.0	0.055	ug/L	J	J	
Cobalt	Total	7440-48-4	1.0	1.0	0.051	ug/L	U	U	
Copper	Total	7440-50-8	0.18	2.0	0.12	ug/L	J*	J	
Iron	Total	7439-89-6	200	200	3.0	ug/L	U	U	
Lead	Total	7439-92-1	1.0	1.0	0.028	ug/L	J*	U	B
Magnesium	Total	7439-95-4	500	500	2.4	ug/L	J*	U	B
Manganese	Total	7439-96-5	1.0	1.0	0.078	ug/L	U*	U	
Nickel	Total	7440-02-0	1.0	1.0	0.043	ug/L	U	U	
Potassium	Total	7440-09-7	500	500	4.4	ug/L	U*	U	
Selenium	Total	7782-49-2	5.0	5.0	0.32	ug/L	U	U	
Silver	Total	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Total	7440-23-5	500	500	5.2	ug/L	J*	U	B
Thallium	Total	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Total	7440-62-2	5.0	5.0	0.42	ug/L	U	U	
Zinc	Total	7440-66-6	4.1	2.0	0.68	ug/L	*		

Lab Sample Name: 9060175-19 Sample No: MH0023 Sample Date: 06/05/2019 08:05:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Total	7429-90-5	74.5	20.0	3.7	ug/L	*		
Antimony	Total	7440-36-0	2.0	2.0	0.093	ug/L	J*	U	B

Analysis Method ICP_MS

Arsenic	Total	7440-38-2	1.1	1.0	0.070	ug/L	*	
Barium	Total	7440-39-3	7.4	10.0	0.096	ug/L	J*	J
Beryllium	Total	7440-41-7	1.0	1.0	0.13	ug/L	U	U
Cadmium	Total	7440-43-9	1.0	1.0	0.12	ug/L	U*	U
Calcium	Total	7440-70-2	8430	500	10.8	ug/L	*	
Chromium	Total	7440-47-3	0.40	2.0	0.055	ug/L	J	J
Cobalt	Total	7440-48-4	1.0	1.0	0.051	ug/L	U	U
Copper	Total	7440-50-8	2.0	2.0	0.12	ug/L	*	
Iron	Total	7439-89-6	150	200	3.0	ug/L	J	J
Lead	Total	7439-92-1	1.0	1.0	0.028	ug/L	J*	U B
Magnesium	Total	7439-95-4	2100	500	2.4	ug/L	*	
Manganese	Total	7439-96-5	6.6	1.0	0.078	ug/L	*	
Nickel	Total	7440-02-0	1.0	1.0	0.043	ug/L	J	U B
Potassium	Total	7440-09-7	880	500	4.4	ug/L	*	
Selenium	Total	7782-49-2	5.0	5.0	0.32	ug/L	U	U
Silver	Total	7440-22-4	1.0	1.0	0.088	ug/L	U	U
Sodium	Total	7440-23-5	2710	500	5.2	ug/L	*	
Thallium	Total	7440-28-0	1.0	1.0	0.051	ug/L	U	U
Vanadium	Total	7440-62-2	1.3	5.0	0.42	ug/L	J	J
Zinc	Total	7440-66-6	7.4	2.0	0.68	ug/L	*	

Lab Sample Name: 9060175-20 Sample No: MH5014 Sample Date: 06/04/2019 12:05:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Total	7429-90-5	20.0	20.0	3.7	ug/L	U*	U	
Antimony	Total	7440-36-0	2.0	2.0	0.093	ug/L	J*	UJ	B, A
Arsenic	Total	7440-38-2	1.0	1.0	0.070	ug/L	U*	UJ	A
Barium	Total	7440-39-3	10.0	10.0	0.096	ug/L	U*	UJ	A
Beryllium	Total	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Total	7440-43-9	1.0	1.0	0.12	ug/L	U*	UJ	A
Calcium	Total	7440-70-2	500	500	10.8	ug/L	J*	UJ	B, A
Chromium	Total	7440-47-3	2.0	2.0	0.055	ug/L	J	U	F
Cobalt	Total	7440-48-4	1.0	1.0	0.051	ug/L	U	U	
Copper	Total	7440-50-8	2.0	2.0	0.12	ug/L	J*	UJ	A, F
Iron	Total	7439-89-6	200	200	3.0	ug/L	U	U	
Lead	Total	7439-92-1	1.0	1.0	0.028	ug/L	U*	UJ	A
Magnesium	Total	7439-95-4	500	500	2.4	ug/L	J*	UJ	B, A
Manganese	Total	7439-96-5	1.0	1.0	0.078	ug/L	J*	UJ	B, A
Nickel	Total	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Total	7440-09-7	500	500	4.4	ug/L	U*	UJ	A
Selenium	Total	7782-49-2	5.0	5.0	0.32	ug/L	U	U	
Silver	Total	7440-22-4	1.0	1.0	0.088	ug/L	U	U	

Analysis Method *ICP_MS*

Sodium	Total	7440-23-5	500	500	5.2	ug/L	J*	UJ	B, A
Thallium	Total	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Total	7440-62-2	5.0	5.0	0.42	ug/L	U	U	
Zinc	Total	7440-66-6	8.7	2.0	0.68	ug/L	*	J+	A, F



DATA VALIDATION REPORT

Elkhorn Mining Site Inspection

SAMPLE DELIVERY GROUP: MH0014

Prepared by

MEC^x
12269 East Vassar Drive
Aurora, CO 80014

I. INTRODUCTION

Task Order Title: Elkhorn Mining Site Inspection
 Contract Task Order: 20408.012.004.0621.00
 Sample Delivery Group: MH0014
 Weston Project Manager: Natalie Quiet
 EPA Project Manager: Joseph Chisholm
 TDD No.: 0004/1807-06
 Case No.: 48289
 Matrix: Water
 QC Level: Stage 2B
 No. of Samples: 20
 No. of Reanalyses/Dilutions: 0
 Laboratory: Bonner Analytical Testing Co.

Table 1. Sample Identification

<i>Sample No.</i>	<i>Lab Sample Name</i>	<i>Matrix Type</i>	<i>Collection Date</i>	<i>Method</i>
MH0014	9060179-01	Surface Water	06/04/2019 12:05:00	Hg, ICP-MS
MH0017	9060179-02	Surface Water	06/04/2019 11:03:00	Hg, ICP-MS
MH0018	9060179-03	Surface Water	06/05/2019 15:53:00	Hg, ICP-MS
MH0019	9060179-04	Surface Water	06/05/2019 15:53:00	Hg, ICP-MS
MH5001	9060179-05	Surface Water	06/04/2019 15:55:00	Hg, ICP-MS
MH5002	9060179-06	Surface Water	06/04/2019 15:12:00	Hg, ICP-MS
MH5003	9060179-07	Surface Water	06/04/2019 16:26:00	Hg, ICP-MS
MH5004	9060179-08	Surface Water	06/05/2019 17:07:00	Hg, ICP-MS
MH5005	9060179-09	Surface Water	06/05/2019 16:49:00	Hg, ICP-MS
MH5006	9060179-10	Surface Water	06/03/2019 14:58:00	Hg, ICP-MS
MH5007	9060179-11	Surface Water	06/03/2019 11:24:00	Hg, ICP-MS
MH5008	9060179-12	Surface Water	06/03/2019 09:57:00	Hg, ICP-MS
MH5009	9060179-13	Surface Water	06/03/2019 11:27:00	Hg, ICP-MS
MH5010	9060179-14	Surface Water	06/03/2019 15:26:00	Hg, ICP-MS
MH5011	9060179-15	Surface Water	06/04/2019 13:16:00	Hg, ICP-MS
MH5012	9060179-16	Surface Water	06/04/2019 12:56:00	Hg, ICP-MS
MH5013	9060179-17	Surface Water	06/04/2019 11:32:00	Hg, ICP-MS
MH5016	9060179-18	Surface Water	06/04/2019 11:57:00	Hg, ICP-MS
MH5020	9060179-19	Surface Water	06/05/2019 15:22:00	Hg, ICP-MS
MH5021	9060179-20	Water	06/03/2019 12:00:00	Hg, ICP-MS

II. Sample Management

Anomalies with sample management are noted below. According to the Sample Receipt Forms the samples were received intact and properly preserved. All coolers were received at 0°C. The chains of custody (COC) were signed and dated by field and/or laboratory personnel. Custody seals were present and intact.

The following issues were noted:

- Two bottles were listed on the COC for sample MH0018, but only one bottle was received. The client directed that the sample be analyzed for dissolved metals and dissolved mercury.
- Two bottles were received for sample MH0011 and no bottles were received for sample MH5011. The filtered bottle labeled for sample MH0011 was logged as sample MH5011 pre client authorization.
- Sample MH0019 was listed twice on the COC, both with collection date of 6/5/19 and collection time of 15:53. Based on sample results and laboratory batching, it is assumed by the reviewer that sample MH0019 in this SDG was filtered, and the results are for dissolved metals. A sample with this identification was also reported in SDG MH0002. The sample in SDG MH0002 is assumed to be unfiltered, and the results are for total metals.

Data Qualifier Reference Table

Qualifier	Organics	Inorganics
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit. The associated value is the quantitation limit or the estimated detection limit for dioxins or PCB congeners.	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit. The associated value is the sample detection limit or the quantitation limit for perchlorate only.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J+	Not applicable	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, and may have a potential positive bias.
J-	Not applicable	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, and may have a potential negative bias.
UJ	The analyte was not deemed above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.	The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."	Not applicable.



Qualifier	Organics	Inorganics
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.	Not applicable.
R	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.

Qualification Code Reference Table

Qualifier	Organics	Inorganics
H	Holding times were exceeded.	Holding times were exceeded.
S	Surrogate recovery was outside QC limits.	The sequence or number of standards used for the calibration was incorrect
C	Calibration %RSD or %D was noncompliant.	Correlation coefficient is <0.995 or calibration was noncompliant.
R	Calibration RRF was <0.05.	%R for calibration is not within control limits.
B	Presumed contamination as indicated by the preparation (method) blank results.	Presumed contamination as indicated by the preparation (method) or calibration blank results.
L	Laboratory Blank Spike/Blank Spike Duplicate %R was not within control limits.	Laboratory Control Sample %R was not within control limits.
L1	LCS/LCSD RPD was outside control limits.	LCS/LCSD RPD was outside control limits.
Q	MS/MSD recovery was poor.	MS recovery was poor.
Q1	MS/MSD RPD was outside control limits.	MS/MSD RPD was outside control limits.
E	Not applicable.	Duplicates showed poor agreement.
I	Internal standard performance was unsatisfactory.	ICP ICS results were unsatisfactory.
A	Not applicable.	ICP Serial Dilution %D were not within control limits.
M	Tuning (BFB or DFTPP) was noncompliant.	ICPMS tune was not compliant.
T	Presumed contamination as indicated by the trip blank results.	Not applicable.
+	False positive – reported compound was not present.	Not applicable.
-	False negative – compound was present but not reported.	Not applicable.
F	Presumed contamination as indicated by the FB or ER results.	Presumed contamination as indicated by the FB or ER results.
F1	Field duplicate results were outside the control limit.	Field duplicate results were outside the control limit.
\$	Reported result or other information was incorrect.	Reported result or other information was incorrect.
?	TIC identity or reported retention time has been changed.	Not applicable.



Qualifier	Organics	Inorganics
D	The analysis with this flag should not be used because another more technically sound analysis is available.	The analysis with this flag should not be used because another more technically sound analysis is available.
P	Instrument performance for pesticides was poor.	Post Digestion Spike recovery was not within control limits.
*II, *III	Unusual problems found with the data that have been described in Section II, "Sample Management," or Section III, "Method Analyses." The number following the asterisk (*) will indicate the report section where a description of the problem can be found.	Unusual problems found with the data that have been described in Section II, "Sample Management," or Section III, "Method Analyses." The number following the asterisk (*) will indicate the report section where a description of the problem can be found.

III. Method Analyses

A. **Methods 200.8 and 245.1—Metals and Mercury**

Reviewed By: M. Hilchey

Date Reviewed: July 12, 2019

The samples listed in Table 1 for these analyses were validated based on the guidelines outlined in the *Quality Assurance Project Plan for U. S. EPA Region 8 CERCLA Site Assessment* (Rev. 2015), *United States Environmental Protection Agency Methods 200.8 and 245.1* and the *National Functional Guidelines for Inorganic Superfund Methods Data Review* (January 2017).

- Holding Times: The analytical holding times, 28 days for mercury and six months for the remaining metals, were met.
- Instrument tune: According to summary reports, ICP-MS instrument tuning requirements were met.
- Calibration:
 - Initial calibration: According to the calibration summaries, correlation coefficients and %Ds met National Functional Guideline (NFG) acceptance requirements.
 - Initial (ICV) and continuing calibration (CCV) verification: ICV and CCV frequency requirements were met. ICV and CCV recoveries were within 90-110% for ICP-MS and 85-115% for mercury.
- Method Blanks: No target analytes were reported in the method blanks (MB) or calibration blanks (ICB/CCB) of sufficient concentration to qualify site sample results except as noted in the table below. For positive blank concentrations, associated detected sample results that were below the reporting limit (RL) were qualified as nondetect (U) at the RL. Associated detected sample results that were below the RL and >10× the blank concentration were not qualified, based on professional judgment. Associated detected sample results that were greater than RL and <5× the blank concentration were qualified as estimated with high bias (J+). For negative blank concentrations greater than the absolute value of the MDL, nondetect results were qualified as estimated (UJ).

Analyte	Blank concentration (ug/L)	Qualified Samples
antimony	0.29 (ICB)	MH5001, MH5002, MH5003, MH5004, MH5005, MH5011, MH5012, MH5013, MH5016, MH5020, MH5021, MH0014, MH0017, MH0018, MH0019
barium	0.65 (ICB)	
cobalt	0.11 (ICB)	
calcium	20.3 (ICB)	MH5021
magnesium	18.4 (ICB)	
potassium	24.9 (ICB)	
sodium	-18.2 (MB)	

Analyte	Blank concentration (ug/L)	Qualified Samples
chromium	0.12 (ICB)	MH5001, MH5002, MH5003, MH5004, MH5005, MH5006, MH5007, MH5008, MH5010, MH5011, MH5012, MH5013, MH5016, MH5020, MH5021, MH0014, MH0017, MH0018, MH0019
nickel	0.13 (CCB)	
iron	16.1 (ICB)	All samples
selenium	-0.34 (MB)	
lead	0.18 (ICB)	MH5012, MH5020, MH0018
	-0.054 (MB)	MH5001, MH5002, MH5003, MH5004, MH5005, MH5011, MH5013, MH5016, MH5021, MH0014, MH0017
manganese	0.95 (CCB)	MH5001, MH5002, MH5003, MH5004, MH5005, MH5006, MH5010, MH5011, MH5012, MH5020, MH5021, MH0014, MH0017, MH0018, MH0019
zinc	1.1 (MB)	MH5001, MH5002, MH5003, MH5005, MH0014, MH0018
aluminum	6.2 (CCB)	MH5001, MH5003, MH5013, MH5016, MH0014

- Interference Check Samples (ICSA/B): ICSA/B data are not reviewed at a Stage 2B validation.
- Laboratory Control Samples (LCS): The LCS recoveries were within 80-120% for ICP-MS.
- Laboratory Duplicates: Laboratory duplicate analysis was performed on sample MH5008 for both methods. All RPDs met the control limits of $\leq 20\%$ for sample results $> 5 \times$ RL and $\pm$ RL for sample results $< 5 \times$ RL.
- Matrix Spike: Matrix spike (MS) analysis was performed on sample MH5008 for both methods. MS recoveries were not assessed when the parent sample concentrations were more than $4 \times$ the spike amount. Recoveries met control limits of 75-125% for all target analytes.
- Post Digestion Spike: Post digestion spike analyses were not performed.
- Serial Dilution: Serial dilution analysis was performed on sample MH5008. Results were not assessed unless the parent sample concentration was $> 50 \times$ the MDL. The control limit of $\leq 10\%$ difference (%D) of the original sample results was met for all target analytes except lead (11%) and calcium (12%). Associated results for samples of the sample matrix (filtered surface water) were qualified as estimated (J for detects, UJ for nondetects).
- Internal Standards: According to the summaries, all ICP-MS sample internal standard intensities were within the control limits of 60-125% of the calibration blank.
- Sample Result Verification: Sample results are not verified at a Stage 2B validation. Detects below the reporting limit were qualified as estimated (J). Nondetects are valid to the reporting limit.
- Field QC Samples: MEC^x evaluated field QC samples, and if necessary, qualified based on method

blanks and other laboratory QC results affecting the usability of the field QC data. MEC^x used the remaining detects to evaluate the associated site samples. Findings associated with field QC samples are summarized below.

- o Field Blanks and Equipment Blanks: Samples MH5022 (from SDG MH00A7, collected 6/4/19) and MH5023 (from SDG MH00A7, collected 6/5/19) and sample MH5021 collected 6/3/19 were identified as field blanks associated with field samples in this SDG by collection date. There were no detections in the field blanks of sufficient concentrations to warrant qualification of associated site samples except as noted in the table below. Associated sample results that were greater than MDL and less than RL were qualified as nondetect (U) at the RL. Associated site sample results that were greater than RL and <10× the field blank concentration were qualified as estimated with high potential bias (J+). Equipment blanks were not collected.

Field blank sample number	analyte	Field blank concentration (µg/L)	Associated qualified site samples
MH5021	copper	0.38	MH5006, MH5007, MH5008, MH5009, MH5010
	zinc	10.3	MH5010
MH5022		8.0	MH5001, MH5002, MH5003, MH5011, MH5012, MH5013, MH5016, MH0014, MH0017
	copper	0.23	
MH5023		0.15	MH5004, MH5005, MH5020, MH0018, MH0019
	zinc	8.7	

- o Field Duplicates: Field duplicate pairs were identified as noted in the table below. The RPD control limit of ≤30% for all target analytes greater than RL and ±RL for all results <RL were met except as noted in the table. The associated results in this pair were qualified as estimated (J for detects, UJ for nondetects).

Parent sample number	Field Duplicate sample number	analyte	Field duplicate RPD
MH0019	MH0018	zinc	60%
MH5007	MH5009	chromium	>RL
MH5016	MH5013	all acceptable	

Validated Sample Result Forms MH0014

Analysis Method Hg

Lab Sample Name: 9060179-01 Sample No: MH0014 Sample Date: 06/04/2019 12:05:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Dissolved 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060179-02 Sample No: MH0017 Sample Date: 06/04/2019 11:03:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Dissolved 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060179-03 Sample No: MH0018 Sample Date: 06/05/2019 15:53:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Dissolved 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060179-04 Sample No: MH0019 Sample Date: 06/05/2019 15:53:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Dissolved 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060179-05 Sample No: MH5001 Sample Date: 06/04/2019 15:55:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Dissolved 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060179-06 Sample No: MH5002 Sample Date: 06/04/2019 15:12:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Dissolved 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060179-07 Sample No: MH5003 Sample Date: 06/04/2019 16:26:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Dissolved 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Analysis Method Hg

Lab Sample Name: 9060179-08 Sample No: MH5004 Sample Date: 06/05/2019 17:07:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Dissolved 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060179-09 Sample No: MH5005 Sample Date: 06/05/2019 16:49:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Dissolved 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060179-10 Sample No: MH5006 Sample Date: 06/03/2019 14:58:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Dissolved 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060179-11 Sample No: MH5007 Sample Date: 06/03/2019 11:24:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Dissolved 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060179-12 Sample No: MH5008 Sample Date: 06/03/2019 09:57:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Dissolved 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060179-13 Sample No: MH5009 Sample Date: 06/03/2019 11:27:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Dissolved 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060179-14 Sample No: MH5010 Sample Date: 06/03/2019 15:26:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Dissolved 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060179-15 Sample No: MH5011 Sample Date: 06/04/2019 13:16:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Dissolved 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Analysis Method Hg

Lab Sample Name: 9060179-16 Sample No: MH5012 Sample Date: 06/04/2019 12:56:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Dissolved 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060179-17 Sample No: MH5013 Sample Date: 06/04/2019 11:32:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Dissolved 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060179-18 Sample No: MH5016 Sample Date: 06/04/2019 11:57:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Dissolved 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060179-19 Sample No: MH5020 Sample Date: 06/05/2019 15:22:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Dissolved 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Lab Sample Name: 9060179-20 Sample No: MH5021 Sample Date: 06/03/2019 12:00:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury Dissolved 7439-97-6 0.20 0.20 0.037 ug/L U **U**

Analysis Method ICP_MS

Lab Sample Name: 9060179-01 Sample No: MH0014 Sample Date: 06/04/2019 12:05:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Aluminum	Dissolved	7429-90-5	21.5	20.0	3.7	ug/L		J+	B
Antimony	Dissolved	7440-36-0	2.0	2.0	0.093	ug/L	J	U	B
Arsenic	Dissolved	7440-38-2	1.1	1.0	0.070	ug/L			
Barium	Dissolved	7440-39-3	10.0	10.0	0.096	ug/L	J	U	B
Beryllium	Dissolved	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Dissolved	7440-43-9	1.0	1.0	0.12	ug/L	U	U	
Calcium	Dissolved	7440-70-2	8780	500	10.8	ug/L	*	J	A
Chromium	Dissolved	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Dissolved	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Dissolved	7440-50-8	2.0	2.0	0.12	ug/L	J	U	F

Analysis Method ICP_MS

Iron	Dissolved	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Dissolved	7439-92-1	1.0	1.0	0.028	ug/L	U*	UJ	B, A
Magnesium	Dissolved	7439-95-4	2170	500	2.4	ug/L			
Manganese	Dissolved	7439-96-5	4.4	1.0	0.078	ug/L		J+	B
Nickel	Dissolved	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Dissolved	7440-09-7	884	500	4.4	ug/L			
Selenium	Dissolved	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Dissolved	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Dissolved	7440-23-5	2690	500	5.2	ug/L			
Thallium	Dissolved	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Dissolved	7440-62-2	0.97	5.0	0.42	ug/L	J	J	
Zinc	Dissolved	7440-66-6	4.6	2.0	0.68	ug/L		J+	B, F

Lab Sample Name: 9060179-02 Sample No: MH0017 Sample Date: 06/04/2019 11:03:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Dissolved	7429-90-5	36.0	20.0	3.7	ug/L			
Antimony	Dissolved	7440-36-0	2.0	2.0	0.093	ug/L	J	U	B
Arsenic	Dissolved	7440-38-2	1.1	1.0	0.070	ug/L			
Barium	Dissolved	7440-39-3	10.0	10.0	0.096	ug/L	J	U	B
Beryllium	Dissolved	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Dissolved	7440-43-9	1.0	1.0	0.12	ug/L	U	U	
Calcium	Dissolved	7440-70-2	8920	500	10.8	ug/L	*	J	A
Chromium	Dissolved	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Dissolved	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Dissolved	7440-50-8	2.0	2.0	0.12	ug/L	J	U	F
Iron	Dissolved	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Dissolved	7439-92-1	1.0	1.0	0.028	ug/L	U*	UJ	B, A
Magnesium	Dissolved	7439-95-4	2190	500	2.4	ug/L			
Manganese	Dissolved	7439-96-5	4.7	1.0	0.078	ug/L		J+	B
Nickel	Dissolved	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Dissolved	7440-09-7	901	500	4.4	ug/L			
Selenium	Dissolved	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Dissolved	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Dissolved	7440-23-5	2720	500	5.2	ug/L			
Thallium	Dissolved	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Dissolved	7440-62-2	1.1	5.0	0.42	ug/L	J	J	
Zinc	Dissolved	7440-66-6	7.8	2.0	0.68	ug/L		J+	F

Lab Sample Name: 9060179-03 Sample No: MH0018 Sample Date: 06/05/2019 15:53:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Analysis Method ICP_MS

Aluminum	Dissolved	7429-90-5	20.0	20.0	3.7	ug/L	U	U	
Antimony	Dissolved	7440-36-0	2.0	2.0	0.093	ug/L	J	U	B
Arsenic	Dissolved	7440-38-2	1.6	1.0	0.070	ug/L			
Barium	Dissolved	7440-39-3	10.0	10.0	0.096	ug/L	J	U	B
Beryllium	Dissolved	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Dissolved	7440-43-9	1.0	1.0	0.12	ug/L	U	U	
Calcium	Dissolved	7440-70-2	18700	500	10.8	ug/L	*	J	A
Chromium	Dissolved	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Dissolved	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Dissolved	7440-50-8	2.0	2.0	0.12	ug/L	J	U	F
Iron	Dissolved	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Dissolved	7439-92-1	1.0	1.0	0.028	ug/L	J*	UJ	B, A
Magnesium	Dissolved	7439-95-4	2190	500	2.4	ug/L			
Manganese	Dissolved	7439-96-5	1.3	1.0	0.078	ug/L		J+	B
Nickel	Dissolved	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Dissolved	7440-09-7	503	500	4.4	ug/L			
Selenium	Dissolved	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Dissolved	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Dissolved	7440-23-5	1910	500	5.2	ug/L			
Thallium	Dissolved	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Dissolved	7440-62-2	0.49	5.0	0.42	ug/L	J	J	
Zinc	Dissolved	7440-66-6	5.1	2.0	0.68	ug/L		J+	B, F, F1

Lab Sample Name: 9060179-04 Sample No: MH0019 Sample Date: 06/05/2019 15:53:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Dissolved	7429-90-5	20.0	20.0	3.7	ug/L	U	U	
Antimony	Dissolved	7440-36-0	2.0	2.0	0.093	ug/L	J	U	B
Arsenic	Dissolved	7440-38-2	1.8	1.0	0.070	ug/L			
Barium	Dissolved	7440-39-3	10.0	10.0	0.096	ug/L	J	U	B
Beryllium	Dissolved	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Dissolved	7440-43-9	0.16	1.0	0.12	ug/L	J	J	
Calcium	Dissolved	7440-70-2	19200	500	10.8	ug/L	*	J	A
Chromium	Dissolved	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Dissolved	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Dissolved	7440-50-8	2.0	2.0	0.12	ug/L	J	U	F
Iron	Dissolved	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Dissolved	7439-92-1	1.2	1.0	0.028	ug/L	*	J	A
Magnesium	Dissolved	7439-95-4	2220	500	2.4	ug/L			
Manganese	Dissolved	7439-96-5	1.0	1.0	0.078	ug/L	J	U	B
Nickel	Dissolved	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Dissolved	7440-09-7	510	500	4.4	ug/L			

Analysis Method ICP_MS

Selenium	Dissolved	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Dissolved	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Dissolved	7440-23-5	1950	500	5.2	ug/L			
Thallium	Dissolved	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Dissolved	7440-62-2	0.53	5.0	0.42	ug/L	J	J	
Zinc	Dissolved	7440-66-6	9.5	2.0	0.68	ug/L		J+	F, F1

Lab Sample Name: 9060179-05

Sample No: MH5001

Sample Date: 06/04/2019 15:55:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Dissolved	7429-90-5	28.1	20.0	3.7	ug/L		J+	B
Antimony	Dissolved	7440-36-0	2.0	2.0	0.093	ug/L	J	U	B
Arsenic	Dissolved	7440-38-2	1.3	1.0	0.070	ug/L			
Barium	Dissolved	7440-39-3	10.0	10.0	0.096	ug/L	J	U	B
Beryllium	Dissolved	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Dissolved	7440-43-9	1.0	1.0	0.12	ug/L	U	U	
Calcium	Dissolved	7440-70-2	6240	500	10.8	ug/L	*	J	A
Chromium	Dissolved	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Dissolved	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Dissolved	7440-50-8	2.0	2.0	0.12	ug/L	J	U	F
Iron	Dissolved	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Dissolved	7439-92-1	1.0	1.0	0.028	ug/L	U*	UJ	B, A
Magnesium	Dissolved	7439-95-4	1170	500	2.4	ug/L			
Manganese	Dissolved	7439-96-5	1.0	1.0	0.078	ug/L	J	U	B
Nickel	Dissolved	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Dissolved	7440-09-7	307	500	4.4	ug/L	J	J	
Selenium	Dissolved	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Dissolved	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Dissolved	7440-23-5	1350	500	5.2	ug/L			
Thallium	Dissolved	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Dissolved	7440-62-2	0.64	5.0	0.42	ug/L	J	J	
Zinc	Dissolved	7440-66-6	4.3	2.0	0.68	ug/L		J+	B, F

Lab Sample Name: 9060179-06

Sample No: MH5002

Sample Date: 06/04/2019 15:12:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Dissolved	7429-90-5	31.1	20.0	3.7	ug/L			
Antimony	Dissolved	7440-36-0	2.0	2.0	0.093	ug/L	J	U	B
Arsenic	Dissolved	7440-38-2	1.4	1.0	0.070	ug/L			
Barium	Dissolved	7440-39-3	10.0	10.0	0.096	ug/L	J	U	B
Beryllium	Dissolved	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Dissolved	7440-43-9	1.0	1.0	0.12	ug/L	U	U	

Analysis Method ICP_MS

Calcium	Dissolved	7440-70-2	6230	500	10.8	ug/L	*	J	A
Chromium	Dissolved	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Dissolved	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Dissolved	7440-50-8	2.0	2.0	0.12	ug/L	J	U	F
Iron	Dissolved	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Dissolved	7439-92-1	1.0	1.0	0.028	ug/L	U*	UJ	B, A
Magnesium	Dissolved	7439-95-4	1190	500	2.4	ug/L			
Manganese	Dissolved	7439-96-5	1.0	1.0	0.078	ug/L	J	U	B
Nickel	Dissolved	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Dissolved	7440-09-7	304	500	4.4	ug/L	J	J	
Selenium	Dissolved	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Dissolved	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Dissolved	7440-23-5	1340	500	5.2	ug/L			
Thallium	Dissolved	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Dissolved	7440-62-2	0.75	5.0	0.42	ug/L	J	J	
Zinc	Dissolved	7440-66-6	4.5	2.0	0.68	ug/L		J+	B, F

Lab Sample Name: 9060179-07

Sample No: MH5003

Sample Date: 06/04/2019 16:26:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Dissolved	7429-90-5	29.5	20.0	3.7	ug/L		J+	B
Antimony	Dissolved	7440-36-0	2.0	2.0	0.093	ug/L	J	U	B
Arsenic	Dissolved	7440-38-2	1.4	1.0	0.070	ug/L			
Barium	Dissolved	7440-39-3	10.0	10.0	0.096	ug/L	J	U	B
Beryllium	Dissolved	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Dissolved	7440-43-9	1.0	1.0	0.12	ug/L	U	U	
Calcium	Dissolved	7440-70-2	5750	500	10.8	ug/L	*	J	A
Chromium	Dissolved	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Dissolved	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Dissolved	7440-50-8	2.0	2.0	0.12	ug/L	J	U	F
Iron	Dissolved	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Dissolved	7439-92-1	1.0	1.0	0.028	ug/L	U*	UJ	B, A
Magnesium	Dissolved	7439-95-4	993	500	2.4	ug/L			
Manganese	Dissolved	7439-96-5	1.0	1.0	0.078	ug/L	J	U	B
Nickel	Dissolved	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Dissolved	7440-09-7	298	500	4.4	ug/L	J	J	
Selenium	Dissolved	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Dissolved	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Dissolved	7440-23-5	1350	500	5.2	ug/L			
Thallium	Dissolved	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Dissolved	7440-62-2	0.67	5.0	0.42	ug/L	J	J	
Zinc	Dissolved	7440-66-6	4.3	2.0	0.68	ug/L		J+	B, F

Analysis Method ICP_MS

Lab Sample Name: 9060179-08 Sample No: MH5004 Sample Date: 06/05/2019 17:07:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Dissolved	7429-90-5	20.0	20.0	3.7	ug/L	U	U	
Antimony	Dissolved	7440-36-0	2.0	2.0	0.093	ug/L	J	U	B
Arsenic	Dissolved	7440-38-2	5.7	1.0	0.070	ug/L			
Barium	Dissolved	7440-39-3	10.0	10.0	0.096	ug/L	J	U	B
Beryllium	Dissolved	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Dissolved	7440-43-9	1.0	1.0	0.12	ug/L	U	U	
Calcium	Dissolved	7440-70-2	8210	500	10.8	ug/L	*	J	A
Chromium	Dissolved	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Dissolved	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Dissolved	7440-50-8	2.0	2.0	0.12	ug/L	J	U	F
Iron	Dissolved	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Dissolved	7439-92-1	1.0	1.0	0.028	ug/L	U*	UJ	B, A
Magnesium	Dissolved	7439-95-4	482	500	2.4	ug/L	J	J	
Manganese	Dissolved	7439-96-5	1.0	1.0	0.078	ug/L	J	U	B
Nickel	Dissolved	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Dissolved	7440-09-7	331	500	4.4	ug/L	J	J	
Selenium	Dissolved	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Dissolved	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Dissolved	7440-23-5	891	500	5.2	ug/L			
Thallium	Dissolved	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Dissolved	7440-62-2	0.64	5.0	0.42	ug/L	J	J	
Zinc	Dissolved	7440-66-6	5.8	2.0	0.68	ug/L		J+	F

Lab Sample Name: 9060179-09 Sample No: MH5005 Sample Date: 06/05/2019 16:49:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Dissolved	7429-90-5	20.0	20.0	3.7	ug/L	U	U	
Antimony	Dissolved	7440-36-0	2.0	2.0	0.093	ug/L	J	U	B
Arsenic	Dissolved	7440-38-2	5.5	1.0	0.070	ug/L			
Barium	Dissolved	7440-39-3	10.0	10.0	0.096	ug/L	J	U	B
Beryllium	Dissolved	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Dissolved	7440-43-9	1.0	1.0	0.12	ug/L	U	U	
Calcium	Dissolved	7440-70-2	8090	500	10.8	ug/L	*	J	A
Chromium	Dissolved	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Dissolved	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Dissolved	7440-50-8	2.0	2.0	0.12	ug/L	J	U	F
Iron	Dissolved	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Dissolved	7439-92-1	1.0	1.0	0.028	ug/L	U*	UJ	B, A

Analysis Method ICP_MS

Magnesium	Dissolved	7439-95-4	462	500	2.4	ug/L	J	J	
Manganese	Dissolved	7439-96-5	1.0	1.0	0.078	ug/L	J	U	B
Nickel	Dissolved	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Dissolved	7440-09-7	316	500	4.4	ug/L	J	J	
Selenium	Dissolved	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Dissolved	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Dissolved	7440-23-5	889	500	5.2	ug/L			
Thallium	Dissolved	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Dissolved	7440-62-2	0.69	5.0	0.42	ug/L	J	J	
Zinc	Dissolved	7440-66-6	5.1	2.0	0.68	ug/L		J+	B, F

Lab Sample Name: 9060179-10 Sample No: MH5006 Sample Date: 06/03/2019 14:58:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Dissolved	7429-90-5	20.0	20.0	3.7	ug/L	U	U	
Antimony	Dissolved	7440-36-0	5.1	2.0	0.093	ug/L			
Arsenic	Dissolved	7440-38-2	7.1	1.0	0.070	ug/L			
Barium	Dissolved	7440-39-3	16.5	10.0	0.096	ug/L			
Beryllium	Dissolved	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Dissolved	7440-43-9	11.2	1.0	0.12	ug/L			
Calcium	Dissolved	7440-70-2	42600	500	10.8	ug/L	*	J	A
Chromium	Dissolved	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Dissolved	7440-48-4	1.4	1.0	0.051	ug/L			
Copper	Dissolved	7440-50-8	2.4	2.0	0.12	ug/L		J+	F
Iron	Dissolved	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Dissolved	7439-92-1	3.1	1.0	0.028	ug/L	*	J	A
Magnesium	Dissolved	7439-95-4	6840	500	2.4	ug/L			
Manganese	Dissolved	7439-96-5	1.6	1.0	0.078	ug/L		J+	B
Nickel	Dissolved	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Dissolved	7440-09-7	1310	500	4.4	ug/L			
Selenium	Dissolved	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Dissolved	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Dissolved	7440-23-5	2870	500	5.2	ug/L			
Thallium	Dissolved	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Dissolved	7440-62-2	0.85	5.0	0.42	ug/L	J	J	
Zinc	Dissolved	7440-66-6	115	2.0	0.68	ug/L			

Lab Sample Name: 9060179-11 Sample No: MH5007 Sample Date: 06/03/2019 11:24:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Dissolved	7429-90-5	20.0	20.0	3.7	ug/L	U	U	
Antimony	Dissolved	7440-36-0	6.8	2.0	0.093	ug/L			

Analysis Method ICP_MS

Arsenic	Dissolved	7440-38-2	7.3	1.0	0.070	ug/L			
Barium	Dissolved	7440-39-3	20.5	10.0	0.096	ug/L			
Beryllium	Dissolved	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Dissolved	7440-43-9	9.9	1.0	0.12	ug/L			
Calcium	Dissolved	7440-70-2	44500	500	10.8	ug/L	*	J	A
Chromium	Dissolved	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B, F1
Cobalt	Dissolved	7440-48-4	1.4	1.0	0.051	ug/L			
Copper	Dissolved	7440-50-8	3.0	2.0	0.12	ug/L		J+	F
Iron	Dissolved	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Dissolved	7439-92-1	7.7	1.0	0.028	ug/L	*	J	A
Magnesium	Dissolved	7439-95-4	7630	500	2.4	ug/L			
Manganese	Dissolved	7439-96-5	6.3	1.0	0.078	ug/L			
Nickel	Dissolved	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Dissolved	7440-09-7	1570	500	4.4	ug/L			
Selenium	Dissolved	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Dissolved	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Dissolved	7440-23-5	3660	500	5.2	ug/L			
Thallium	Dissolved	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Dissolved	7440-62-2	0.49	5.0	0.42	ug/L	J	J	
Zinc	Dissolved	7440-66-6	236	2.0	0.68	ug/L			

Lab Sample Name: 9060179-12 Sample No: MH5008 Sample Date: 06/03/2019 09:57:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Dissolved	7429-90-5	20.0	20.0	3.7	ug/L	U	U	
Antimony	Dissolved	7440-36-0	8.3	2.0	0.093	ug/L			
Arsenic	Dissolved	7440-38-2	8.2	1.0	0.070	ug/L			
Barium	Dissolved	7440-39-3	20.9	10.0	0.096	ug/L			
Beryllium	Dissolved	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Dissolved	7440-43-9	9.5	1.0	0.12	ug/L			
Calcium	Dissolved	7440-70-2	44700	500	10.8	ug/L	*	J	A
Chromium	Dissolved	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Dissolved	7440-48-4	1.4	1.0	0.051	ug/L			
Copper	Dissolved	7440-50-8	3.4	2.0	0.12	ug/L		J+	F
Iron	Dissolved	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Dissolved	7439-92-1	6.7	1.0	0.028	ug/L	*	J	A
Magnesium	Dissolved	7439-95-4	7720	500	2.4	ug/L			
Manganese	Dissolved	7439-96-5	11.7	1.0	0.078	ug/L			
Nickel	Dissolved	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Dissolved	7440-09-7	1580	500	4.4	ug/L			
Selenium	Dissolved	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Dissolved	7440-22-4	1.0	1.0	0.088	ug/L	U	U	

Analysis Method ICP_MS

Sodium	Dissolved	7440-23-5	3860	500	5.2	ug/L		
Thallium	Dissolved	7440-28-0	1.0	1.0	0.051	ug/L	U	U
Vanadium	Dissolved	7440-62-2	0.45	5.0	0.42	ug/L	J	J
Zinc	Dissolved	7440-66-6	275	2.0	0.68	ug/L		

Lab Sample Name: 9060179-13 **Sample No:** MH5009 **Sample Date:** 06/03/2019 11:27:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Dissolved	7429-90-5	20.0	20.0	3.7	ug/L	U	U	
Antimony	Dissolved	7440-36-0	7.3	2.0	0.093	ug/L			
Arsenic	Dissolved	7440-38-2	7.3	1.0	0.070	ug/L			
Barium	Dissolved	7440-39-3	20.2	10.0	0.096	ug/L			
Beryllium	Dissolved	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Dissolved	7440-43-9	10.2	1.0	0.12	ug/L			
Calcium	Dissolved	7440-70-2	44500	500	10.8	ug/L	*	J	A
Chromium	Dissolved	7440-47-3	5.1	2.0	0.055	ug/L		J	F1
Cobalt	Dissolved	7440-48-4	1.2	1.0	0.051	ug/L			
Copper	Dissolved	7440-50-8	3.0	2.0	0.12	ug/L		J+	F
Iron	Dissolved	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Dissolved	7439-92-1	8.2	1.0	0.028	ug/L	*	J	A
Magnesium	Dissolved	7439-95-4	7560	500	2.4	ug/L			
Manganese	Dissolved	7439-96-5	5.8	1.0	0.078	ug/L			
Nickel	Dissolved	7440-02-0	1.8	1.0	0.043	ug/L			
Potassium	Dissolved	7440-09-7	1560	500	4.4	ug/L			
Selenium	Dissolved	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Dissolved	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Dissolved	7440-23-5	3600	500	5.2	ug/L			
Thallium	Dissolved	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Dissolved	7440-62-2	5.0	5.0	0.42	ug/L	U	U	
Zinc	Dissolved	7440-66-6	241	2.0	0.68	ug/L			

Lab Sample Name: 9060179-14 **Sample No:** MH5010 **Sample Date:** 06/03/2019 15:26:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Dissolved	7429-90-5	20.0	20.0	3.7	ug/L	U	U	
Antimony	Dissolved	7440-36-0	2.4	2.0	0.093	ug/L			
Arsenic	Dissolved	7440-38-2	6.0	1.0	0.070	ug/L			
Barium	Dissolved	7440-39-3	13.0	10.0	0.096	ug/L			
Beryllium	Dissolved	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Dissolved	7440-43-9	8.3	1.0	0.12	ug/L			
Calcium	Dissolved	7440-70-2	40100	500	10.8	ug/L	*	J	A
Chromium	Dissolved	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B

Analysis Method ICP_MS

Cobalt	Dissolved	7440-48-4	1.1	1.0	0.051	ug/L			
Copper	Dissolved	7440-50-8	2.3	2.0	0.12	ug/L		J+	F
Iron	Dissolved	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Dissolved	7439-92-1	4.4	1.0	0.028	ug/L	*	J	A
Magnesium	Dissolved	7439-95-4	5990	500	2.4	ug/L			
Manganese	Dissolved	7439-96-5	1.6	1.0	0.078	ug/L		J+	B
Nickel	Dissolved	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Dissolved	7440-09-7	979	500	4.4	ug/L			
Selenium	Dissolved	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Dissolved	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Dissolved	7440-23-5	2360	500	5.2	ug/L			
Thallium	Dissolved	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Dissolved	7440-62-2	0.59	5.0	0.42	ug/L	J	J	
Zinc	Dissolved	7440-66-6	85.2	2.0	0.68	ug/L		J+	F

Lab Sample Name: 9060179-15

Sample No: MH5011

Sample Date: 06/04/2019 13:16:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Dissolved	7429-90-5	34.9	20.0	3.7	ug/L			
Antimony	Dissolved	7440-36-0	2.0	2.0	0.093	ug/L	J	U	B
Arsenic	Dissolved	7440-38-2	1.6	1.0	0.070	ug/L			
Barium	Dissolved	7440-39-3	10.0	10.0	0.096	ug/L	J	U	B
Beryllium	Dissolved	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Dissolved	7440-43-9	1.0	1.0	0.12	ug/L	U	U	
Calcium	Dissolved	7440-70-2	6540	500	10.8	ug/L	*	J	A
Chromium	Dissolved	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Dissolved	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Dissolved	7440-50-8	2.0	2.0	0.12	ug/L	J	U	F
Iron	Dissolved	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Dissolved	7439-92-1	1.0	1.0	0.028	ug/L	U*	UJ	B, A
Magnesium	Dissolved	7439-95-4	1240	500	2.4	ug/L			
Manganese	Dissolved	7439-96-5	1.2	1.0	0.078	ug/L		J+	B
Nickel	Dissolved	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Dissolved	7440-09-7	315	500	4.4	ug/L	J	J	
Selenium	Dissolved	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Dissolved	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Dissolved	7440-23-5	1370	500	5.2	ug/L			
Thallium	Dissolved	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Dissolved	7440-62-2	0.74	5.0	0.42	ug/L	J	J	
Zinc	Dissolved	7440-66-6	5.5	2.0	0.68	ug/L		J+	F

Analysis Method ICP_MS

Lab Sample Name: 9060179-16 Sample No: MH5012 Sample Date: 06/04/2019 12:56:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Dissolved	7429-90-5	34.6	20.0	3.7	ug/L			
Antimony	Dissolved	7440-36-0	2.0	2.0	0.093	ug/L	J	U	B
Arsenic	Dissolved	7440-38-2	1.6	1.0	0.070	ug/L			
Barium	Dissolved	7440-39-3	10.0	10.0	0.096	ug/L	J	U	B
Beryllium	Dissolved	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Dissolved	7440-43-9	1.0	1.0	0.12	ug/L	U	U	
Calcium	Dissolved	7440-70-2	6560	500	10.8	ug/L	*	J	A
Chromium	Dissolved	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Dissolved	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Dissolved	7440-50-8	2.0	2.0	0.12	ug/L	J	U	F
Iron	Dissolved	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Dissolved	7439-92-1	1.0	1.0	0.028	ug/L	J*	UJ	B, A
Magnesium	Dissolved	7439-95-4	1240	500	2.4	ug/L			
Manganese	Dissolved	7439-96-5	1.0	1.0	0.078	ug/L	J	U	B
Nickel	Dissolved	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Dissolved	7440-09-7	345	500	4.4	ug/L	J	J	
Selenium	Dissolved	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Dissolved	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Dissolved	7440-23-5	1410	500	5.2	ug/L			
Thallium	Dissolved	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Dissolved	7440-62-2	0.75	5.0	0.42	ug/L	J	J	
Zinc	Dissolved	7440-66-6	6.4	2.0	0.68	ug/L		J+	F

Lab Sample Name: 9060179-17 Sample No: MH5013 Sample Date: 06/04/2019 11:32:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Dissolved	7429-90-5	20.0	20.0	3.7	ug/L		J+	B
Antimony	Dissolved	7440-36-0	2.0	2.0	0.093	ug/L	J	U	B
Arsenic	Dissolved	7440-38-2	1.1	1.0	0.070	ug/L			
Barium	Dissolved	7440-39-3	10.0	10.0	0.096	ug/L	J	U	B
Beryllium	Dissolved	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Dissolved	7440-43-9	1.0	1.0	0.12	ug/L	U	U	
Calcium	Dissolved	7440-70-2	8840	500	10.8	ug/L	*	J	A
Chromium	Dissolved	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Dissolved	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Dissolved	7440-50-8	2.0	2.0	0.12	ug/L	J	U	F
Iron	Dissolved	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Dissolved	7439-92-1	1.0	1.0	0.028	ug/L	U*	UJ	B, A

Analysis Method ICP_MS

Magnesium	Dissolved	7439-95-4	2110	500	2.4	ug/L			
Manganese	Dissolved	7439-96-5	4.8	1.0	0.078	ug/L			
Nickel	Dissolved	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Dissolved	7440-09-7	876	500	4.4	ug/L			
Selenium	Dissolved	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Dissolved	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Dissolved	7440-23-5	2630	500	5.2	ug/L			
Thallium	Dissolved	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Dissolved	7440-62-2	0.97	5.0	0.42	ug/L	J	J	
Zinc	Dissolved	7440-66-6	5.8	2.0	0.68	ug/L		J+	F

Lab Sample Name: 9060179-18 **Sample No:** MH5016 **Sample Date:** 06/04/2019 11:57:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Dissolved	7429-90-5	20.0	20.0	3.7	ug/L	J	U	B
Antimony	Dissolved	7440-36-0	2.0	2.0	0.093	ug/L	J	U	B
Arsenic	Dissolved	7440-38-2	1.1	1.0	0.070	ug/L			
Barium	Dissolved	7440-39-3	10.0	10.0	0.096	ug/L	J	U	B
Beryllium	Dissolved	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Dissolved	7440-43-9	1.0	1.0	0.12	ug/L	U	U	
Calcium	Dissolved	7440-70-2	9020	500	10.8	ug/L	*	J	A
Chromium	Dissolved	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Dissolved	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Dissolved	7440-50-8	2.0	2.0	0.12	ug/L	J	U	F
Iron	Dissolved	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Dissolved	7439-92-1	1.0	1.0	0.028	ug/L	U*	UJ	B, A
Magnesium	Dissolved	7439-95-4	2170	500	2.4	ug/L			
Manganese	Dissolved	7439-96-5	5.6	1.0	0.078	ug/L			
Nickel	Dissolved	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Dissolved	7440-09-7	897	500	4.4	ug/L			
Selenium	Dissolved	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Dissolved	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Dissolved	7440-23-5	2740	500	5.2	ug/L			
Thallium	Dissolved	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Dissolved	7440-62-2	0.95	5.0	0.42	ug/L	J	J	
Zinc	Dissolved	7440-66-6	6.7	2.0	0.68	ug/L		J+	F

Lab Sample Name: 9060179-19 **Sample No:** MH5020 **Sample Date:** 06/05/2019 15:22:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Dissolved	7429-90-5	20.0	20.0	3.7	ug/L	U	U	
Antimony	Dissolved	7440-36-0	2.0	2.0	0.093	ug/L	J	U	B

Analysis Method ICP_MS

Arsenic	Dissolved	7440-38-2	1.7	1.0	0.070	ug/L			
Barium	Dissolved	7440-39-3	10.0	10.0	0.096	ug/L	J	U	B
Beryllium	Dissolved	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Dissolved	7440-43-9	1.0	1.0	0.12	ug/L	U	U	
Calcium	Dissolved	7440-70-2	19200	500	10.8	ug/L	*	J	A
Chromium	Dissolved	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Dissolved	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Dissolved	7440-50-8	2.0	2.0	0.12	ug/L	J	U	F
Iron	Dissolved	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Dissolved	7439-92-1	1.0	1.0	0.028	ug/L	J*	UJ	B, A
Magnesium	Dissolved	7439-95-4	2190	500	2.4	ug/L			
Manganese	Dissolved	7439-96-5	1.2	1.0	0.078	ug/L		J+	B
Nickel	Dissolved	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Dissolved	7440-09-7	503	500	4.4	ug/L			
Selenium	Dissolved	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Dissolved	7440-22-4	1.0	1.0	0.088	ug/L	U	U	
Sodium	Dissolved	7440-23-5	1880	500	5.2	ug/L			
Thallium	Dissolved	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Dissolved	7440-62-2	0.57	5.0	0.42	ug/L	J	J	
Zinc	Dissolved	7440-66-6	5.7	2.0	0.68	ug/L		J+	F

Lab Sample Name: 9060179-20 Sample No: MH5021 Sample Date: 06/03/2019 12:00:00

Matrix Type: Water

Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	Dissolved	7429-90-5	20.0	20.0	3.7	ug/L	U	U	
Antimony	Dissolved	7440-36-0	2.0	2.0	0.093	ug/L	J	U	B
Arsenic	Dissolved	7440-38-2	1.0	1.0	0.070	ug/L	U	U	
Barium	Dissolved	7440-39-3	10.0	10.0	0.096	ug/L	J	U	B
Beryllium	Dissolved	7440-41-7	1.0	1.0	0.13	ug/L	U	U	
Cadmium	Dissolved	7440-43-9	1.0	1.0	0.12	ug/L	U	U	
Calcium	Dissolved	7440-70-2	500	500	10.8	ug/L	J*	U	B
Chromium	Dissolved	7440-47-3	2.0	2.0	0.055	ug/L	J	U	B
Cobalt	Dissolved	7440-48-4	1.0	1.0	0.051	ug/L	J	U	B
Copper	Dissolved	7440-50-8	0.38	2.0	0.12	ug/L	J	J	
Iron	Dissolved	7439-89-6	200	200	3.0	ug/L	J	U	B
Lead	Dissolved	7439-92-1	1.0	1.0	0.028	ug/L	U*	UJ	B
Magnesium	Dissolved	7439-95-4	500	500	2.4	ug/L	J	U	B
Manganese	Dissolved	7439-96-5	1.0	1.0	0.078	ug/L	J	U	B
Nickel	Dissolved	7440-02-0	1.0	1.0	0.043	ug/L	J	U	B
Potassium	Dissolved	7440-09-7	500	500	4.4	ug/L	J	U	B
Selenium	Dissolved	7782-49-2	5.0	5.0	0.32	ug/L	U	UJ	B
Silver	Dissolved	7440-22-4	1.0	1.0	0.088	ug/L	U	U	

Analysis Method *ICP_MS*

Sodium	Dissolved	7440-23-5	500	500	5.2	ug/L	U	UJ	B
Thallium	Dissolved	7440-28-0	1.0	1.0	0.051	ug/L	U	U	
Vanadium	Dissolved	7440-62-2	5.0	5.0	0.42	ug/L	U	U	
Zinc	Dissolved	7440-66-6	10.3	2.0	0.68	ug/L			



DATA VALIDATION REPORT

Elkhorn Mining Site Inspection

SAMPLE DELIVERY GROUP: MH0024

Prepared by

MEC^x
12269 East Vassar Drive
Aurora, CO 80014

I. INTRODUCTION

Task Order Title: Elkhorn Mining Site Inspection
Contract Task Order: 20408.012.004.0621.00
Sample Delivery Group: MH0024
Weston Project Manager: Natalie Quiet
EPA Project Manager: Joseph Chisholm
TDD No.: 0004/1807-06
Case No.: 48289
Matrix: Sediment
QC Level: Stage 2B
No. of Samples: 20
No. of Reanalyses/Dilutions: 0
Laboratory: Bonner Analytical Testing Co.

Table 1. Sample Identification

<i>Sample No.</i>	<i>Lab Sample Name</i>	<i>Matrix Type</i>	<i>Collection Date</i>	<i>Method</i>
MH0024	9060219-01	Sediment	06/04/2019 16:05:00	Hg, ICP-AES, ICP-MS
MH0025	9060219-02	Sediment	06/04/2019 15:20:00	Hg, ICP-AES, ICP-MS
MH0026	9060219-03	Sediment	06/04/2019 16:31:00	Hg, ICP-AES, ICP-MS
MH0054	9060219-04	Sediment	06/03/2019 15:13:00	Hg, ICP-AES, ICP-MS
MH0055	9060219-05	Sediment	06/03/2019 11:24:00	Hg, ICP-AES, ICP-MS
MH0056	9060219-06	Sediment	06/03/2019 09:57:00	Hg, ICP-AES, ICP-MS
MH0057	9060219-07	Sediment	06/03/2019 11:27:00	Hg, ICP-AES, ICP-MS
MH0058	9060219-08	Sediment	06/03/2019 15:32:00	Hg, ICP-AES, ICP-MS
MH0067	9060219-09	Sediment	06/04/2019 13:12:00	Hg, ICP-AES, ICP-MS
MH0068	9060219-10	Sediment	06/04/2019 12:58:00	Hg, ICP-AES, ICP-MS
MH0078	9060219-11	Sediment	06/04/2019 11:36:00	Hg, ICP-AES, ICP-MS
MH0079	9060219-12	Sediment	06/04/2019 12:07:00	Hg, ICP-AES, ICP-MS
MH0080	9060219-13	Sediment	06/04/2019 12:32:00	Hg, ICP-AES, ICP-MS
MH0081	9060219-14	Sediment	06/04/2019 12:00:00	Hg, ICP-AES, ICP-MS
MH0084	9060219-15	Sediment	06/04/2019 11:05:00	Hg, ICP-AES, ICP-MS
MH0089	9060219-16	Sediment	06/05/2019 16:04:00	Hg, ICP-AES, ICP-MS
MH0092	9060219-17	Sediment	06/05/2019 16:04:00	Hg, ICP-AES, ICP-MS
MH0093	9060219-18	Sediment	06/05/2019 15:34:00	Hg, ICP-AES, ICP-MS
MH00A3	9060219-19	Sediment	06/05/2019 17:11:00	Hg, ICP-AES, ICP-MS
MH00A4	9060219-20	Sediment	06/05/2019 16:51:00	Hg, ICP-AES, ICP-MS



II. Sample Management

According to the Sample Receipt Forms the samples were received intact and properly preserved. All coolers were received at 0°C; however, as no sample containers were noted as broken or frozen, no qualifications were applied. The chains of custody (COC) were signed and dated by field and/or laboratory personnel. Custody seals were present and intact.

Data Qualifier Reference Table

Qualifier	Organics	Inorganics
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit. The associated value is the quantitation limit or the estimated detection limit for dioxins or PCB congeners.	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit. The associated value is the sample detection limit or the quantitation limit for perchlorate only.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J+	Not applicable	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, and may have a potential positive bias.
J-	Not applicable	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, and may have a potential negative bias.
UJ	The analyte was not deemed above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.	The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."	Not applicable.



Qualifier	Organics	Inorganics
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.	Not applicable.
R	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.

Qualification Code Reference Table

Qualifier	Organics	Inorganics
H	Holding times were exceeded.	Holding times were exceeded.
S	Surrogate recovery was outside QC limits.	The sequence or number of standards used for the calibration was incorrect
C	Calibration %RSD or %D was noncompliant.	Correlation coefficient is <0.995 or calibration was noncompliant.
R	Calibration RRF was <0.05.	%R for calibration is not within control limits.
B	Presumed contamination as indicated by the preparation (method) blank results.	Presumed contamination as indicated by the preparation (method) or calibration blank results.
L	Laboratory Blank Spike/Blank Spike Duplicate %R was not within control limits.	Laboratory Control Sample %R was not within control limits.
L1	LCS/LCSD RPD was outside control limits.	LCS/LCSD RPD was outside control limits.
Q	MS/MSD recovery was poor.	MS recovery was poor.
Q1	MS/MSD RPD was outside control limits.	MS/MSD RPD was outside control limits.
E	Not applicable.	Duplicates showed poor agreement.
I	Internal standard performance was unsatisfactory.	ICP ICS results were unsatisfactory.
A	Not applicable.	ICP Serial Dilution %D were not within control limits.
M	Tuning (BFB or DFTPP) was noncompliant.	ICPMS tune was not compliant.
T	Presumed contamination as indicated by the trip blank results.	Not applicable.
+	False positive – reported compound was not present.	Not applicable.
-	False negative – compound was present but not reported.	Not applicable.
F	Presumed contamination as indicated by the FB or ER results.	Presumed contamination as indicated by the FB or ER results.
F1	Field duplicate results were outside the control limit.	Field duplicate results were outside the control limit.
\$	Reported result or other information was incorrect.	Reported result or other information was incorrect.
?	TIC identity or reported retention time has been changed.	Not applicable.



Qualifier	Organics	Inorganics
D	The analysis with this flag should not be used because another more technically sound analysis is available.	The analysis with this flag should not be used because another more technically sound analysis is available.
P	Instrument performance for pesticides was poor.	Post Digestion Spike recovery was not within control limits.
*II, *III	Unusual problems found with the data that have been described in Section II, "Sample Management," or Section III, "Method Analyses." The number following the asterisk (*) will indicate the report section where a description of the problem can be found.	Unusual problems found with the data that have been described in Section II, "Sample Management," or Section III, "Method Analyses." The number following the asterisk (*) will indicate the report section where a description of the problem can be found.

III. Method Analyses

A. **Methods 200.7, 200.8 and 245.1—Metals and Mercury**

Reviewed By: M. Hilchey

Date Reviewed: July 17, 2019

The samples listed in Table 1 for these analyses were validated based on the guidelines outlined in the *Quality Assurance Project Plan for U. S. EPA Region 8 CERCLA Site Assessment* (Rev. 2015), *United States Environmental Protection Agency Methods 200.7, 200.8 and 245.1* and the *National Functional Guidelines for Inorganic Superfund Methods Data Review* (January 2017).

- Holding Times: The analytical holding times, 28 days for mercury and six months for the remaining metals, were met.
- Instrument tune: According to summary reports, ICP-MS instrument tuning requirements were met.
- Calibration:
 - Initial calibration: According to the calibration summaries, correlation coefficients and %Ds met National Functional Guideline (NFG) acceptance requirements.
 - Initial (ICV) and continuing calibration (CCV) verification: ICV and CCV frequency requirements were met. ICV and CCV recoveries were within 90-110% for ICP-MS and ICP-AES, and 85-115% for mercury.
- Method Blanks: No target analytes were reported in the method blanks (MB) or calibration blanks (ICB/CCB) of sufficient concentration to qualify site sample results except as noted in the table below. For positive blank concentrations, associated detected sample results that were below the reporting limit (RL) were qualified as nondetect (U) at the RL. Associated detected sample results that were below the RL and >10× the blank concentration were not qualified, based on professional judgment. Associated detected sample results that were greater than RL and <5× the blank concentration were qualified as estimated with high bias (J+). For negative blank concentrations greater than the absolute value of the MDL, associated nondetect results were qualified as estimated (UJ), and associated results <5× the absolute value of the negative blank result were qualified as estimated with low potential bias (J-).

Analyte	Blank concentration (ug/L)	Qualified Samples
antimony	1.4 (CCB)	MH0024, MH0025, MH0026, MH0067, MH0068, MH0089
	-7.3 (CCB)	MH0078, MH0079, MH0080, MH0081, MH0084
	-9.8 (CCB)	MH0093, MH00A3, MH00A4
silver	0.59 (CCB)	MH078, MH0079, MH0080, MH0081, MH0084
thallium	0.79 (CCB)	MH0024, MH0025, MH0026, MH0054, MH0055, MH0056, MH0057, MH0058, MH0067, MH0068,

Analyte	Blank concentration (ug/L)	Qualified Samples
		MH0078, MH0079, MH0080, MH0081, MH0084, MH0089, MH0092, MH0093, MH00A4
beryllium	0.041 mg/Kg dry weight (MB)	All site samples
mercury	-0.047 mg/Kg (MB)	MH0024, MH0025, MH0026, MH0067, MH0068, MH0078, MH0079, MH0080, MH0081, MH0084, MH0089, MH0093, MH00A3

- Interference Check Samples (ICSA/B): ICSA/B data are not reviewed at a Stage 2B validation.
- Laboratory Control Samples (LCS): The LCS recoveries were within 80-120% for ICP-MS and ICP-AES.
- Laboratory Duplicates: Laboratory duplicate analysis was performed on sample MH0098 for all methods. RPDs met the control limits of $\leq 20\%$ for sample results $> 5 \times \text{RL}$ and $\pm \text{RL}$ for sample results $< 5 \times \text{RL}$ for all target analytes except copper (32%), lead (72%), silver ($> \text{RL}$), chromium (21%) and nickel (28%). Associated results for all site samples were qualified as estimated (J for detects, UJ for nondetects).
- Matrix Spike: Matrix spike (MS) analysis was performed on sample MH0089 for all methods. It should be noted that MS results were not reported for ICP-AES analytes aluminum, calcium, iron, magnesium, sodium and potassium. MS recoveries were not assessed when the parent sample concentrations were more than $4 \times$ the spike amount. Recoveries met control limits of 75-125% for all target analytes except antimony (49%), manganese (169%) and zinc (533%). Antimony results for all samples were qualified as estimated with low potential bias (J- for detects, UJ for nondetects). All results for manganese and zinc were qualified as estimated with high potential bias (J+).
- Post Digestion Spike: Post digestion spike (PDS) analysis was performed on sample MH0089 for ICP-AES analytes antimony, manganese and zinc. PDS recoveries were within 75-125%. Bias was removed from matrix spike qualifiers (see above) for these three analytes due to acceptable PDS recoveries.
- Serial Dilution: Serial dilution analysis was performed on sample MH0089 for ICP-MS and ICP-AES. Results were not assessed unless the parent sample concentration was $> 50 \times$ the MDL. The control limit of $\leq 10\%$ difference (%D) of the original sample results was met for all target analytes except silver (16%) and cobalt (11%). Associated results for all samples were qualified as estimated (J for detects, UJ for nondetects).
- Internal Standards: All ICP-MS sample internal standard intensities were within the control limits of 60-125% of the calibration blanks with the following exceptions. All internal standard intensities for samples MH0024, MH0025, MH0026 and MH0054 were $> 125\%$. The samples were not subsequently diluted $2 \times$; therefore, all ICP-MS analyte results for these samples were qualified as estimated (J for detects, UJ for nondetects).

- **Sample Result Verification:** Sample results are not verified at a Stage 2B validation. Detects below the reporting limit were qualified as estimated (J). Nondetects are valid to the reporting limit.

Several samples were diluted for various ICP-AES analytes and mercury due to raw results above the calibration range. All reporting limits were adjusted appropriately. Detected results for dilutions were flagged with “D” by the laboratory.

- **Field QC Samples:** MEC^x evaluated field QC samples, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. MEC^x used the remaining detects to evaluate the associated site samples. Findings associated with field QC samples are summarized below.
 - o **Field Blanks and Equipment Blanks:** No field or equipment blanks were identified for this SDG.
 - o **Field Duplicates:** Field duplicate (FD) pairs were identified as noted in the table below. The RPD control limit of $\leq 50\%$ for all target analytes greater than RL and $\pm RL$ for all results $< RL$ were met except as noted in the table. Associated results for the applicable field duplicate pair were qualified as estimated (J).

Parent sample number	Field Duplicate sample number	analyte	Field duplicate RPD
MH0078	MH0081	magnesium	77%
		manganese	73%
MH0055	MH0057	all acceptable	
MH0089	MH0091	calcium	101%
		lead	92%
		zinc	67%

Validated Sample Result Forms MH0024

Analysis Method Hg

Lab Sample Name: 9060219-01

Sample No: MH0024

Sample Date: 06/04/2019 16:05:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Mercury	7439-97-6	0.033	0.13	0.021	mg/kg	J	J-	B

Lab Sample Name: 9060219-02

Sample No: MH0025

Sample Date: 06/04/2019 15:20:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury	7439-97-6	0.044	0.14	0.022	mg/kg	J	J-	B
---------	-----------	-------	------	-------	-------	---	----	---

Lab Sample Name: 9060219-03

Sample No: MH0026

Sample Date: 06/04/2019 16:31:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury	7439-97-6	0.12	0.12	0.018	mg/kg	U	UJ	B
---------	-----------	------	------	-------	-------	---	----	---

Lab Sample Name: 9060219-04

Sample No: MH0054

Sample Date: 06/03/2019 15:13:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury	7439-97-6	11.1	2.5	0.40	mg/kg	D		
---------	-----------	------	-----	------	-------	---	--	--

Lab Sample Name: 9060219-05

Sample No: MH0055

Sample Date: 06/03/2019 11:24:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury	7439-97-6	2.5	0.39	0.063	mg/kg	D		
---------	-----------	-----	------	-------	-------	---	--	--

Lab Sample Name: 9060219-06

Sample No: MH0056

Sample Date: 06/03/2019 09:57:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury	7439-97-6	3.4	0.38	0.060	mg/kg	D		
---------	-----------	-----	------	-------	-------	---	--	--

Lab Sample Name: 9060219-07

Sample No: MH0057

Sample Date: 06/03/2019 11:27:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury	7439-97-6	2.1	0.39	0.063	mg/kg	D		
---------	-----------	-----	------	-------	-------	---	--	--

Analysis Method Hg

Lab Sample Name: 9060219-08		Sample No: MH0058		Sample Date: 06/03/2019 15:32:00					
Matrix Type: Soil									
Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Mercury		7439-97-6	8.4	2.8	0.45	mg/kg	D		
Lab Sample Name:	9060219-09	Sample No:	MH0067		Sample Date: 06/04/2019 13:12:00				
Matrix Type: Soil									
Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Mercury		7439-97-6	0.037	0.13	0.021	mg/kg	J	J-	B
Lab Sample Name:	9060219-10	Sample No:	MH0068		Sample Date: 06/04/2019 12:58:00				
Matrix Type: Soil									
Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Mercury		7439-97-6	0.16	0.16	0.026	mg/kg	U	UJ	B
Lab Sample Name:	9060219-11	Sample No:	MH0078		Sample Date: 06/04/2019 11:36:00				
Matrix Type: Soil									
Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Mercury		7439-97-6	0.13	0.13	0.020	mg/kg	U	UJ	B
Lab Sample Name:	9060219-12	Sample No:	MH0079		Sample Date: 06/04/2019 12:07:00				
Matrix Type: Soil									
Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Mercury		7439-97-6	0.11	0.11	0.017	mg/kg	U	UJ	B
Lab Sample Name:	9060219-13	Sample No:	MH0080		Sample Date: 06/04/2019 12:32:00				
Matrix Type: Soil									
Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Mercury		7439-97-6	0.11	0.11	0.017	mg/kg	U	UJ	B
Lab Sample Name:	9060219-14	Sample No:	MH0081		Sample Date: 06/04/2019 12:00:00				
Matrix Type: Soil									
Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Mercury		7439-97-6	0.11	0.11	0.018	mg/kg	U	UJ	B
Lab Sample Name:	9060219-15	Sample No:	MH0084		Sample Date: 06/04/2019 11:05:00				
Matrix Type: Soil									
Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Mercury		7439-97-6	0.11	0.11	0.018	mg/kg	U	UJ	B

Analysis Method Hg

Lab Sample Name: 9060219-16 Sample No: MH0089 Sample Date: 06/05/2019 16:04:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.13 0.13 0.020 mg/kg U **UJ** **B**

Lab Sample Name: 9060219-17 Sample No: MH0092 Sample Date: 06/05/2019 16:04:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.11 0.13 0.021 mg/kg J **J**

Lab Sample Name: 9060219-18 Sample No: MH0093 Sample Date: 06/05/2019 15:34:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.12 0.12 0.019 mg/kg U **UJ** **B**

Lab Sample Name: 9060219-19 Sample No: MH00A3 Sample Date: 06/05/2019 17:11:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.021 0.12 0.019 mg/kg J **J-** **B**

Lab Sample Name: 9060219-20 Sample No: MH00A4 Sample Date: 06/05/2019 16:51:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.10 0.13 0.020 mg/kg J **J**

Analysis Method ICP_AES

Lab Sample Name: 9060219-01 Sample No: MH0024 Sample Date: 06/04/2019 16:05:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Aluminum 7429-90-5 16300 24.2 0.67 mg/kg

Antimony 7440-36-0 1.7 7.3 0.24 mg/kg J* **UJ** **B, Q**

Arsenic 7440-38-2 28.5 1.2 0.012 mg/kg

Calcium 7440-70-2 9350 605 5.7 mg/kg

Copper 7440-50-8 24.5 3.0 0.059 mg/kg * **J** **E**

Iron 7439-89-6 22400 12.1 0.93 mg/kg

Lead 7439-92-1 58.0 1.2 0.17 mg/kg * **J** **E**

Magnesium 7439-95-4 7610 605 2.4 mg/kg

Manganese 7439-96-5 622 1.8 0.092 mg/kg * **J** **Q**

Potassium 7440-09-7 1890 605 9.2 mg/kg

Analysis Method ICP_AES

Silver	7440-22-4	2.1	1.2	0.040	mg/kg	*	J	E, A
Sodium	7440-23-5	268	605	2.8	mg/kg	J	J	
Zinc	7440-66-6	96.6	7.3	0.063	mg/kg	*	J	Q

Lab Sample Name: 9060219-02 Sample No: MH0025 Sample Date: 06/04/2019 15:20:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	19200	27.6	0.76	mg/kg			
Antimony	7440-36-0	1.7	8.3	0.28	mg/kg	J*	UJ	B, Q
Arsenic	7440-38-2	46.4	1.4	0.014	mg/kg			
Calcium	7440-70-2	11100	690	6.5	mg/kg			
Copper	7440-50-8	29.2	3.4	0.068	mg/kg	*	J	E
Iron	7439-89-6	25500	13.8	1.1	mg/kg			
Lead	7439-92-1	35.6	1.4	0.19	mg/kg	*	J	E
Magnesium	7439-95-4	7020	690	2.8	mg/kg			
Manganese	7439-96-5	564	2.1	0.10	mg/kg	*	J	Q
Potassium	7440-09-7	2160	690	10.5	mg/kg			
Silver	7440-22-4	2.4	1.4	0.046	mg/kg	*	J	E, A
Sodium	7440-23-5	376	690	3.2	mg/kg	J	J	
Zinc	7440-66-6	183	8.3	0.072	mg/kg	*	J	Q

Lab Sample Name: 9060219-03 Sample No: MH0026 Sample Date: 06/04/2019 16:31:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	15400	23.8	0.65	mg/kg			
Antimony	7440-36-0	1.1	7.1	0.24	mg/kg	J*	UJ	B, Q
Arsenic	7440-38-2	25.1	1.2	0.012	mg/kg			
Calcium	7440-70-2	9680	594	5.6	mg/kg			
Copper	7440-50-8	14.3	3.0	0.058	mg/kg	*	J	E
Iron	7439-89-6	22200	11.9	0.92	mg/kg			
Lead	7439-92-1	29.6	1.2	0.17	mg/kg	*	J	E
Magnesium	7439-95-4	6820	594	2.4	mg/kg			
Manganese	7439-96-5	460	1.8	0.090	mg/kg	*	J	Q
Potassium	7440-09-7	1550	594	9.0	mg/kg			
Silver	7440-22-4	2.0	1.2	0.039	mg/kg	*	J	E, A
Sodium	7440-23-5	278	594	2.7	mg/kg	J	J	
Zinc	7440-66-6	70.9	7.1	0.062	mg/kg	*	J	Q

Lab Sample Name: 9060219-04 Sample No: MH0054 Sample Date: 06/03/2019 15:13:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	8780	25.4	0.70	mg/kg			

Analysis Method ICP_AES

Antimony	7440-36-0	42.3	7.6	0.25	mg/kg	*	J	Q
Arsenic	7440-38-2	121	1.3	0.013	mg/kg			
Calcium	7440-70-2	19300	634	6.0	mg/kg			
Copper	7440-50-8	1210	3.2	0.062	mg/kg	*	J	E
Iron	7439-89-6	23700	12.7	0.98	mg/kg			
Lead	7439-92-1	1320	1.3	0.18	mg/kg	*	J	E
Magnesium	7439-95-4	10100	634	2.5	mg/kg			
Manganese	7439-96-5	631	1.9	0.096	mg/kg	*	J	Q
Potassium	7440-09-7	993	634	9.6	mg/kg			
Silver	7440-22-4	19.3	1.3	0.042	mg/kg	*	J	E, A
Sodium	7440-23-5	283	634	2.9	mg/kg	J	J	
Zinc	7440-66-6	3060	7.6	0.066	mg/kg	*	J	Q

Lab Sample Name: 9060219-05

Sample No: MH0055

Sample Date: 06/03/2019 11:24:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	1360	25.2	0.69	mg/kg			
Antimony	7440-36-0	192	7.6	0.25	mg/kg	*	J	Q
Arsenic	7440-38-2	243	1.3	0.013	mg/kg			
Calcium	7440-70-2	142000	3160	29.7	mg/kg	D		
Copper	7440-50-8	281	3.2	0.062	mg/kg	*	J	E
Iron	7439-89-6	9620	12.6	0.97	mg/kg			
Lead	7439-92-1	3050	6.3	0.88	mg/kg	D*	J	E
Magnesium	7439-95-4	74800	3160	12.6	mg/kg	D		
Manganese	7439-96-5	1780	1.9	0.096	mg/kg	*	J	Q
Potassium	7440-09-7	438	631	9.6	mg/kg	J	J	
Silver	7440-22-4	56.4	1.3	0.042	mg/kg	*	J	E, A
Sodium	7440-23-5	32.6	631	2.9	mg/kg	J	J	
Zinc	7440-66-6	10700	37.9	0.33	mg/kg	D*	J	Q

Lab Sample Name: 9060219-06

Sample No: MH0056

Sample Date: 06/03/2019 09:57:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	2800	24.2	0.66	mg/kg			
Antimony	7440-36-0	152	7.3	0.24	mg/kg	*	J	Q
Arsenic	7440-38-2	283	1.2	0.012	mg/kg			
Calcium	7440-70-2	98100	3020	28.4	mg/kg	D		
Copper	7440-50-8	276	3.0	0.059	mg/kg	*	J	E
Iron	7439-89-6	12700	12.1	0.93	mg/kg			
Lead	7439-92-1	2370	1.2	0.17	mg/kg	*	J	E
Magnesium	7439-95-4	51300	3020	12.1	mg/kg	D		
Manganese	7439-96-5	1780	1.8	0.092	mg/kg	*	J	Q

Analysis Method ICP_AES

Potassium	7440-09-7	590	604	9.2	mg/kg	J	J	
Silver	7440-22-4	52.6	1.2	0.040	mg/kg	*	J	E, A
Sodium	7440-23-5	115	604	2.8	mg/kg	J	J	
Zinc	7440-66-6	10000	36.3	0.31	mg/kg	D*	J	Q

Lab Sample Name: 9060219-07

Sample No: MH0057

Sample Date: 06/03/2019 11:27:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	1360	23.5	0.65	mg/kg			
Antimony	7440-36-0	184	7.0	0.23	mg/kg	*	J	Q
Arsenic	7440-38-2	221	1.2	0.012	mg/kg			
Calcium	7440-70-2	138000	2940	27.6	mg/kg	D		
Copper	7440-50-8	269	2.9	0.058	mg/kg	*	J	E
Iron	7439-89-6	9440	11.7	0.90	mg/kg			
Lead	7439-92-1	2900	5.9	0.82	mg/kg	D*	J	E
Magnesium	7439-95-4	72700	2940	11.7	mg/kg	D		
Manganese	7439-96-5	1690	1.8	0.089	mg/kg	*	J	Q
Potassium	7440-09-7	428	587	8.9	mg/kg	J	J	
Silver	7440-22-4	53.4	1.2	0.039	mg/kg	*	J	E, A
Sodium	7440-23-5	37.2	587	2.7	mg/kg	J	J	
Zinc	7440-66-6	10700	35.2	0.31	mg/kg	D*	J	Q

Lab Sample Name: 9060219-08

Sample No: MH0058

Sample Date: 06/03/2019 15:32:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	11300	26.5	0.73	mg/kg			
Antimony	7440-36-0	20.9	8.0	0.27	mg/kg	*	J	Q
Arsenic	7440-38-2	186	1.3	0.013	mg/kg			
Calcium	7440-70-2	17800	663	6.2	mg/kg			
Copper	7440-50-8	276	3.3	0.065	mg/kg	*	J	E
Iron	7439-89-6	37200	13.3	1.0	mg/kg			
Lead	7439-92-1	645	1.3	0.19	mg/kg	*	J	E
Magnesium	7439-95-4	7800	663	2.7	mg/kg			
Manganese	7439-96-5	618	2.0	0.10	mg/kg	*	J	Q
Potassium	7440-09-7	1420	663	10.1	mg/kg			
Silver	7440-22-4	12.8	1.3	0.044	mg/kg	*	J	E, A
Sodium	7440-23-5	300	663	3.0	mg/kg	J	J	
Zinc	7440-66-6	2160	8.0	0.069	mg/kg	*	J	Q

Lab Sample Name: 9060219-09

Sample No: MH0067

Sample Date: 06/04/2019 13:12:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Analysis Method ICP_AES

Aluminum	7429-90-5	17600	25.9	0.71	mg/kg			
Antimony	7440-36-0	1.2	7.8	0.26	mg/kg	J*	UJ	B, Q
Arsenic	7440-38-2	40.6	1.3	0.013	mg/kg			
Calcium	7440-70-2	9300	647	6.1	mg/kg			
Copper	7440-50-8	26.4	3.2	0.063	mg/kg	*	J	E
Iron	7439-89-6	24500	12.9	1.0	mg/kg			
Lead	7439-92-1	34.6	1.3	0.18	mg/kg	*	J	E
Magnesium	7439-95-4	6520	647	2.6	mg/kg			
Manganese	7439-96-5	580	1.9	0.098	mg/kg	*	J	Q
Potassium	7440-09-7	1870	647	9.8	mg/kg			
Silver	7440-22-4	2.2	1.3	0.043	mg/kg	*	J	E, A
Sodium	7440-23-5	387	647	3.0	mg/kg	J	J	
Zinc	7440-66-6	171	7.8	0.067	mg/kg	*	J	Q

Lab Sample Name: 9060219-10 Sample No: MH0068 Sample Date: 06/04/2019 12:58:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	20400	37.2	1.0	mg/kg			
Antimony	7440-36-0	1.3	11.2	0.37	mg/kg	J*	UJ	B, Q
Arsenic	7440-38-2	41.3	1.9	0.019	mg/kg			
Calcium	7440-70-2	14200	931	8.7	mg/kg			
Copper	7440-50-8	24.0	4.7	0.091	mg/kg	*	J	E
Iron	7439-89-6	29000	18.6	1.4	mg/kg			
Lead	7439-92-1	58.3	1.9	0.26	mg/kg	*	J	E
Magnesium	7439-95-4	7200	931	3.7	mg/kg			
Manganese	7439-96-5	690	2.8	0.14	mg/kg	*	J	Q
Potassium	7440-09-7	2190	931	14.1	mg/kg			
Silver	7440-22-4	2.6	1.9	0.061	mg/kg	*	J	E, A
Sodium	7440-23-5	377	931	4.3	mg/kg	J	J	
Zinc	7440-66-6	167	11.2	0.097	mg/kg	*	J	Q

Lab Sample Name: 9060219-11 Sample No: MH0078 Sample Date: 06/04/2019 11:36:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	3330	23.3	0.64	mg/kg			
Antimony	7440-36-0	7.0	7.0	0.23	mg/kg	U*	UJ	B, Q
Arsenic	7440-38-2	4.9	1.2	0.012	mg/kg			
Calcium	7440-70-2	1500	581	5.5	mg/kg			
Copper	7440-50-8	12.3	2.9	0.057	mg/kg	*	J	E
Iron	7439-89-6	6770	11.6	0.90	mg/kg			
Lead	7439-92-1	3.2	1.2	0.16	mg/kg	*	J	E
Magnesium	7439-95-4	1520	581	2.3	mg/kg		J	F1

Analysis Method ICP_AES

Manganese	7439-96-5	195	1.7	0.088	mg/kg	*	J	Q, F1
Potassium	7440-09-7	697	581	8.8	mg/kg			
Silver	7440-22-4	1.2	1.2	0.038	mg/kg	J*	UJ	B, E, A
Sodium	7440-23-5	53.4	581	2.7	mg/kg	J	J	
Zinc	7440-66-6	14.2	7.0	0.060	mg/kg	*	J	Q

Lab Sample Name: 9060219-12 Sample No: MH0079 Sample Date: 06/04/2019 12:07:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	3780	24.0	0.66	mg/kg			
Antimony	7440-36-0	7.2	7.2	0.24	mg/kg	U*	UJ	B, Q
Arsenic	7440-38-2	5.6	1.2	0.012	mg/kg			
Calcium	7440-70-2	2340	601	5.6	mg/kg			
Copper	7440-50-8	8.0	3.0	0.059	mg/kg	*	J	E
Iron	7439-89-6	7360	12.0	0.93	mg/kg			
Lead	7439-92-1	2.4	1.2	0.17	mg/kg	*	J	E
Magnesium	7439-95-4	1550	601	2.4	mg/kg			
Manganese	7439-96-5	202	1.8	0.091	mg/kg	*	J	Q
Potassium	7440-09-7	580	601	9.1	mg/kg	J	J	
Silver	7440-22-4	1.2	1.2	0.040	mg/kg	J*	UJ	B, E, A
Sodium	7440-23-5	68.1	601	2.8	mg/kg	J	J	
Zinc	7440-66-6	15.1	7.2	0.062	mg/kg	*	J	Q

Lab Sample Name: 9060219-13 Sample No: MH0080 Sample Date: 06/04/2019 12:32:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	4050	23.0	0.63	mg/kg			
Antimony	7440-36-0	6.9	6.9	0.23	mg/kg	U*	UJ	B, Q
Arsenic	7440-38-2	7.9	1.2	0.012	mg/kg			
Calcium	7440-70-2	2240	576	5.4	mg/kg			
Copper	7440-50-8	7.4	2.9	0.056	mg/kg	*	J	E
Iron	7439-89-6	7340	11.5	0.89	mg/kg			
Lead	7439-92-1	2.9	1.2	0.16	mg/kg	*	J	E
Magnesium	7439-95-4	987	576	2.3	mg/kg			
Manganese	7439-96-5	285	1.7	0.088	mg/kg	*	J	Q
Potassium	7440-09-7	562	576	8.8	mg/kg	J	J	
Silver	7440-22-4	1.2	1.2	0.038	mg/kg	J*	UJ	B, E, A
Sodium	7440-23-5	146	576	2.7	mg/kg	J	J	
Zinc	7440-66-6	14.2	6.9	0.060	mg/kg	*	J	Q

Analysis Method ICP_AES

Lab Sample Name: 9060219-14 Sample No: MH0081 Sample Date: 06/04/2019 12:00:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	2450	23.5	0.65	mg/kg			
Antimony	7440-36-0	7.1	7.1	0.24	mg/kg	U*	UJ	B, Q
Arsenic	7440-38-2	3.8	1.2	0.012	mg/kg			
Calcium	7440-70-2	1290	588	5.5	mg/kg			
Copper	7440-50-8	10.8	2.9	0.058	mg/kg	*	J	E
Iron	7439-89-6	4310	11.8	0.91	mg/kg			
Lead	7439-92-1	2.4	1.2	0.16	mg/kg	*	J	E
Magnesium	7439-95-4	673	588	2.4	mg/kg		J	F1
Manganese	7439-96-5	90.0	1.8	0.089	mg/kg	*	J	Q, F1
Potassium	7440-09-7	389	588	8.9	mg/kg	J	J	
Silver	7440-22-4	1.2	1.2	0.039	mg/kg	J*	UJ	B, E, A
Sodium	7440-23-5	54.1	588	2.7	mg/kg	J	J	
Zinc	7440-66-6	8.3	7.1	0.061	mg/kg	*	J	Q

Lab Sample Name: 9060219-15 Sample No: MH0084 Sample Date: 06/04/2019 11:05:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	4130	22.0	0.60	mg/kg			
Antimony	7440-36-0	6.6	6.6	0.22	mg/kg	U*	UJ	B, Q
Arsenic	7440-38-2	8.6	1.1	0.011	mg/kg			
Calcium	7440-70-2	1820	549	5.2	mg/kg			
Copper	7440-50-8	14.0	2.7	0.054	mg/kg	*	J	E
Iron	7439-89-6	7560	11.0	0.85	mg/kg			
Lead	7439-92-1	3.5	1.1	0.15	mg/kg	*	J	E
Magnesium	7439-95-4	1820	549	2.2	mg/kg			
Manganese	7439-96-5	142	1.6	0.083	mg/kg	*	J	Q
Potassium	7440-09-7	921	549	8.3	mg/kg			
Silver	7440-22-4	1.1	1.1	0.036	mg/kg	J*	UJ	B, E, A
Sodium	7440-23-5	64.4	549	2.5	mg/kg	J	J	
Zinc	7440-66-6	18.7	6.6	0.057	mg/kg	*	J	Q

Lab Sample Name: 9060219-16 Sample No: MH0089 Sample Date: 06/05/2019 16:04:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	5210	24.3	0.67	mg/kg			
Antimony	7440-36-0	2.6	7.3	0.24	mg/kg	J*	UJ	B, Q
Arsenic	7440-38-2	40.2	1.2	0.012	mg/kg			
Calcium	7440-70-2	3650	608	5.7	mg/kg		J	F1

Analysis Method ICP_AES

Copper	7440-50-8	29.7	3.0	0.060	mg/kg	*	J	E
Iron	7439-89-6	13000	12.2	0.94	mg/kg			
Lead	7439-92-1	147	1.2	0.17	mg/kg	*	J	E, F1
Magnesium	7439-95-4	1610	608	2.4	mg/kg			
Manganese	7439-96-5	236	1.8	0.092	mg/kg	*	J	Q
Potassium	7440-09-7	812	608	9.2	mg/kg			
Silver	7440-22-4	3.1	1.2	0.040	mg/kg	*	J	E, A
Sodium	7440-23-5	49.4	608	2.8	mg/kg	J	J	
Zinc	7440-66-6	90.6	7.3	0.063	mg/kg	*	J	Q, F1

Lab Sample Name: 9060219-17

Sample No: MH0092

Sample Date: 06/05/2019 16:04:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	5020	23.9	0.66	mg/kg			
Antimony	7440-36-0	5.9	7.2	0.24	mg/kg	J*	J	Q
Arsenic	7440-38-2	34.4	1.2	0.012	mg/kg			
Calcium	7440-70-2	11100	597	5.6	mg/kg		J	F1
Copper	7440-50-8	22.8	3.0	0.059	mg/kg	*	J	E
Iron	7439-89-6	11100	11.9	0.92	mg/kg			
Lead	7439-92-1	396	1.2	0.17	mg/kg	*	J	E, F1
Magnesium	7439-95-4	1530	597	2.4	mg/kg			
Manganese	7439-96-5	260	1.8	0.091	mg/kg	*	J	Q
Potassium	7440-09-7	693	597	9.1	mg/kg			
Silver	7440-22-4	3.2	1.2	0.039	mg/kg	*	J	E, A
Sodium	7440-23-5	52.8	597	2.7	mg/kg	J	J	
Zinc	7440-66-6	184	7.2	0.062	mg/kg	*	J	Q, F1

Lab Sample Name: 9060219-18

Sample No: MH0093

Sample Date: 06/05/2019 15:34:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	7040	23.0	0.63	mg/kg			
Antimony	7440-36-0	6.9	6.9	0.23	mg/kg	U*	UJ	B, Q
Arsenic	7440-38-2	40.1	1.1	0.011	mg/kg			
Calcium	7440-70-2	4880	575	5.4	mg/kg			
Copper	7440-50-8	20.9	2.9	0.056	mg/kg	*	J	E
Iron	7439-89-6	16000	11.5	0.88	mg/kg			
Lead	7439-92-1	28.7	1.1	0.16	mg/kg	*	J	E
Magnesium	7439-95-4	2780	575	2.3	mg/kg			
Manganese	7439-96-5	208	1.7	0.087	mg/kg	*	J	Q
Potassium	7440-09-7	1040	575	8.7	mg/kg			
Silver	7440-22-4	1.4	1.1	0.038	mg/kg	*	J	E, A
Sodium	7440-23-5	55.0	575	2.6	mg/kg	J	J	

Analysis Method ICP_AES

Zinc	7440-66-6	74.4	6.9	0.060	mg/kg	*	J	Q
Lab Sample Name:	9060219-19	Sample No:	MH00A3	Sample Date:	06/05/2019 17:11:00			
Matrix Type:	Soil							

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes			
Aluminum	7429-90-5	12700	21.4	0.59	mg/kg						
Antimony	7440-36-0	0.42	6.4	0.21	mg/kg	J*	J-	B, Q			
Arsenic	7440-38-2	47.5	1.1	0.011	mg/kg						
Calcium	7440-70-2	5170	536	5.0	mg/kg						
Copper	7440-50-8	17.4	2.7	0.053	mg/kg	*	J	E			
Iron	7439-89-6	22000	10.7	0.83	mg/kg						
Lead	7439-92-1	65.5	1.1	0.15	mg/kg	*	J	E			
Magnesium	7439-95-4	4810	536	2.1	mg/kg						
Manganese	7439-96-5	422	1.6	0.081	mg/kg	*	J	Q			
Potassium	7440-09-7	2550	536	8.1	mg/kg						
Silver	7440-22-4	2.2	1.1	0.035	mg/kg	*	J	E, A			
Sodium	7440-23-5	234	536	2.5	mg/kg	J	J				
Zinc	7440-66-6	108	6.4	0.056	mg/kg	*	J	Q			
Lab Sample Name:	9060219-20	Sample No:	MH00A4						Sample Date:	06/05/2019 16:51:00	
Matrix Type:	Soil										

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	12400	24.3	0.67	mg/kg			
Antimony	7440-36-0	0.31	7.3	0.24	mg/kg	J*	J-	B, Q
Arsenic	7440-38-2	62.7	1.2	0.012	mg/kg			
Calcium	7440-70-2	8530	607	5.7	mg/kg			
Copper	7440-50-8	33.3	3.0	0.060	mg/kg	*	J	E
Iron	7439-89-6	21100	12.1	0.94	mg/kg			
Lead	7439-92-1	70.2	1.2	0.17	mg/kg	*	J	E
Magnesium	7439-95-4	4530	607	2.4	mg/kg			
Manganese	7439-96-5	368	1.8	0.092	mg/kg	*	J	Q
Potassium	7440-09-7	1910	607	9.2	mg/kg			
Silver	7440-22-4	2.2	1.2	0.040	mg/kg	*	J	E, A
Sodium	7440-23-5	352	607	2.8	mg/kg	J	J	
Zinc	7440-66-6	92.6	7.3	0.063	mg/kg	*	J	Q

Analysis Method ICP_MS

Lab Sample Name:	9060219-01	Sample No:	MH0024	Sample Date:	06/04/2019 16:05:00
Matrix Type:	Soil				

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	49.4	5.8	0.059	mg/kg		J	*III

Analysis Method ICP_MS

Beryllium	7440-41-7	0.58	0.58	0.041	mg/kg	J	UJ	B, *III
Cadmium	7440-43-9	0.44	0.58	0.068	mg/kg	J	J	*III
Chromium	7440-47-3	19.1	1.2	0.036	mg/kg	*	J	E, *III
Cobalt	7440-48-4	7.4	0.58	0.029	mg/kg	*	J	A, *III
Nickel	7440-02-0	17.6	0.58	0.027	mg/kg	*	J	E, *III
Selenium	7782-49-2	0.49	2.9	0.21	mg/kg	J	J	*III
Thallium	7440-28-0	0.58	0.58	0.021	mg/kg	J	UJ	B, *III
Vanadium	7440-62-2	20.3	2.9	0.023	mg/kg		J	*III

Lab Sample Name: 9060219-02 Sample No: MH0025 Sample Date: 06/04/2019 15:20:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	76.5	6.5	0.066	mg/kg		J	*III
Beryllium	7440-41-7	0.65	0.65	0.045	mg/kg	J	UJ	B, *III
Cadmium	7440-43-9	0.77	0.65	0.077	mg/kg		J	*III
Chromium	7440-47-3	23.8	1.3	0.040	mg/kg	*	J	E, *III
Cobalt	7440-48-4	9.8	0.65	0.032	mg/kg	*	J	A, *III
Nickel	7440-02-0	21.3	0.65	0.030	mg/kg	*	J	E, *III
Selenium	7782-49-2	0.64	3.2	0.23	mg/kg	J	J	*III
Thallium	7440-28-0	0.65	0.65	0.023	mg/kg	J	UJ	B, *III
Vanadium	7440-62-2	30.5	3.2	0.026	mg/kg		J	*III

Lab Sample Name: 9060219-03 Sample No: MH0026 Sample Date: 06/04/2019 16:31:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	60.9	5.5	0.056	mg/kg		J	*III
Beryllium	7440-41-7	0.55	0.55	0.038	mg/kg	J	UJ	B, *III
Cadmium	7440-43-9	0.39	0.55	0.065	mg/kg	J	J	*III
Chromium	7440-47-3	22.4	1.1	0.034	mg/kg	*	J	E, *III
Cobalt	7440-48-4	8.1	0.55	0.027	mg/kg	*	J	A, *III
Nickel	7440-02-0	23.4	0.55	0.025	mg/kg	*	J	E, *III
Selenium	7782-49-2	0.42	2.7	0.20	mg/kg	J	J	*III
Thallium	7440-28-0	0.55	0.55	0.020	mg/kg	J	UJ	B, *III
Vanadium	7440-62-2	29.3	2.7	0.022	mg/kg		J	*III

Lab Sample Name: 9060219-04 Sample No: MH0054 Sample Date: 06/03/2019 15:13:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	60.1	5.8	0.059	mg/kg		J	*III
Beryllium	7440-41-7	0.58	0.58	0.040	mg/kg	J	UJ	B, *III
Cadmium	7440-43-9	72.9	0.58	0.068	mg/kg		J	*III
Chromium	7440-47-3	8.8	1.2	0.036	mg/kg	*	J	E, *III

Analysis Method ICP_MS

Cobalt	7440-48-4	10.1	0.58	0.029	mg/kg	*	J	A, *III
Nickel	7440-02-0	10.3	0.58	0.026	mg/kg	*	J	E, *III
Selenium	7782-49-2	0.70	2.9	0.21	mg/kg	J	J	*III
Thallium	7440-28-0	0.58	0.58	0.021	mg/kg	J	UJ	B, *III
Vanadium	7440-62-2	32.2	2.9	0.023	mg/kg		J	*III

Lab Sample Name: 9060219-05 Sample No: MH0055 Sample Date: 06/03/2019 11:24:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	10.4	6.1	0.062	mg/kg			
Beryllium	7440-41-7	0.61	0.61	0.043	mg/kg	J	U	B
Cadmium	7440-43-9	109	0.61	0.072	mg/kg			
Chromium	7440-47-3	1.4	1.2	0.038	mg/kg	*	J	E
Cobalt	7440-48-4	1.4	0.61	0.030	mg/kg	*	J	A
Nickel	7440-02-0	4.2	0.61	0.028	mg/kg	*	J	E
Selenium	7782-49-2	0.31	3.0	0.22	mg/kg	J	J	
Thallium	7440-28-0	0.61	0.61	0.022	mg/kg	J	U	B
Vanadium	7440-62-2	8.8	3.0	0.024	mg/kg			

Lab Sample Name: 9060219-06 Sample No: MH0056 Sample Date: 06/03/2019 09:57:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	16.3	6.1	0.062	mg/kg			
Beryllium	7440-41-7	0.61	0.61	0.043	mg/kg	J	U	B
Cadmium	7440-43-9	85.8	0.61	0.072	mg/kg			
Chromium	7440-47-3	2.9	1.2	0.038	mg/kg	*	J	E
Cobalt	7440-48-4	2.7	0.61	0.030	mg/kg	*	J	A
Nickel	7440-02-0	4.7	0.61	0.028	mg/kg	*	J	E
Selenium	7782-49-2	0.30	3.0	0.22	mg/kg	J	J	
Thallium	7440-28-0	0.61	0.61	0.022	mg/kg	J	U	B
Vanadium	7440-62-2	12.7	3.0	0.024	mg/kg			

Lab Sample Name: 9060219-07 Sample No: MH0057 Sample Date: 06/03/2019 11:27:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	10.6	6.0	0.061	mg/kg			
Beryllium	7440-41-7	0.60	0.60	0.042	mg/kg	J	U	B
Cadmium	7440-43-9	119	0.60	0.071	mg/kg			
Chromium	7440-47-3	1.5	1.2	0.037	mg/kg	*	J	E
Cobalt	7440-48-4	1.6	0.60	0.030	mg/kg	*	J	A
Nickel	7440-02-0	4.5	0.60	0.028	mg/kg	*	J	E
Selenium	7782-49-2	0.34	3.0	0.22	mg/kg	J	J	

Analysis Method ICP_MS

Thallium	7440-28-0	0.60	0.60	0.022	mg/kg	J	U	B
Vanadium	7440-62-2	9.1	3.0	0.024	mg/kg			

Lab Sample Name: 9060219-08 **Sample No:** MH0058 **Sample Date:** 06/03/2019 15:32:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	45.4	6.5	0.066	mg/kg			
Beryllium	7440-41-7	0.65	0.65	0.046	mg/kg	J	U	B
Cadmium	7440-43-9	30.2	0.65	0.077	mg/kg			
Chromium	7440-47-3	10.8	1.3	0.040	mg/kg	*	J	E
Cobalt	7440-48-4	10.0	0.65	0.033	mg/kg	*	J	A
Nickel	7440-02-0	10.1	0.65	0.030	mg/kg	*	J	E
Selenium	7782-49-2	0.64	3.3	0.23	mg/kg	J	J	
Thallium	7440-28-0	0.65	0.65	0.023	mg/kg	J	U	B
Vanadium	7440-62-2	24.3	3.3	0.026	mg/kg			

Lab Sample Name: 9060219-09 **Sample No:** MH0067 **Sample Date:** 06/04/2019 13:12:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	70.6	5.9	0.060	mg/kg			
Beryllium	7440-41-7	0.59	0.59	0.041	mg/kg	J	U	B
Cadmium	7440-43-9	1.1	0.59	0.070	mg/kg			
Chromium	7440-47-3	17.4	1.2	0.037	mg/kg	*	J	E
Cobalt	7440-48-4	8.2	0.59	0.030	mg/kg	*	J	A
Nickel	7440-02-0	16.0	0.59	0.027	mg/kg	*	J	E
Selenium	7782-49-2	0.65	3.0	0.21	mg/kg	J	J	
Thallium	7440-28-0	0.59	0.59	0.021	mg/kg	J	U	B
Vanadium	7440-62-2	23.8	3.0	0.024	mg/kg			

Lab Sample Name: 9060219-10 **Sample No:** MH0068 **Sample Date:** 06/04/2019 12:58:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	79.6	9.1	0.093	mg/kg			
Beryllium	7440-41-7	0.91	0.91	0.064	mg/kg	J	U	B
Cadmium	7440-43-9	1.1	0.91	0.11	mg/kg			
Chromium	7440-47-3	21.9	1.8	0.057	mg/kg	*	J	E
Cobalt	7440-48-4	11.2	0.91	0.046	mg/kg	*	J	A
Nickel	7440-02-0	22.9	0.91	0.042	mg/kg	*	J	E
Selenium	7782-49-2	0.70	4.6	0.33	mg/kg	J	J	
Thallium	7440-28-0	0.91	0.91	0.033	mg/kg	J	U	B
Vanadium	7440-62-2	34.0	4.6	0.036	mg/kg			

Analysis Method ICP_MS

Lab Sample Name: 9060219-11

Sample No: MH0078

Sample Date: 06/04/2019 11:36:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	14.8	5.6	0.057	mg/kg			
Beryllium	7440-41-7	0.56	0.56	0.039	mg/kg	J	U	B
Cadmium	7440-43-9	0.56	0.56	0.066	mg/kg	U	U	
Chromium	7440-47-3	5.3	1.1	0.035	mg/kg	*	J	E
Cobalt	7440-48-4	1.5	0.56	0.028	mg/kg	*	J	A
Nickel	7440-02-0	2.4	0.56	0.026	mg/kg	*	J	E
Selenium	7782-49-2	0.25	2.8	0.20	mg/kg	J	J	
Thallium	7440-28-0	0.56	0.56	0.020	mg/kg	J	U	B
Vanadium	7440-62-2	9.2	2.8	0.022	mg/kg			

Lab Sample Name: 9060219-12

Sample No: MH0079

Sample Date: 06/04/2019 12:07:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	19.1	5.2	0.053	mg/kg			
Beryllium	7440-41-7	0.52	0.52	0.037	mg/kg	J	U	B
Cadmium	7440-43-9	0.52	0.52	0.062	mg/kg	U	U	
Chromium	7440-47-3	6.3	1.0	0.032	mg/kg	*	J	E
Cobalt	7440-48-4	2.5	0.52	0.026	mg/kg	*	J	A
Nickel	7440-02-0	3.1	0.52	0.024	mg/kg	*	J	E
Selenium	7782-49-2	0.23	2.6	0.19	mg/kg	J	J	
Thallium	7440-28-0	0.52	0.52	0.019	mg/kg	J	U	B
Vanadium	7440-62-2	13.2	2.6	0.021	mg/kg			

Lab Sample Name: 9060219-13

Sample No: MH0080

Sample Date: 06/04/2019 12:32:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	15.3	5.8	0.059	mg/kg			
Beryllium	7440-41-7	0.58	0.58	0.041	mg/kg	J	U	B
Cadmium	7440-43-9	0.58	0.58	0.069	mg/kg	U	U	
Chromium	7440-47-3	5.5	1.2	0.036	mg/kg	*	J	E
Cobalt	7440-48-4	1.6	0.58	0.029	mg/kg	*	J	A
Nickel	7440-02-0	2.5	0.58	0.027	mg/kg	*	J	E
Selenium	7782-49-2	2.9	2.9	0.21	mg/kg	U	U	
Thallium	7440-28-0	0.58	0.58	0.021	mg/kg	J	U	B
Vanadium	7440-62-2	8.7	2.9	0.023	mg/kg			

Analysis Method ICP_MS

Lab Sample Name: 9060219-14 Sample No: MH0081 Sample Date: 06/04/2019 12:00:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	13.6	5.8	0.059	mg/kg			
Beryllium	7440-41-7	0.58	0.58	0.040	mg/kg	J	U	B
Cadmium	7440-43-9	0.58	0.58	0.068	mg/kg	U	U	
Chromium	7440-47-3	4.9	1.2	0.036	mg/kg	*	J	E
Cobalt	7440-48-4	1.6	0.58	0.029	mg/kg	*	J	A
Nickel	7440-02-0	2.7	0.58	0.027	mg/kg	*	J	E
Selenium	7782-49-2	0.22	2.9	0.21	mg/kg	J	J	
Thallium	7440-28-0	0.58	0.58	0.021	mg/kg	J	U	B
Vanadium	7440-62-2	10.1	2.9	0.023	mg/kg			

Lab Sample Name: 9060219-15 Sample No: MH0084 Sample Date: 06/04/2019 11:05:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	20.0	5.9	0.060	mg/kg			
Beryllium	7440-41-7	0.59	0.59	0.041	mg/kg	J	U	B
Cadmium	7440-43-9	0.59	0.59	0.069	mg/kg	U	U	
Chromium	7440-47-3	8.6	1.2	0.036	mg/kg	*	J	E
Cobalt	7440-48-4	2.4	0.59	0.029	mg/kg	*	J	A
Nickel	7440-02-0	4.8	0.59	0.027	mg/kg	*	J	E
Selenium	7782-49-2	0.28	2.9	0.21	mg/kg	J	J	
Thallium	7440-28-0	0.59	0.59	0.021	mg/kg	J	U	B
Vanadium	7440-62-2	15.9	2.9	0.024	mg/kg			

Lab Sample Name: 9060219-16 Sample No: MH0089 Sample Date: 06/05/2019 16:04:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	23.6	5.9	0.060	mg/kg			
Beryllium	7440-41-7	0.59	0.59	0.041	mg/kg	J	U	B
Cadmium	7440-43-9	1.7	0.59	0.070	mg/kg			
Chromium	7440-47-3	8.4	1.2	0.037	mg/kg	*	J	E
Cobalt	7440-48-4	3.1	0.59	0.030	mg/kg	*	J	A
Nickel	7440-02-0	7.2	0.59	0.027	mg/kg	*	J	E
Selenium	7782-49-2	0.74	3.0	0.21	mg/kg	J	J	
Thallium	7440-28-0	0.59	0.59	0.021	mg/kg	J	U	B
Vanadium	7440-62-2	20.3	3.0	0.024	mg/kg			

Analysis Method ICP_MS

Lab Sample Name: 9060219-17

Sample No: MH0092

Sample Date: 06/05/2019 16:04:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	20.8	6.5	0.066	mg/kg			
Beryllium	7440-41-7	0.65	0.65	0.045	mg/kg	J	U	B
Cadmium	7440-43-9	1.8	0.65	0.076	mg/kg			
Chromium	7440-47-3	7.3	1.3	0.040	mg/kg	*	J	E
Cobalt	7440-48-4	2.7	0.65	0.032	mg/kg	*	J	A
Nickel	7440-02-0	8.4	0.65	0.030	mg/kg	*	J	E
Selenium	7782-49-2	0.71	3.2	0.23	mg/kg	J	J	
Thallium	7440-28-0	0.65	0.65	0.023	mg/kg	J	U	B
Vanadium	7440-62-2	16.4	3.2	0.026	mg/kg			

Lab Sample Name: 9060219-18

Sample No: MH0093

Sample Date: 06/05/2019 15:34:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	26.1	6.3	0.064	mg/kg			
Beryllium	7440-41-7	0.63	0.63	0.044	mg/kg	J	U	B
Cadmium	7440-43-9	0.86	0.63	0.074	mg/kg			
Chromium	7440-47-3	10.5	1.3	0.039	mg/kg	*	J	E
Cobalt	7440-48-4	3.2	0.63	0.031	mg/kg	*	J	A
Nickel	7440-02-0	6.0	0.63	0.029	mg/kg	*	J	E
Selenium	7782-49-2	0.41	3.1	0.23	mg/kg	J	J	
Thallium	7440-28-0	0.63	0.63	0.023	mg/kg	J	U	B
Vanadium	7440-62-2	25.7	3.1	0.025	mg/kg			

Lab Sample Name: 9060219-19

Sample No: MH00A3

Sample Date: 06/05/2019 17:11:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	25.3	5.4	0.055	mg/kg			
Beryllium	7440-41-7	0.54	0.54	0.038	mg/kg	J	U	B
Cadmium	7440-43-9	0.67	0.54	0.063	mg/kg			
Chromium	7440-47-3	12.2	1.1	0.033	mg/kg	*	J	E
Cobalt	7440-48-4	3.9	0.54	0.027	mg/kg	*	J	A
Nickel	7440-02-0	16.9	0.54	0.025	mg/kg	*	J	E
Selenium	7782-49-2	0.29	2.7	0.19	mg/kg	J	J	
Thallium	7440-28-0	0.54	0.54	0.019	mg/kg	U	U	
Vanadium	7440-62-2	18.7	2.7	0.021	mg/kg			

Analysis Method ICP_MS

Lab Sample Name: 9060219-20 Sample No: MH00A4 Sample Date: 06/05/2019 16:51:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	35.6	5.6	0.057	mg/kg			
Beryllium	7440-41-7	0.56	0.56	0.039	mg/kg	J	U	B
Cadmium	7440-43-9	0.53	0.56	0.066	mg/kg	J	J	
Chromium	7440-47-3	32.2	1.1	0.035	mg/kg	*	J	E
Cobalt	7440-48-4	5.6	0.56	0.028	mg/kg	*	J	A
Nickel	7440-02-0	27.8	0.56	0.026	mg/kg	*	J	E
Selenium	7782-49-2	0.39	2.8	0.20	mg/kg	J	J	
Thallium	7440-28-0	0.56	0.56	0.020	mg/kg	J	U	B
Vanadium	7440-62-2	19.0	2.8	0.022	mg/kg			



DATA VALIDATION REPORT

Elkhorn Mining Site Inspection

SAMPLE DELIVERY GROUP: MH0027

Prepared by

MEC^x
12269 East Vassar Drive
Aurora, CO 80014

I. INTRODUCTION

Task Order Title: Elkhorn Mining Site Inspection
 Contract Task Order: 20408.012.004.0621.00
 Sample Delivery Group: MH0027
 Weston Project Manager: Natalie Quiet
 EPA Project Manager: Joseph Chisholm
 TDD No.: 0004/1807-06
 Case No.: 48289
 Matrix: Soil/Solids
 QC Level: Stage 2B
 No. of Samples: 10
 No. of Reanalyses/Dilutions: 0
 Laboratory: Bonner Analytical Testing Co.

Table 1. Sample Identification

<i>Sample No.</i>	<i>Lab Sample Name</i>	<i>Matrix Type</i>	<i>Collection Date</i>	<i>Method</i>
MH0027	9060153-01	Surface Soil	06/04/2019 16:49:00	Hg, ICP-AES, ICP_MS
MH0028	9060153-02	Surface Soil	06/04/2019 16:49:00	Hg, ICP-AES, ICP_MS
MH0029	9060153-03	Waste Material	06/04/2019 11:00:00	Hg, ICP-AES, ICP_MS
MH0032	9060153-04	Waste Material	06/04/2019 12:40:00	Hg, ICP-AES, ICP_MS
MH0034	9060153-05	Waste Material	06/04/2019 13:45:00	Hg, ICP-AES, ICP_MS
MH0051	9060153-06	Waste Material	06/04/2019 16:22:00	Hg, ICP-AES, ICP_MS
MH0052	9060153-07	Waste Material	06/04/2019 15:59:00	Hg, ICP-AES, ICP_MS
MH0053	9060153-08	Waste Material	06/04/2019 16:17:00	Hg, ICP-AES, ICP_MS
MH0069	9060153-09	Surface Soil	06/03/2019 13:15:00	Hg, ICP-AES, ICP_MS
MH0070	9060153-10	Surface Soil	06/03/2019 13:21:00	Hg, ICP-AES, ICP_MS



II. Sample Management

According to the Sample Receipt Forms the samples were received intact and properly preserved. All coolers were received at 0°C; however, none of the containers were noted as broken or damaged and no qualifications were applied. The chains of custody (COC) were signed and dated by field and/or laboratory personnel. Custody seals were present and intact.

Data Qualifier Reference Table

Qualifier	Organics	Inorganics
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit. The associated value is the quantitation limit or the estimated detection limit for dioxins or PCB congeners.	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit. The associated value is the sample detection limit or the quantitation limit for perchlorate only.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J+	Not applicable	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, and may have a potential positive bias.
J-	Not applicable	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, and may have a potential negative bias.
UJ	The analyte was not deemed above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.	The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."	Not applicable.



Qualifier	Organics	Inorganics
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.	Not applicable.
R	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.

Qualification Code Reference Table

Qualifier	Organics	Inorganics
H	Holding times were exceeded.	Holding times were exceeded.
S	Surrogate recovery was outside QC limits.	The sequence or number of standards used for the calibration was incorrect
C	Calibration %RSD or %D was noncompliant.	Correlation coefficient is <0.995 or calibration was noncompliant.
R	Calibration RRF was <0.05.	%R for calibration is not within control limits.
B	Presumed contamination as indicated by the preparation (method) blank results.	Presumed contamination as indicated by the preparation (method) or calibration blank results.
L	Laboratory Blank Spike/Blank Spike Duplicate %R was not within control limits.	Laboratory Control Sample %R was not within control limits.
L1	LCS/LCSD RPD was outside control limits.	LCS/LCSD RPD was outside control limits.
Q	MS/MSD recovery was poor.	MS recovery was poor.
Q1	MS/MSD RPD was outside control limits.	MS/MSD RPD was outside control limits.
E	Not applicable.	Duplicates showed poor agreement.
I	Internal standard performance was unsatisfactory.	ICP ICS results were unsatisfactory.
A	Not applicable.	ICP Serial Dilution %D were not within control limits.
M	Tuning (BFB or DFTPP) was noncompliant.	ICPMS tune was not compliant.
T	Presumed contamination as indicated by the trip blank results.	Not applicable.
+	False positive – reported compound was not present.	Not applicable.
-	False negative – compound was present but not reported.	Not applicable.
F	Presumed contamination as indicated by the FB or ER results.	Presumed contamination as indicated by the FB or ER results.
F1	Field duplicate results were outside the control limit.	Field duplicate results were outside the control limit.
\$	Reported result or other information was incorrect.	Reported result or other information was incorrect.
?	TIC identity or reported retention time has been changed.	Not applicable.



Qualifier	Organics	Inorganics
D	The analysis with this flag should not be used because another more technically sound analysis is available.	The analysis with this flag should not be used because another more technically sound analysis is available.
P	Instrument performance for pesticides was poor.	Post Digestion Spike recovery was not within control limits.
*II, *III	Unusual problems found with the data that have been described in Section II, "Sample Management," or Section III, "Method Analyses." The number following the asterisk (*) will indicate the report section where a description of the problem can be found.	Unusual problems found with the data that have been described in Section II, "Sample Management," or Section III, "Method Analyses." The number following the asterisk (*) will indicate the report section where a description of the problem can be found.

III. Method Analyses

A. **Methods 200.7, 200.8 and 245.1—Metals and Mercury**

Reviewed By: M. Hilchey

Date Reviewed: July 18, 2019

The samples listed in Table 1 for these analyses were validated based on the guidelines outlined in the *Quality Assurance Project Plan for U. S. EPA Region 8 CERCLA Site Assessment* (Rev. 2015), *United States Environmental Protection Agency Methods 200.7, 200.8 and 245.1* and the *National Functional Guidelines for Inorganic Superfund Methods Data Review* (January 2017).

- Holding Times: The analytical holding times, 28 days for mercury and six months for the remaining metals, were met.
- Instrument tune: According to summary reports, ICP-MS instrument tuning requirements were met.
- Calibration:
 - Initial calibration: According to the calibration summaries, correlation coefficients and %Ds met National Functional Guideline (NFG) acceptance requirements.
 - Initial (ICV) and continuing calibration (CCV) verification: ICV and CCV frequency requirements were met. ICV and CCV recoveries were within 90-110% for ICP-MS and ICP-AES, and 85-115% for mercury.
- Method Blanks: No target analytes were reported in the method blanks (MB) or calibration blanks (ICB/CCB) of sufficient concentration to qualify site sample results except as noted in the table below. For positive blank concentrations, associated detected sample results that were below the reporting limit (RL) were qualified as nondetect (U) at the RL. Associated detected sample results that were below the RL and >10× the blank concentration were not qualified, based on professional judgment. Associated detected sample results that were greater than RL and <5× the blank concentration were qualified as estimated with high bias (J+). For negative blank concentrations greater than the absolute value of the MDL, associated nondetect results were qualified as estimated (UJ), and associated results <5× the absolute value of the negative blank result were qualified as estimated with low potential bias (J-).

Analyte	Blank concentration	Qualified Samples
antimony	0.4 mg/Kg (MB)	MH0028, MH0034, MH0069, MH0070
sodium	4.9 mg/Kg (MB)	MH0029, MH0034, MH0053
selenium	-0.35 mg/Kg (MB)	MH0028, MH0028, MH0029, MH0032, MH0051, MH0052, MH0053, MH0069
	-0.37 µg/L (CCB)	MH0034, MH0070
thallium	0.16 mg/Kg (MB)	MH0027, MH0028, MH0032, MH0034, MH0051, MH0052, MH0053

- Interference Check Samples (ICSA/B): ICSA/B data are not reviewed at a Stage 2B validation.
- Laboratory Control Samples (LCS): The LCS recoveries were within 80-120% for ICP-MS and ICP-AES.
- Laboratory Duplicates: Laboratory duplicate analysis was performed on sample MH0051 for all methods. RPDs met the control limits of $\leq 20\%$ for sample results $> 5 \times \text{RL}$ and $\pm \text{RL}$ for sample results $< 5 \times \text{RL}$ for all target analytes except calcium (30%) and vanadium (32%). Associated results for all site samples of similar matrix (waste material) were qualified as estimated (J).
- Matrix Spike: Matrix spike (MS) analysis was performed on sample MH0051 for all methods. It should be noted that MS results were not reported for ICP-AES analytes aluminum, calcium, iron, magnesium, sodium and potassium. MS recoveries were not assessed when the parent sample concentrations were more than $4 \times$ the spike amount. Recoveries met control limits of 75-125% for all target analytes.
- Post Digestion Spike: Post digestion spike (PDS) analysis was performed on sample MH0051 for cadmium and vanadium only. PDS recoveries were within 75-125% for all target analytes except cadmium (53%). Cadmium results for all site samples of similar matrix (waste material) were qualified as estimated with low potential bias (J-).
- Serial Dilution: Serial dilution analysis was performed on sample MH0051 for ICP-AES and ICP-MS. Results were not assessed unless the parent sample concentration was $> 50 \times$ the MDL. The control limit of $\leq 10\%$ difference (%D) of the original sample results was met for all target analytes except arsenic (14%), copper (11%), chromium (13%) and vanadium (11%). Associated results for all samples of similar matrix (waste material) were qualified as estimated (J).
- Internal Standards: Several ICP-MS sample internal standard intensities failed to meet the control limits of 60-125% of the calibration blank. These samples were diluted $2 \times$ and analyzed for affected analytes. Intensities for internal standards holmium and terbium were greater than 125% in the undiluted and diluted analyses of sample MH0034. Results for associated analytes thallium and barium in this sample were reported from the undiluted analysis and were qualified as estimated (J). The remaining results reported from the dilutions were associated with acceptable internal standard intensities.
- Sample Result Verification: Sample results are not verified at a Stage 2B validation. Detects below the reporting limit were qualified as estimated (J). Nondetects are valid to the reporting limit.

Several samples were diluted for various analytes due to matrix interference, results above the calibration range, and failed internal standard recoveries. All reporting limits were adjusted appropriately. Results for dilutions were flagged with "D" by the laboratory.
- Field QC Samples: MEC^x evaluated field QC samples, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. MEC^x used the remaining detects to evaluate the associated site samples. Findings associated with field QC samples are summarized below.

- o Field Blanks and Equipment Blanks: No field or equipment blanks were identified for this SDG.
- o Field Duplicates: Field duplicate (FD) pairs were identified as noted in the table below. The RPD control limit of $\leq 50\%$ for all target analytes greater than RL and $\pm RL$ for all results $< RL$ were met except as noted in the table. Associated results for the applicable field duplicate pair were qualified as estimated (J for detects, UJ for nondetects).

Parent sample number	Field Duplicate sample number	analyte	Field duplicate RPD
MH0051	MH0053	barium	65%
		iron	94%
		cadmium	102%
		vanadium	113%
		aluminum	72%
		antimony	123%
		arsenic	83%
		calcium	151%
		copper	117%
		lead	96%
		manganese	72%
		silver	51%
		zinc	96%
MH0034	MH0036 SDG MH0030	All acceptable	
MH0050 SDG MH0030	MH0052	aluminum	79%
		antimony	117%
		arsenic	90%
		calcium	135%
		copper	127%
		iron	97%
		lead	93%
		manganese	84%
		silver	118%
		sodium	>RL
		zinc	104%
		barium	57%
		cadmium	90%
		vanadium	129%

Validated Sample Result Forms MH0027

Analysis Method Hg

Lab Sample Name: 9060153-01

Sample No: MH0027

Sample Date: 06/04/2019 16:49:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Mercury	7439-97-6	0.52	0.18	0.029	mg/kg			

Lab Sample Name: 9060153-02

Sample No: MH0028

Sample Date: 06/04/2019 16:49:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.20 0.13 0.021 mg/kg

Lab Sample Name: 9060153-03

Sample No: MH0029

Sample Date: 06/04/2019 11:00:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.051 0.11 0.018 mg/kg J J

Lab Sample Name: 9060153-04

Sample No: MH0032

Sample Date: 06/04/2019 12:40:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.21 0.12 0.019 mg/kg

Lab Sample Name: 9060153-05

Sample No: MH0034

Sample Date: 06/04/2019 13:45:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.15 0.10 0.017 mg/kg

Lab Sample Name: 9060153-06

Sample No: MH0051

Sample Date: 06/04/2019 16:22:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.18 0.12 0.019 mg/kg

Lab Sample Name: 9060153-07

Sample No: MH0052

Sample Date: 06/04/2019 15:59:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.24 0.11 0.017 mg/kg

Analysis Method Hg

Lab Sample Name: 9060153-08 Sample No: MH0053 Sample Date: 06/04/2019 16:17:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.28 0.11 0.017 mg/kg

Lab Sample Name: 9060153-09 Sample No: MH0069 Sample Date: 06/03/2019 13:15:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.10 0.12 0.020 mg/kg J

Lab Sample Name: 9060153-10 Sample No: MH0070 Sample Date: 06/03/2019 13:21:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.065 0.12 0.019 mg/kg J

Analysis Method ICP_AES

Lab Sample Name: 9060153-01 Sample No: MH0027 Sample Date: 06/04/2019 16:49:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Aluminum 7429-90-5 15100 42.1 1.2 mg/kg

Antimony 7440-36-0 4.2 12.6 0.42 mg/kg J

Arsenic 7440-38-2 22.5 2.1 0.021 mg/kg *

Calcium 7440-70-2 23400 1050 9.9 mg/kg *

Copper 7440-50-8 66.5 5.3 0.10 mg/kg *

Iron 7439-89-6 12200 21.0 1.6 mg/kg

Lead 7439-92-1 203 2.1 0.29 mg/kg

Magnesium 7439-95-4 9420 1050 4.2 mg/kg

Manganese 7439-96-5 1190 3.2 0.16 mg/kg

Potassium 7440-09-7 3200 1050 16.0 mg/kg

Silver 7440-22-4 2.4 2.1 0.069 mg/kg

Sodium 7440-23-5 114 1050 4.8 mg/kg J

Zinc 7440-66-6 361 12.6 0.11 mg/kg

Lab Sample Name: 9060153-02 Sample No: MH0028 Sample Date: 06/04/2019 16:49:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Aluminum 7429-90-5 28200 27.7 0.76 mg/kg

Antimony 7440-36-0 8.3 8.3 0.28 mg/kg J U B

Arsenic 7440-38-2 27.6 1.4 0.014 mg/kg *

Calcium 7440-70-2 29100 693 6.5 mg/kg *

Analysis Method ICP_AES

Copper	7440-50-8	46.9	3.5	0.068	mg/kg	*		
Iron	7439-89-6	20400	13.9	1.1	mg/kg			
Lead	7439-92-1	89.9	1.4	0.19	mg/kg			
Magnesium	7439-95-4	24000	693	2.8	mg/kg			
Manganese	7439-96-5	1120	2.1	0.11	mg/kg			
Potassium	7440-09-7	4490	693	10.5	mg/kg			
Silver	7440-22-4	1.5	1.4	0.046	mg/kg			
Sodium	7440-23-5	184	693	3.2	mg/kg	J		J
Zinc	7440-66-6	257	8.3	0.072	mg/kg			

Lab Sample Name: 9060153-03

Sample No: MH0029

Sample Date: 06/04/2019 11:00:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	13100	23.6	0.65	mg/kg			
Antimony	7440-36-0	15.0	7.1	0.24	mg/kg			
Arsenic	7440-38-2	1970	5.9	0.059	mg/kg	D*	J	A
Calcium	7440-70-2	16600	589	5.5	mg/kg	*	J	E
Copper	7440-50-8	1280	14.7	0.29	mg/kg	D*	J	A
Iron	7439-89-6	63500	58.9	4.5	mg/kg	D		
Lead	7439-92-1	265	1.2	0.16	mg/kg			
Magnesium	7439-95-4	7150	589	2.4	mg/kg			
Manganese	7439-96-5	6860	8.8	0.45	mg/kg	D		
Potassium	7440-09-7	3190	589	9.0	mg/kg			
Silver	7440-22-4	2.9	1.2	0.039	mg/kg			
Sodium	7440-23-5	589	589	2.7	mg/kg	J	U	B
Zinc	7440-66-6	9690	35.3	0.31	mg/kg	D		

Lab Sample Name: 9060153-04

Sample No: MH0032

Sample Date: 06/04/2019 12:40:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	12100	23.5	0.65	mg/kg			
Antimony	7440-36-0	37.8	7.1	0.24	mg/kg			
Arsenic	7440-38-2	2160	11.8	0.12	mg/kg	D*	J	A
Calcium	7440-70-2	27500	588	5.5	mg/kg	*	J	E
Copper	7440-50-8	5160	29.4	0.58	mg/kg	D*	J	A
Iron	7439-89-6	167000	118	9.1	mg/kg	D		
Lead	7439-92-1	646	1.2	0.16	mg/kg			
Magnesium	7439-95-4	1130	588	2.4	mg/kg			
Manganese	7439-96-5	12400	17.7	0.89	mg/kg	D		
Potassium	7440-09-7	812	588	8.9	mg/kg			
Silver	7440-22-4	7.5	1.2	0.039	mg/kg			
Sodium	7440-23-5	60.7	588	2.7	mg/kg	J	J	

Analysis Method ICP_AES

Zinc	7440-66-6	33600	70.6	0.61	mg/kg	D
Lab Sample Name:	9060153-05	Sample No:	MH0034	Sample Date:	06/04/2019 13:45:00	
Matrix Type:	Soil					

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	13900	22.7	0.62	mg/kg			
Antimony	7440-36-0	6.8	6.8	0.23	mg/kg	J	U	B
Arsenic	7440-38-2	458	11.4	0.11	mg/kg	D*	J	A
Calcium	7440-70-2	4910	568	5.3	mg/kg	*	J	E
Copper	7440-50-8	10100	28.4	0.56	mg/kg	D*	J	A
Iron	7439-89-6	19400	11.4	0.87	mg/kg			
Lead	7439-92-1	80.2	1.1	0.16	mg/kg			
Magnesium	7439-95-4	5830	568	2.3	mg/kg			
Manganese	7439-96-5	1740	1.7	0.086	mg/kg			
Potassium	7440-09-7	1860	568	8.6	mg/kg			
Silver	7440-22-4	0.86	1.1	0.037	mg/kg	J	J	
Sodium	7440-23-5	568	568	2.6	mg/kg	J	U	B
Zinc	7440-66-6	36300	68.1	0.59	mg/kg	D		

Lab Sample Name:	9060153-06	Sample No:	MH0051	Sample Date:	06/04/2019 16:22:00
Matrix Type:	Soil				

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	47200	244	6.7	mg/kg	D	J	F1
Antimony	7440-36-0	121	73.3	2.4	mg/kg	D	J	F1
Arsenic	7440-38-2	12900	61.1	0.61	mg/kg	D*	J	A, F1
Calcium	7440-70-2	26500	6110	57.5	mg/kg	D*	J	E, F1
Copper	7440-50-8	11000	30.6	0.60	mg/kg	D*	J	A, F1
Iron	7439-89-6	232000	122	9.4	mg/kg	D	J	F1
Lead	7439-92-1	13200	12.2	1.7	mg/kg	D	J	F1
Magnesium	7439-95-4	6820	6110	24.4	mg/kg	D		
Manganese	7439-96-5	1310	18.3	0.93	mg/kg	D	J	F1
Potassium	7440-09-7	979	6110	92.9	mg/kg	JD	J	
Silver	7440-22-4	55.5	12.2	0.40	mg/kg	D	J	F1
Sodium	7440-23-5	59.2	6110	28.1	mg/kg	JD	J	
Zinc	7440-66-6	15400	73.3	0.64	mg/kg	D	J	F1

Lab Sample Name:	9060153-07	Sample No:	MH0052	Sample Date:	06/04/2019 15:59:00
Matrix Type:	Soil				

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	49900	236	6.5	mg/kg	D	J	F1
Antimony	7440-36-0	71.8	70.7	2.4	mg/kg	D	J	F1
Arsenic	7440-38-2	12600	58.9	0.59	mg/kg	D*	J	A, F1

Analysis Method ICP_AES

Calcium	7440-70-2	36000	5890	55.4	mg/kg	D*	J	E, F1
Copper	7440-50-8	11700	29.5	0.58	mg/kg	D*	J	A, F1
Iron	7439-89-6	236000	118	9.1	mg/kg	D	J	F1
Lead	7439-92-1	9690	11.8	1.7	mg/kg	D	J	F1
Magnesium	7439-95-4	5020	5890	23.6	mg/kg	JD	J	
Manganese	7439-96-5	1400	17.7	0.90	mg/kg	D	J	F1
Potassium	7440-09-7	795	5890	89.6	mg/kg	JD	J	
Silver	7440-22-4	42.4	11.8	0.39	mg/kg	D	J	F1
Sodium	7440-23-5	5890	5890	27.1	mg/kg	UD	UJ	F1
Zinc	7440-66-6	18600	70.7	0.61	mg/kg	D	J	F1

Lab Sample Name: 9060153-08 Sample No: MH0053 Sample Date: 06/04/2019 16:17:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	22200	22.6	0.62	mg/kg		J	F1
Antimony	7440-36-0	29.3	6.8	0.23	mg/kg		J	F1
Arsenic	7440-38-2	5350	22.6	0.23	mg/kg	D*	J	A, F1
Calcium	7440-70-2	190000	11300	106	mg/kg	D*	J	E, F1
Copper	7440-50-8	2890	56.6	1.1	mg/kg	D*	J	A, F1
Iron	7439-89-6	84000	226	17.4	mg/kg	D	J	F1
Lead	7439-92-1	4620	22.6	3.2	mg/kg	D	J	F1
Magnesium	7439-95-4	6140	566	2.3	mg/kg			
Manganese	7439-96-5	615	1.7	0.086	mg/kg		J	F1
Potassium	7440-09-7	917	566	8.6	mg/kg			
Silver	7440-22-4	32.8	1.1	0.037	mg/kg		J	F1
Sodium	7440-23-5	566	566	2.6	mg/kg	J	U	B
Zinc	7440-66-6	5420	136	1.2	mg/kg	D	J	F1

Lab Sample Name: 9060153-09 Sample No: MH0069 Sample Date: 06/03/2019 13:15:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	21300	26.2	0.72	mg/kg			
Antimony	7440-36-0	7.9	7.9	0.26	mg/kg	J	U	B
Arsenic	7440-38-2	168	1.3	0.013	mg/kg	*		
Calcium	7440-70-2	7720	655	6.2	mg/kg	*		
Copper	7440-50-8	37.8	3.3	0.064	mg/kg	*		
Iron	7439-89-6	20300	13.1	1.0	mg/kg			
Lead	7439-92-1	227	1.3	0.18	mg/kg			
Magnesium	7439-95-4	3050	655	2.6	mg/kg			
Manganese	7439-96-5	1550	2.0	0.10	mg/kg			
Potassium	7440-09-7	4150	655	10.0	mg/kg			
Silver	7440-22-4	1.7	1.3	0.043	mg/kg			

Analysis Method ICP_AES

Sodium		7440-23-5	111	655	3.0	mg/kg	J	J	
Zinc		7440-66-6	234	7.9	0.068	mg/kg			
Lab Sample Name:		9060153-10	Sample No:		MH0070		Sample Date:		06/03/2019 13:21:00
Matrix Type: Soil									
Analyte		CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum		7429-90-5	20800	26.1	0.72	mg/kg			
Antimony		7440-36-0	7.8	7.8	0.26	mg/kg	J	U	B
Arsenic		7440-38-2	119	1.3	0.013	mg/kg	*		
Calcium		7440-70-2	4410	652	6.1	mg/kg			
Copper		7440-50-8	14.7	3.3	0.064	mg/kg	*		
Iron		7439-89-6	18900	13.0	1.0	mg/kg			
Lead		7439-92-1	106	1.3	0.18	mg/kg			
Magnesium		7439-95-4	2480	652	2.6	mg/kg			
Manganese		7439-96-5	784	2.0	0.099	mg/kg			
Potassium		7440-09-7	3050	652	9.9	mg/kg			
Silver		7440-22-4	1.1	1.3	0.043	mg/kg	J	J	
Sodium		7440-23-5	63.1	652	3.0	mg/kg	J	J	
Zinc		7440-66-6	209	7.8	0.068	mg/kg			

Analysis Method ICP_MS

Lab Sample Name: 9060153-01		Sample No: MH0027		Sample Date: 06/04/2019 16:49:00				
Matrix Type: Soil								
Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	221	10.0	0.10	mg/kg			
Beryllium	7440-41-7	0.27	1.0	0.070	mg/kg	J	J	
Cadmium	7440-43-9	3.3	1.0	0.12	mg/kg	*		
Chromium	7440-47-3	7.7	2.0	0.062	mg/kg	*		
Cobalt	7440-48-4	3.2	1.0	0.050	mg/kg			
Nickel	7440-02-0	7.0	1.0	0.046	mg/kg			
Selenium	7782-49-2	5.0	5.0	0.36	mg/kg	U	UJ	B
Thallium	7440-28-0	1.0	1.0	0.036	mg/kg	J	U	B
Vanadium	7440-62-2	8.6	5.0	0.040	mg/kg	*		
Lab Sample Name: 9060153-02		Sample No: MH0028		Sample Date: 06/04/2019 16:49:00				
Matrix Type: Soil								
Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	283	6.5	0.067	mg/kg			
Beryllium	7440-41-7	1.1	0.65	0.046	mg/kg			
Cadmium	7440-43-9	1.7	0.65	0.077	mg/kg	*		
Chromium	7440-47-3	16.4	1.3	0.041	mg/kg	*		

Analysis Method ICP_MS

Cobalt	7440-48-4	7.4	0.65	0.033	mg/kg			
Nickel	7440-02-0	16.4	0.65	0.030	mg/kg			
Selenium	7782-49-2	3.3	3.3	0.24	mg/kg	U	UJ	B
Thallium	7440-28-0	0.65	0.65	0.024	mg/kg	J	U	B
Vanadium	7440-62-2	23.0	3.3	0.026	mg/kg	*		

Lab Sample Name: 9060153-03 Sample No: MH0029 Sample Date: 06/04/2019 11:00:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	863	6.1	0.062	mg/kg			
Beryllium	7440-41-7	1.8	0.61	0.042	mg/kg			
Cadmium	7440-43-9	39.0	0.61	0.072	mg/kg	*	J-	P
Chromium	7440-47-3	12.7	1.2	0.038	mg/kg	*	J	A
Cobalt	7440-48-4	42.8	0.61	0.030	mg/kg			
Nickel	7440-02-0	80.4	0.61	0.028	mg/kg			
Selenium	7782-49-2	3.0	3.0	0.22	mg/kg	U	UJ	B
Thallium	7440-28-0	1.6	0.61	0.022	mg/kg			
Vanadium	7440-62-2	20.7	3.0	0.024	mg/kg	*	J	E, A

Lab Sample Name: 9060153-04 Sample No: MH0032 Sample Date: 06/04/2019 12:40:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	620	6.1	0.062	mg/kg			
Beryllium	7440-41-7	12.7	0.61	0.042	mg/kg			
Cadmium	7440-43-9	63.6	0.61	0.072	mg/kg	*	J-	P
Chromium	7440-47-3	1.3	1.2	0.038	mg/kg	*	J	A
Cobalt	7440-48-4	940	1.2	0.061	mg/kg	D		
Nickel	7440-02-0	201	0.61	0.028	mg/kg			
Selenium	7782-49-2	3.0	3.0	0.22	mg/kg	U	UJ	B
Thallium	7440-28-0	0.61	0.61	0.022	mg/kg	J	U	B
Vanadium	7440-62-2	3.2	3.0	0.024	mg/kg	*	J	E, A

Lab Sample Name: 9060153-05 Sample No: MH0034 Sample Date: 06/04/2019 13:45:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	232	5.5	0.056	mg/kg		J	*III
Beryllium	7440-41-7	13.6	1.1	0.077	mg/kg	D		
Cadmium	7440-43-9	68.6	0.55	0.065	mg/kg	*	J	P
Chromium	7440-47-3	30.7	2.2	0.068	mg/kg	D*	J	A
Cobalt	7440-48-4	280	1.1	0.055	mg/kg	D		
Nickel	7440-02-0	292	1.1	0.051	mg/kg	D		
Selenium	7782-49-2	5.5	5.5	0.40	mg/kg	UD	UJ	B

Analysis Method ICP_MS

Thallium	7440-28-0	0.70	0.55	0.020	mg/kg		J+	B, *III
Vanadium	7440-62-2	24.0	5.5	0.044	mg/kg	D*	J	E, A

Lab Sample Name: 9060153-06 Sample No: MH0051 Sample Date: 06/04/2019 16:22:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	227	5.8	0.059	mg/kg		J	F1
Beryllium	7440-41-7	1.7	0.58	0.040	mg/kg			
Cadmium	7440-43-9	246	0.58	0.068	mg/kg	*	J-	P, F1
Chromium	7440-47-3	9.7	1.2	0.036	mg/kg	*	J	A
Cobalt	7440-48-4	6.0	0.58	0.029	mg/kg			
Nickel	7440-02-0	26.5	0.58	0.027	mg/kg			
Selenium	7782-49-2	2.9	2.9	0.21	mg/kg	U	UJ	B
Thallium	7440-28-0	0.60	0.58	0.021	mg/kg		J+	B
Vanadium	7440-62-2	353	2.9	0.023	mg/kg	*	J	E, A, F1

Lab Sample Name: 9060153-07 Sample No: MH0052 Sample Date: 06/04/2019 15:59:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	215	5.6	0.057	mg/kg		J	F1
Beryllium	7440-41-7	1.5	0.56	0.039	mg/kg			
Cadmium	7440-43-9	197	0.56	0.066	mg/kg	*	J-	P, F1
Chromium	7440-47-3	10.1	1.1	0.034	mg/kg	*	J	A
Cobalt	7440-48-4	4.5	0.56	0.028	mg/kg			
Nickel	7440-02-0	23.5	0.56	0.026	mg/kg			
Selenium	7782-49-2	0.30	2.8	0.20	mg/kg	J	J-	B
Thallium	7440-28-0	0.56	0.56	0.020	mg/kg	J	U	B
Vanadium	7440-62-2	399	2.8	0.022	mg/kg	*	J	E, A, F1

Lab Sample Name: 9060153-08 Sample No: MH0053 Sample Date: 06/04/2019 16:17:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	116	5.7	0.058	mg/kg		J	F1
Beryllium	7440-41-7	1.2	0.57	0.040	mg/kg			
Cadmium	7440-43-9	80.1	0.57	0.067	mg/kg	*	J-	P, F1
Chromium	7440-47-3	6.7	1.1	0.035	mg/kg	*	J	A
Cobalt	7440-48-4	4.4	0.57	0.028	mg/kg			
Nickel	7440-02-0	26.2	0.57	0.026	mg/kg			
Selenium	7782-49-2	2.8	2.8	0.20	mg/kg	U	UJ	B
Thallium	7440-28-0	0.57	0.57	0.020	mg/kg	J	U	B
Vanadium	7440-62-2	98.5	2.8	0.023	mg/kg	*	J	E, A, F1

Analysis Method ICP_MS

Lab Sample Name: 9060153-09

Sample No: MH0069

Sample Date: 06/03/2019 13:15:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	287	6.4	0.066	mg/kg			
Beryllium	7440-41-7	1.1	0.64	0.045	mg/kg			
Cadmium	7440-43-9	2.2	0.64	0.076	mg/kg	*		
Chromium	7440-47-3	13.8	1.3	0.040	mg/kg	*		
Cobalt	7440-48-4	7.6	0.64	0.032	mg/kg			
Nickel	7440-02-0	14.7	0.64	0.030	mg/kg			
Selenium	7782-49-2	3.2	3.2	0.23	mg/kg	U	UJ	B
Thallium	7440-28-0	0.84	0.64	0.023	mg/kg			
Vanadium	7440-62-2	22.0	3.2	0.026	mg/kg	*		

Lab Sample Name: 9060153-10

Sample No: MH0070

Sample Date: 06/03/2019 13:21:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	151	6.3	0.065	mg/kg			
Beryllium	7440-41-7	1.6	1.3	0.089	mg/kg	D		
Cadmium	7440-43-9	0.67	0.63	0.075	mg/kg	*		
Chromium	7440-47-3	19.1	2.5	0.079	mg/kg	D*		
Cobalt	7440-48-4	10.4	1.3	0.063	mg/kg	D		
Nickel	7440-02-0	29.4	1.3	0.058	mg/kg	D		
Selenium	7782-49-2	6.3	6.3	0.46	mg/kg	UD	UJ	B
Thallium	7440-28-0	0.85	0.63	0.023	mg/kg			
Vanadium	7440-62-2	50.1	6.3	0.051	mg/kg	D*		



DATA VALIDATION REPORT

Elkhorn Mining Site Inspection

SAMPLE DELIVERY GROUP: MH0030

Prepared by

MEC^x
12269 East Vassar Drive
Aurora, CO 80014

I. INTRODUCTION

Task Order Title: Elkhorn Mining Site Inspection
 Contract Task Order: 20408.012.004.0621.00
 Sample Delivery Group: MH0030
 Weston Project Manager: Natalie Quiet
 EPA Project Manager: Joseph Chisholm
 TDD No.: 0004/1807-06
 Case No.: 48289
 Matrix: Solids
 QC Level: Stage 2B
 No. of Samples: 12
 No. of Reanalyses/Dilutions: 0
 Laboratory: Bonner Analytical Testing Co.

Table 1. Sample Identification

<i>Sample No.</i>	<i>Lab Sample Name</i>	<i>Matrix Type</i>	<i>Collection Date</i>	<i>Method</i>
MH0030	9060156-01	Waste Material	06/04/2019 11:00:00	Hg, ICP-AES, ICP-MS
MH0031	9060156-02	Waste Material	06/04/2019 12:35:00	Hg, ICP-AES, ICP-MS
MH0033	9060156-03	Waste Material	06/04/2019 13:50:00	Hg, ICP-AES, ICP-MS
MH0035	9060156-04	Waste Material	06/04/2019 14:25:00	Hg, ICP-AES, ICP-MS
MH0036	9060156-05	Waste Material	06/04/2019 14:27:00	Hg, ICP-AES, ICP-MS
MH0037	9060156-06	Waste Material	06/04/2019 14:18:00	Hg, ICP-AES, ICP-MS
MH0038	9060156-07	Waste Material	06/04/2019 14:15:00	Hg, ICP-AES, ICP-MS
MH0050	9060156-08	Waste Material	06/04/2019 15:59:00	Hg, ICP-AES, ICP-MS
MH0077	9060156-09	Waste Material	06/03/2019 12:24:00	Hg, ICP-AES, ICP-MS
MH0098	9060156-10	Waste Material	06/05/2019 14:25:00	Hg, ICP-AES, ICP-MS
MH00A5	9060156-11	Tailings	06/03/2019 13:03:00	Hg, ICP-AES, ICP-MS
MH00A8	9060156-12	Tailings	06/04/2019 12:15:00	Hg, ICP-AES, ICP-MS



II. Sample Management

According to the Sample Receipt Forms the samples were received intact and properly preserved. All coolers were received at 0°C; however, as no samples were noted as broken, no qualifications were applied. The chains of custody (COC) were signed and dated by field and/or laboratory personnel. Custody seals were present and intact

Data Qualifier Reference Table

Qualifier	Organics	Inorganics
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit. The associated value is the quantitation limit or the estimated detection limit for dioxins or PCB congeners.	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit. The associated value is the sample detection limit or the quantitation limit for perchlorate only.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J+	Not applicable	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, and may have a potential positive bias.
J-	Not applicable	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, and may have a potential negative bias.
UJ	The analyte was not deemed above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.	The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."	Not applicable.



Qualifier	Organics	Inorganics
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.	Not applicable.
R	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.

Qualification Code Reference Table

Qualifier	Organics	Inorganics
H	Holding times were exceeded.	Holding times were exceeded.
S	Surrogate recovery was outside QC limits.	The sequence or number of standards used for the calibration was incorrect
C	Calibration %RSD or %D was noncompliant.	Correlation coefficient is <0.995 or calibration was noncompliant.
R	Calibration RRF was <0.05.	%R for calibration is not within control limits.
B	Presumed contamination as indicated by the preparation (method) blank results.	Presumed contamination as indicated by the preparation (method) or calibration blank results.
L	Laboratory Blank Spike/Blank Spike Duplicate %R was not within control limits.	Laboratory Control Sample %R was not within control limits.
L1	LCS/LCSD RPD was outside control limits.	LCS/LCSD RPD was outside control limits.
Q	MS/MSD recovery was poor.	MS recovery was poor.
Q1	MS/MSD RPD was outside control limits.	MS/MSD RPD was outside control limits.
E	Not applicable.	Duplicates showed poor agreement.
I	Internal standard performance was unsatisfactory.	ICP ICS results were unsatisfactory.
A	Not applicable.	ICP Serial Dilution %D were not within control limits.
M	Tuning (BFB or DFTPP) was noncompliant.	ICPMS tune was not compliant.
T	Presumed contamination as indicated by the trip blank results.	Not applicable.
+	False positive – reported compound was not present.	Not applicable.
-	False negative – compound was present but not reported.	Not applicable.
F	Presumed contamination as indicated by the FB or ER results.	Presumed contamination as indicated by the FB or ER results.
F1	Field duplicate results were outside the control limit.	Field duplicate results were outside the control limit.
\$	Reported result or other information was incorrect.	Reported result or other information was incorrect.
?	TIC identity or reported retention time has been changed.	Not applicable.



Qualifier	Organics	Inorganics
D	The analysis with this flag should not be used because another more technically sound analysis is available.	The analysis with this flag should not be used because another more technically sound analysis is available.
P	Instrument performance for pesticides was poor.	Post Digestion Spike recovery was not within control limits.
*II, *III	Unusual problems found with the data that have been described in Section II, "Sample Management," or Section III, "Method Analyses." The number following the asterisk (*) will indicate the report section where a description of the problem can be found.	Unusual problems found with the data that have been described in Section II, "Sample Management," or Section III, "Method Analyses." The number following the asterisk (*) will indicate the report section where a description of the problem can be found.

III. Method Analyses

A. **Methods 200.7, 200.8 and 245.1—Metals and Mercury**

Reviewed By: M. Hilchey

Date Reviewed: July 19, 2019

The samples listed in Table 1 for these analyses were validated based on the guidelines outlined in the *Quality Assurance Project Plan for U. S. EPA Region 8 CERCLA Site Assessment* (Rev. 2015), *United States Environmental Protection Agency Methods 200.7, 200.8 and 245.1* and the *National Functional Guidelines for Inorganic Superfund Methods Data Review* (January 2017).

- Holding Times: The analytical holding times, 28 days for mercury and six months for the remaining metals, were met.
- Instrument tune: According to summary reports, ICP-MS instrument tuning requirements were met.
- Calibration:
 - Initial calibration: According to the calibration summaries, correlation coefficients and %Ds met National Functional Guideline (NFG) acceptance requirements.
 - Initial (ICV) and continuing calibration (CCV) verification: ICV and CCV frequency requirements were met. ICV and CCV recoveries were within 90-110% for ICP-MS and ICP-AES, and 85-115% for mercury.
- Method Blanks: No target analytes were reported in the method blanks (MB) or calibration blanks (ICB/CCB) of sufficient concentration to qualify site sample results except as noted in the table below. For positive blank concentrations, associated detected sample results that were below the reporting limit (RL) were qualified as nondetect (U) at the RL. Associated detected sample results that were below the RL and >10× the blank concentration were not qualified, based on professional judgment. Associated detected sample results that were greater than RL and <5× the blank concentration were qualified as estimated with high bias (J+). For negative blank concentrations greater than the absolute value of the MDL, associated nondetect results were qualified as estimated (UJ), and associated results <5× the absolute value of the negative blank result were qualified as estimated with low potential bias (J-).

Analyte	Blank concentration	Qualified Samples
sodium	-49.8 µg/L (CCB)	MH0036, MH0037, MH0038, MH0050, MH0098
selenium	-0.42 µg/L (CCB)	MH0030, MH0050, MH0077
	0.30 mg/Kg (MB)	MH0031, MH0033, MH0035, MH0037, MH0038, MH00A5, MH00A6
thallium	0.30 mg/KG (MB)	All site samples
mercury	-0.055 µg/L (CCB)	MH0030, MH0031, MH00A8

- Interference Check Samples (ICSA/B): ICSA/B data are not reviewed at a Stage 2B validation.
- Laboratory Control Samples (LCS): The LCS recoveries were within 80-120% for ICP-MS and ICP-AES.
- Laboratory Duplicates: Laboratory duplicate analysis was performed on sample MH0050 for all methods. RPDs met the control limits of $\leq 20\%$ for sample results $> 5 \times \text{RL}$ and $\pm \text{RL}$ for sample results $< 5 \times \text{RL}$ for all target analytes except aluminum (22%), antimony ($> \text{RL}$), arsenic (26%), calcium (32%), lead (45%), manganese (40%), silver (42%) and cobalt (32%). Associated results for all site samples of similar matrix (waste material) were qualified as estimated (J).
- Matrix Spike: Matrix spike (MS) analysis was performed on sample MH0050 for all methods. It should be noted that MS results were not reported for ICP-AES analytes aluminum, calcium, iron, magnesium, sodium and potassium. MS recoveries were not assessed when the parent sample concentrations were more than $4 \times$ the spike amount. Recoveries met control limits of 75-125% for all target analytes except antimony (34%), barium (74%), chromium (72%), nickel (62%) and selenium (70%). Associated results for all site samples of similar matrix (waste material) were qualified as estimated with potential low bias (J- for detects, UJ for nondetects).
- Post Digestion Spike: Post digestion spike (PDS) analysis was performed on sample MH0050 for ICP-AES (antimony only) and ICP-MS (barium, chromium, nickel and selenium only). PDS recoveries were within 75-125% for all target analytes except chromium (72%) and antimony (69%). Associated results for all site samples of similar matrix (waste material) were qualified as estimated with low potential bias (J-). Bias was removed from detected results for matrix spike qualifiers for barium, nickel and selenium due to acceptable PDS recoveries.
- Serial Dilution: Serial dilution analysis was performed on sample MH0050 for ICP-AES and ICP-MS. Results were not assessed unless the parent sample concentration was $> 50 \times$ the MDL. The control limit of $\leq 10\%$ difference (%D) of the original sample results was met for all target analytes except aluminum (18%), antimony (23%), arsenic (12%), magnesium (26%), manganese (23%), potassium (15%), silver (20%), cadmium (11%) and nickel (15%). Associated results for all samples of similar matrix (waste material) were qualified as estimated (J).
- Internal Standards: Several ICP-MS sample internal standard intensities failed to meet the control limits of 60-125% of the calibration blank. These samples were diluted $2 \times$ and analyzed for affected analytes. Intensities for internal standards holmium (associated with target analyte thallium) in samples MH0035, MH0036, MH0037 and MH0038, and terbium (associated with target analyte barium) in sample MH0038 were greater than 125% in both the undiluted and diluted analyses. Results for associated analytes (thallium in all 4 samples and barium in sample MH0038) were reported from the undiluted analyses and were qualified as estimated (J for detects and UJ for nondetects). The remaining results reported from the dilutions were associated with acceptable internal standard intensities.
- Sample Result Verification: Sample results are not verified at a Stage 2B validation. Detects below the reporting limit were qualified as estimated (J). Nondetects are valid to the reporting limit.

Sample MH0031 was analyzed at an initial 5×dilution for ICP-AES due to high analyte concentrations. Several samples were diluted for various analytes due to results above the calibration range and failed internal standard recoveries. All reporting limits were adjusted appropriately. Results for dilutions were flagged with “D” by the laboratory.

- Field QC Samples: MEC^x evaluated field QC samples, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. MEC^x used the remaining detects to evaluate the associated site samples. Findings associated with field QC samples are summarized below.
 - Field Blanks and Equipment Blanks: No field or equipment blanks were identified for this SDG.
 - Field Duplicates: Field duplicate (FD) pairs were identified as noted in the table below. The RPD control limit of ≤50% for all target analytes greater than RL and ±RL for all results <RL were met except as noted in the table. Associated results for the applicable field duplicate pair were qualified as estimated (J for detects, UJ for nondetects).

Parent sample number	Field Duplicate sample number	analyte	Field duplicate RPD
MH0033	MH0035	manganese	70%
		beryllium	61%
		cobalt	66%
		nickel	52%
MH0034 SDG MH0027	MH0036	All acceptable	
MH0050	MH0052 SDG MH0027	aluminum	79%
		antimony	117%
		arsenic	90%
		calcium	135%
		copper	127%
		iron	97%
		lead	93%
		manganese	84%
		silver	118%
		Sodium	>RL
		zinc	104%
		barium	57%
		cadmium	90%
		vanadium	129%
MH0098	MH00A0 SDG MH0040	chromium	95%
		nickel	55%
		selenium	73%
		vanadium	86%
		barium	52%



Validated Sample Result Forms MH0030

Analysis Method Hg

Lab Sample Name: 9060156-01

Sample No: MH0030

Sample Date: 06/04/2019 11:00:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Mercury	7439-97-6	0.039	0.11	0.018	mg/kg	J	J-	B

Lab Sample Name: 9060156-02

Sample No: MH0031

Sample Date: 06/04/2019 12:35:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.11 0.11 0.018 mg/kg U

UJ B

Lab Sample Name: 9060156-03

Sample No: MH0033

Sample Date: 06/04/2019 13:50:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.11 0.12 0.019 mg/kg J

J

Lab Sample Name: 9060156-04

Sample No: MH0035

Sample Date: 06/04/2019 14:25:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.20 0.11 0.017 mg/kg

Lab Sample Name: 9060156-05

Sample No: MH0036

Sample Date: 06/04/2019 14:27:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.11 0.11 0.018 mg/kg

Lab Sample Name: 9060156-06

Sample No: MH0037

Sample Date: 06/04/2019 14:18:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.38 0.12 0.019 mg/kg

Lab Sample Name: 9060156-07

Sample No: MH0038

Sample Date: 06/04/2019 14:15:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.79 0.12 0.019 mg/kg

Analysis Method Hg

Lab Sample Name: 9060156-08 Sample No: MH0050 Sample Date: 06/04/2019 15:59:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.26 0.11 0.017 mg/kg

Lab Sample Name: 9060156-09 Sample No: MH0077 Sample Date: 06/03/2019 12:24:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.20 0.11 0.017 mg/kg

Lab Sample Name: 9060156-10 Sample No: MH0098 Sample Date: 06/05/2019 14:25:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 2.1 0.30 0.048 mg/kg D

Lab Sample Name: 9060156-11 Sample No: MH00A5 Sample Date: 06/03/2019 13:03:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.24 0.10 0.016 mg/kg

Lab Sample Name: 9060156-12 Sample No: MH00A8 Sample Date: 06/04/2019 12:15:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.10 0.10 0.017 mg/kg U **UJ** **B**

Analysis Method ICP_AES

Lab Sample Name: 9060156-01 Sample No: MH0030 Sample Date: 06/04/2019 11:00:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Aluminum 7429-90-5 13100 22.7 0.62 mg/kg * **J** **E, A**

Antimony 7440-36-0 13.6 6.8 0.23 mg/kg * **J-** **E, Q, P, A**

Arsenic 7440-38-2 1390 5.7 0.057 mg/kg D* **J** **E, A**

Calcium 7440-70-2 17400 566 5.3 mg/kg * **J** **E**

Copper 7440-50-8 1170 14.2 0.28 mg/kg D

Iron 7439-89-6 37800 11.3 0.87 mg/kg

Lead 7439-92-1 179 1.1 0.16 mg/kg * **J** **E**

Magnesium 7439-95-4 4810 566 2.3 mg/kg * **J** **A**

Manganese 7439-96-5 4780 8.5 0.43 mg/kg D* **J** **E, A**

Potassium 7440-09-7 3580 566 8.6 mg/kg * **J** **A**

Analysis Method ICP_AES

Silver	7440-22-4	2.4	1.1	0.037	mg/kg	*	J	E, A
Sodium	7440-23-5	51.7	566	2.6	mg/kg	J	J	
Zinc	7440-66-6	10300	34.0	0.29	mg/kg	D		

Lab Sample Name: 9060156-02 Sample No: MH0031 Sample Date: 06/04/2019 12:35:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	11900	108	3.0	mg/kg	D*	J	E, A
Antimony	7440-36-0	26.1	32.3	1.1	mg/kg	JD*	J-	E, Q, P, A
Arsenic	7440-38-2	2900	16.1	0.16	mg/kg	D*	J	E, A
Calcium	7440-70-2	6080	2690	25.3	mg/kg	D*	J	E
Copper	7440-50-8	1390	13.4	0.26	mg/kg	D		
Iron	7439-89-6	186000	161	12.4	mg/kg	D		
Lead	7439-92-1	582	5.4	0.75	mg/kg	D*	J	E
Magnesium	7439-95-4	556	2690	10.8	mg/kg	JD*	J	A
Manganese	7439-96-5	8590	24.2	1.2	mg/kg	D*	J	E, A
Potassium	7440-09-7	3020	2690	40.9	mg/kg	D*	J	A
Silver	7440-22-4	9.3	5.4	0.18	mg/kg	D*	J	E, A
Sodium	7440-23-5	29.8	2690	12.4	mg/kg	JD	J	
Zinc	7440-66-6	5840	32.3	0.28	mg/kg	D		

Lab Sample Name: 9060156-03 Sample No: MH0033 Sample Date: 06/04/2019 13:50:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	11600	23.9	0.66	mg/kg	*	J	E, A
Antimony	7440-36-0	5.9	7.2	0.24	mg/kg	J*	J-	E, Q, P, A
Arsenic	7440-38-2	1050	6.0	0.060	mg/kg	D*	J	E, A
Calcium	7440-70-2	4340	596	5.6	mg/kg	*	J	E
Copper	7440-50-8	3330	14.9	0.29	mg/kg	D		
Iron	7439-89-6	33600	11.9	0.92	mg/kg			
Lead	7439-92-1	194	1.2	0.17	mg/kg	*	J	E
Magnesium	7439-95-4	3450	596	2.4	mg/kg	*	J	A
Manganese	7439-96-5	1570	1.8	0.091	mg/kg	*	J	E, A, F1
Potassium	7440-09-7	1560	596	9.1	mg/kg	*	J	A
Silver	7440-22-4	1.6	1.2	0.039	mg/kg	*	J	E, A
Sodium	7440-23-5	36.9	596	2.7	mg/kg	J	J	
Zinc	7440-66-6	15000	35.8	0.31	mg/kg	D		

Lab Sample Name: 9060156-04 Sample No: MH0035 Sample Date: 06/04/2019 14:25:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	12700	22.2	0.61	mg/kg	*	J	E, A

Analysis Method ICP_AES

Antimony	7440-36-0	4.6	6.7	0.22	mg/kg	J*	J-	E, Q, P, A
Arsenic	7440-38-2	1070	5.5	0.055	mg/kg	D*	J	E, A
Calcium	7440-70-2	4150	554	5.2	mg/kg	*	J	E
Copper	7440-50-8	3340	13.9	0.27	mg/kg	D		
Iron	7439-89-6	32700	11.1	0.85	mg/kg			
Lead	7439-92-1	163	1.1	0.16	mg/kg	*	J	E
Magnesium	7439-95-4	3840	554	2.2	mg/kg	*	J	A
Manganese	7439-96-5	3260	8.3	0.42	mg/kg	D*	J	E, A, F1
Potassium	7440-09-7	1760	554	8.4	mg/kg	*	J	A
Silver	7440-22-4	1.5	1.1	0.037	mg/kg	*	J	E, A
Sodium	7440-23-5	69.1	554	2.5	mg/kg	J	J	
Zinc	7440-66-6	16900	66.5	0.58	mg/kg	D		

Lab Sample Name: 9060156-05

Sample No: MH0036

Sample Date: 06/04/2019 14:27:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	15400	22.6	0.62	mg/kg	*	J	E, A
Antimony	7440-36-0	2.7	6.8	0.23	mg/kg	J*	J-	E, Q, P, A
Arsenic	7440-38-2	414	1.1	0.011	mg/kg	*	J	E, A
Calcium	7440-70-2	4310	564	5.3	mg/kg	*	J	E
Copper	7440-50-8	8160	28.2	0.55	mg/kg	D		
Iron	7439-89-6	17100	11.3	0.87	mg/kg			
Lead	7439-92-1	81.3	1.1	0.16	mg/kg	*	J	E
Magnesium	7439-95-4	5400	564	2.3	mg/kg	*	J	A
Manganese	7439-96-5	1380	1.7	0.086	mg/kg	*	J	E, A
Potassium	7440-09-7	1820	564	8.6	mg/kg	*	J	A
Silver	7440-22-4	0.74	1.1	0.037	mg/kg	J*	J	E, A
Sodium	7440-23-5	9.7	564	2.6	mg/kg	J	J-	B
Zinc	7440-66-6	31700	67.7	0.59	mg/kg	D		

Lab Sample Name: 9060156-06

Sample No: MH0037

Sample Date: 06/04/2019 14:18:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	40700	25.1	0.69	mg/kg	*	J	E, A
Antimony	7440-36-0	2.1	7.5	0.25	mg/kg	J*	J-	E, Q, P, A
Arsenic	7440-38-2	203	1.3	0.013	mg/kg	*	J	E, A
Calcium	7440-70-2	6300	628	5.9	mg/kg	*	J	E
Copper	7440-50-8	17000	47.1	0.92	mg/kg	D		
Iron	7439-89-6	10100	12.6	0.97	mg/kg			
Lead	7439-92-1	56.3	1.3	0.18	mg/kg	*	J	E
Magnesium	7439-95-4	3850	628	2.5	mg/kg	*	J	A
Manganese	7439-96-5	6500	28.3	1.4	mg/kg	D*	J	E, A

Analysis Method ICP_AES

Potassium	7440-09-7	441	628	9.6	mg/kg	J*	J	A
Silver	7440-22-4	0.59	1.3	0.041	mg/kg	J*	J	E, A
Sodium	7440-23-5	7.1	628	2.9	mg/kg	J	J-	B
Zinc	7440-66-6	47200	113	0.98	mg/kg	D		

Lab Sample Name: 9060156-07

Sample No: MH0038

Sample Date: 06/04/2019 14:15:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	26500	23.5	0.65	mg/kg	*	J	E, A
Antimony	7440-36-0	2.0	7.1	0.24	mg/kg	J*	J-	E, Q, P, A
Arsenic	7440-38-2	162	1.2	0.012	mg/kg	*	J	E, A
Calcium	7440-70-2	18800	588	5.5	mg/kg	*	J	E
Copper	7440-50-8	16000	44.1	0.86	mg/kg	D		
Iron	7439-89-6	3830	11.8	0.91	mg/kg			
Lead	7439-92-1	44.0	1.2	0.16	mg/kg	*	J	E
Magnesium	7439-95-4	2580	588	2.4	mg/kg	*	J	A
Manganese	7439-96-5	7540	26.5	1.3	mg/kg	D*	J	E, A
Potassium	7440-09-7	307	588	8.9	mg/kg	J*	J	A
Silver	7440-22-4	0.33	1.2	0.039	mg/kg	J*	J	E, A
Sodium	7440-23-5	4.2	588	2.7	mg/kg	J	J-	B
Zinc	7440-66-6	47800	106	0.92	mg/kg	D		

Lab Sample Name: 9060156-08

Sample No: MH0050

Sample Date: 06/04/2019 15:59:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	21600	22.1	0.61	mg/kg	*	J	E, A, F1
Antimony	7440-36-0	18.7	6.6	0.22	mg/kg	*	J-	E, Q, P, A, F1
Arsenic	7440-38-2	4760	16.6	0.17	mg/kg	D*	J	E, A, F1
Calcium	7440-70-2	187000	8290	77.9	mg/kg	D*	J	E, F1
Copper	7440-50-8	2600	41.4	0.81	mg/kg	D	J	F1
Iron	7439-89-6	81400	166	12.8	mg/kg	D	J	F1
Lead	7439-92-1	3560	16.6	2.3	mg/kg	D*	J	E, F1
Magnesium	7439-95-4	6150	553	2.2	mg/kg	*	J	A
Manganese	7439-96-5	570	1.7	0.084	mg/kg	*	J	E, A, F1
Potassium	7440-09-7	757	553	8.4	mg/kg	*	J	A
Silver	7440-22-4	10.9	1.1	0.036	mg/kg	*	J	E, A, F1
Sodium	7440-23-5	21.1	553	2.5	mg/kg	J	J-	B, F1
Zinc	7440-66-6	5900	99.5	0.86	mg/kg	D	J	F1

Lab Sample Name: 9060156-09

Sample No: MH0077

Sample Date: 06/03/2019 12:24:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Analysis Method ICP_AES

Aluminum	7429-90-5	10900	22.1	0.61	mg/kg	*	J	E, A
Antimony	7440-36-0	10.1	6.6	0.22	mg/kg	*	J-	E, Q, P, A
Arsenic	7440-38-2	654	3.3	0.033	mg/kg	D*	J	E, A
Calcium	7440-70-2	11300	553	5.2	mg/kg	*	J	E
Copper	7440-50-8	34.5	2.8	0.054	mg/kg			
Iron	7439-89-6	26000	11.1	0.85	mg/kg			
Lead	7439-92-1	1270	1.1	0.15	mg/kg	*	J	E
Magnesium	7439-95-4	2940	553	2.2	mg/kg	*	J	A
Manganese	7439-96-5	571	1.7	0.084	mg/kg	*	J	E, A
Potassium	7440-09-7	2230	553	8.4	mg/kg	*	J	A
Silver	7440-22-4	5.5	1.1	0.036	mg/kg	*	J	E, A
Sodium	7440-23-5	97.8	553	2.5	mg/kg	J	J	
Zinc	7440-66-6	847	6.6	0.057	mg/kg			

Lab Sample Name: 9060156-10 Sample No: MH0098 Sample Date: 06/05/2019 14:25:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	5940	20.5	0.57	mg/kg	*	J	E, A
Antimony	7440-36-0	152	6.2	0.21	mg/kg	*	J-	E, Q, P, A
Arsenic	7440-38-2	399	1.0	0.010	mg/kg	*	J	E, A
Calcium	7440-70-2	8000	514	4.8	mg/kg	*	J	E
Copper	7440-50-8	550	2.6	0.050	mg/kg			
Iron	7439-89-6	28800	10.3	0.79	mg/kg			
Lead	7439-92-1	7610	5.1	0.72	mg/kg	D*	J	E
Magnesium	7439-95-4	1810	514	2.1	mg/kg	*	J	A
Manganese	7439-96-5	533	1.5	0.078	mg/kg	*	J	E, A
Potassium	7440-09-7	826	514	7.8	mg/kg	*	J	A
Silver	7440-22-4	157	5.1	0.17	mg/kg	D*	J	E, A
Sodium	7440-23-5	21.8	514	2.4	mg/kg	J	J-	B
Zinc	7440-66-6	6160	30.8	0.27	mg/kg	D		

Lab Sample Name: 9060156-11 Sample No: MH00A5 Sample Date: 06/03/2019 13:03:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	4210	20.6	0.57	mg/kg	*		
Antimony	7440-36-0	5.8	6.2	0.21	mg/kg	J*	J	
Arsenic	7440-38-2	3340	10.3	0.10	mg/kg	D*		
Calcium	7440-70-2	27000	514	4.8	mg/kg	*		
Copper	7440-50-8	41.3	2.6	0.050	mg/kg			
Iron	7439-89-6	30600	10.3	0.79	mg/kg			
Lead	7439-92-1	2360	1.0	0.14	mg/kg	*		
Magnesium	7439-95-4	11100	514	2.1	mg/kg	*		

Analysis Method ICP_AES

Manganese	7439-96-5	431	1.5	0.078	mg/kg	*		
Potassium	7440-09-7	1970	514	7.8	mg/kg	*		
Silver	7440-22-4	13.4	1.0	0.034	mg/kg	*		
Sodium	7440-23-5	46.9	514	2.4	mg/kg	J		J
Zinc	7440-66-6	4760	61.7	0.53	mg/kg	D		

Lab Sample Name: 9060156-12 Sample No: MH00A8 Sample Date: 06/04/2019 12:15:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	8180	20.9	0.58	mg/kg	*		
Antimony	7440-36-0	31.1	6.3	0.21	mg/kg	*		
Arsenic	7440-38-2	2630	10.5	0.10	mg/kg	D*		
Calcium	7440-70-2	9320	523	4.9	mg/kg	*		
Copper	7440-50-8	1060	26.2	0.51	mg/kg	D		
Iron	7439-89-6	160000	105	8.1	mg/kg	D		
Lead	7439-92-1	688	1.0	0.15	mg/kg	*		
Magnesium	7439-95-4	667	523	2.1	mg/kg	*		
Manganese	7439-96-5	8670	15.7	0.80	mg/kg	D*		
Potassium	7440-09-7	1450	523	8.0	mg/kg	*		
Silver	7440-22-4	4.5	1.0	0.035	mg/kg	*		
Sodium	7440-23-5	54.0	523	2.4	mg/kg	J		J
Zinc	7440-66-6	7320	62.8	0.54	mg/kg	D		

Analysis Method ICP_MS

Lab Sample Name: 9060156-01 Sample No: MH0030 Sample Date: 06/04/2019 11:00:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	543	5.3	0.055	mg/kg	*	J	Q
Beryllium	7440-41-7	1.8	0.53	0.037	mg/kg			
Cadmium	7440-43-9	47.5	0.53	0.063	mg/kg	*	J	A
Chromium	7440-47-3	5.4	1.1	0.033	mg/kg	*	J-	Q, P
Cobalt	7440-48-4	58.1	0.53	0.027	mg/kg	*	J	E
Nickel	7440-02-0	71.5	0.53	0.025	mg/kg	*	J	Q, A
Selenium	7782-49-2	2.7	2.7	0.19	mg/kg	U*	UJ	B, Q
Thallium	7440-28-0	1.3	0.53	0.019	mg/kg		J+	B
Vanadium	7440-62-2	10.3	2.7	0.021	mg/kg			

Lab Sample Name: 9060156-02 Sample No: MH0031 Sample Date: 06/04/2019 12:35:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	512	5.7	0.059	mg/kg	*	J	Q

Analysis Method ICP_MS

Beryllium	7440-41-7	5.9	0.57	0.040	mg/kg			
Cadmium	7440-43-9	34.6	0.57	0.068	mg/kg	*	J	A
Chromium	7440-47-3	2.5	1.1	0.036	mg/kg	*	J-	Q, P
Cobalt	7440-48-4	200	0.57	0.029	mg/kg	*	J	E
Nickel	7440-02-0	40.3	0.57	0.026	mg/kg	*	J	Q, A
Selenium	7782-49-2	2.9	2.9	0.21	mg/kg	J*	UJ	B, Q
Thallium	7440-28-0	0.97	0.57	0.021	mg/kg		J+	B
Vanadium	7440-62-2	6.6	2.9	0.023	mg/kg			

Lab Sample Name: 9060156-03

Sample No: MH0033

Sample Date: 06/04/2019 13:50:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	326	6.0	0.061	mg/kg	*	J	Q
Beryllium	7440-41-7	4.6	0.60	0.042	mg/kg		J	F1
Cadmium	7440-43-9	44.2	0.60	0.070	mg/kg	*	J	A
Chromium	7440-47-3	10.1	1.2	0.037	mg/kg	*	J-	Q, P
Cobalt	7440-48-4	140	0.60	0.030	mg/kg	*	J	E, F1
Nickel	7440-02-0	103	0.60	0.027	mg/kg	*	J	Q, A, F1
Selenium	7782-49-2	3.0	3.0	0.21	mg/kg	J*	UJ	B, Q
Thallium	7440-28-0	1.2	1.2	0.043	mg/kg	JD	U	B
Vanadium	7440-62-2	12.6	3.0	0.024	mg/kg			

Lab Sample Name: 9060156-04

Sample No: MH0035

Sample Date: 06/04/2019 14:25:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	544	11.0	0.11	mg/kg	D*	J	Q
Beryllium	7440-41-7	8.6	1.1	0.077	mg/kg	D	J	F1
Cadmium	7440-43-9	54.9	0.55	0.065	mg/kg	*	J	A
Chromium	7440-47-3	14.6	2.2	0.068	mg/kg	D*	J-	Q, P
Cobalt	7440-48-4	278	1.1	0.055	mg/kg	D*	J	E, F1
Nickel	7440-02-0	176	1.1	0.050	mg/kg	D*	J	Q, A, F1
Selenium	7782-49-2	5.5	5.5	0.40	mg/kg	JD*	UJ	B, Q
Thallium	7440-28-0	1.1	0.55	0.020	mg/kg		J+	B, *III
Vanadium	7440-62-2	18.6	5.5	0.044	mg/kg	D		

Lab Sample Name: 9060156-05

Sample No: MH0036

Sample Date: 06/04/2019 14:27:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	349	11.7	0.12	mg/kg	D*	J	Q
Beryllium	7440-41-7	14.0	1.2	0.082	mg/kg	D		
Cadmium	7440-43-9	78.4	0.59	0.069	mg/kg	*	J	A
Chromium	7440-47-3	24.4	2.3	0.073	mg/kg	D*	J-	Q, P

Analysis Method ICP_MS

Cobalt	7440-48-4	399	1.2	0.059	mg/kg	D*	J	E
Nickel	7440-02-0	283	1.2	0.054	mg/kg	D*	J	Q, A
Selenium	7782-49-2	5.9	5.9	0.42	mg/kg	UD*	UJ	Q
Thallium	7440-28-0	0.92	0.59	0.021	mg/kg		J+	B, *III
Vanadium	7440-62-2	19.3	5.9	0.047	mg/kg	D		

Lab Sample Name: 9060156-06 Sample No: MH0037 Sample Date: 06/04/2019 14:18:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	352	12.9	0.13	mg/kg	D*	J	Q
Beryllium	7440-41-7	13.5	0.65	0.045	mg/kg			
Cadmium	7440-43-9	199	0.65	0.076	mg/kg	*	J	A
Chromium	7440-47-3	10.9	1.3	0.040	mg/kg	*	J-	Q, P
Cobalt	7440-48-4	375	0.65	0.032	mg/kg	*	J	E
Nickel	7440-02-0	377	0.65	0.030	mg/kg	*	J	Q, A
Selenium	7782-49-2	3.2	3.2	0.23	mg/kg	J*	UJ	B, Q
Thallium	7440-28-0	0.65	0.65	0.023	mg/kg	J	UJ	B, *III
Vanadium	7440-62-2	17.4	3.2	0.026	mg/kg			

Lab Sample Name: 9060156-07 Sample No: MH0038 Sample Date: 06/04/2019 14:15:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	362	6.2	0.063	mg/kg	*	J	Q, *III
Beryllium	7440-41-7	16.6	0.62	0.043	mg/kg			
Cadmium	7440-43-9	178	0.62	0.073	mg/kg	*	J	A
Chromium	7440-47-3	7.0	1.2	0.038	mg/kg	*	J-	Q, P
Cobalt	7440-48-4	199	0.62	0.031	mg/kg	*	J	E
Nickel	7440-02-0	343	0.62	0.028	mg/kg	*	J	Q, A
Selenium	7782-49-2	3.1	3.1	0.22	mg/kg	J*	UJ	B, Q
Thallium	7440-28-0	0.62	0.62	0.022	mg/kg	J	UJ	B, *III
Vanadium	7440-62-2	12.8	3.1	0.025	mg/kg			

Lab Sample Name: 9060156-08 Sample No: MH0050 Sample Date: 06/04/2019 15:59:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	120	5.4	0.055	mg/kg	*	J	Q, F1
Beryllium	7440-41-7	1.5	0.54	0.038	mg/kg			
Cadmium	7440-43-9	75.0	0.54	0.063	mg/kg	*	J	A, F1
Chromium	7440-47-3	7.2	1.1	0.033	mg/kg	*	J-	Q, P
Cobalt	7440-48-4	7.3	0.54	0.027	mg/kg	*	J	E
Nickel	7440-02-0	32.8	0.54	0.025	mg/kg	*	J	Q, A
Selenium	7782-49-2	2.7	2.7	0.19	mg/kg	U*	UJ	B, Q

Analysis Method ICP_MS

Thallium	7440-28-0	0.54	0.54	0.019	mg/kg	J	U	B
Vanadium	7440-62-2	86.7	2.7	0.021	mg/kg		J	F1
Lab Sample Name: 9060156-09		Sample No: MH0077		Sample Date: 06/03/2019 12:24:00				

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	127	5.4	0.055	mg/kg	*	J	Q
Beryllium	7440-41-7	0.75	0.54	0.038	mg/kg			
Cadmium	7440-43-9	4.7	0.54	0.064	mg/kg	*	J	A
Chromium	7440-47-3	4.8	1.1	0.034	mg/kg	*	J-	Q, P
Cobalt	7440-48-4	10.0	0.54	0.027	mg/kg	*	J	E
Nickel	7440-02-0	19.3	0.54	0.025	mg/kg	*	J	Q, A
Selenium	7782-49-2	2.7	2.7	0.20	mg/kg	U*	UJ	B, Q
Thallium	7440-28-0	0.70	0.54	0.020	mg/kg		J+	B
Vanadium	7440-62-2	12.0	2.7	0.022	mg/kg			

Lab Sample Name: 9060156-10 Sample No: MH0098 Sample Date: 06/05/2019 14:25:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	9.6	5.2	0.053	mg/kg	*	J	Q, F1
Beryllium	7440-41-7	0.24	0.52	0.036	mg/kg	J	J	
Cadmium	7440-43-9	135	0.52	0.061	mg/kg	*	J	A
Chromium	7440-47-3	2.3	1.0	0.032	mg/kg	*	J-	Q, P, F1
Cobalt	7440-48-4	8.3	0.52	0.026	mg/kg	*	J	E
Nickel	7440-02-0	78.1	0.52	0.024	mg/kg	*	J	Q, A, F1
Selenium	7782-49-2	4.8	2.6	0.19	mg/kg	*	J	Q, F1
Thallium	7440-28-0	0.52	0.52	0.019	mg/kg	J	U	B
Vanadium	7440-62-2	16.3	2.6	0.021	mg/kg		J	F1

Lab Sample Name: 9060156-11 Sample No: MH00A5 Sample Date: 06/03/2019 13:03:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	31.7	5.1	0.052	mg/kg	*		
Beryllium	7440-41-7	0.84	0.51	0.036	mg/kg			
Cadmium	7440-43-9	49.1	0.51	0.061	mg/kg	*		
Chromium	7440-47-3	2.4	1.0	0.032	mg/kg	*		
Cobalt	7440-48-4	9.1	0.51	0.026	mg/kg	*		
Nickel	7440-02-0	30.2	0.51	0.024	mg/kg	*		
Selenium	7782-49-2	2.6	2.6	0.19	mg/kg	J*	U	B
Thallium	7440-28-0	0.51	0.51	0.019	mg/kg	J	U	B
Vanadium	7440-62-2	2.7	2.6	0.021	mg/kg			

Analysis Method ICP_MS

Lab Sample Name: 9060156-12 Sample No: MH00A8 Sample Date: 06/04/2019 12:15:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	419	5.3	0.054	mg/kg	*		
Beryllium	7440-41-7	4.5	0.53	0.037	mg/kg			
Cadmium	7440-43-9	31.9	0.53	0.063	mg/kg	*		
Chromium	7440-47-3	2.4	1.1	0.033	mg/kg	*		
Cobalt	7440-48-4	232	0.53	0.027	mg/kg	*		
Nickel	7440-02-0	46.3	0.53	0.025	mg/kg	*		
Selenium	7782-49-2	2.7	2.7	0.19	mg/kg	J*	U	B
Thallium	7440-28-0	0.88	0.53	0.019	mg/kg		J+	B
Vanadium	7440-62-2	5.5	2.7	0.021	mg/kg			



DATA VALIDATION REPORT

Elkhorn Mining Site Inspection

SAMPLE DELIVERY GROUP: MH0039

Prepared by

MEC^x
12269 East Vassar Drive
Aurora, CO 80014

I. INTRODUCTION

Task Order Title: Elkhorn Mining Site Inspection
 Contract Task Order: 20408.012.004.0621.00
 Sample Delivery Group: MH0039
 Weston Project Manager: Natalie Quiet
 EPA Project Manager: Joseph Chisholm
 TDD No.: 0004/1807-06
 Case No.: 48289
 Matrix: Soils/Solids
 QC Level: Stage 2B
 No. of Samples: 12
 No. of Reanalyses/Dilutions: 0
 Laboratory: Bonner Analytical Testing Co.

Table 1. Sample Identification

<i>Sample No.</i>	<i>Lab Sample Name</i>	<i>Matrix Type</i>	<i>Collection Date</i>	<i>Method</i>
MH0039	9060159-01	Surface Soil	06/04/2019 15:46:00	Hg, ICP-AES, ICP-MS
MH0041	9060159-02	Tailings	06/04/2019 16:37:00	Hg, ICP-AES, ICP-MS
MH0042	9060159-03	Tailings	06/04/2019 16:49:00	Hg, ICP-AES, ICP-MS
MH0043	9060159-04	Tailings	06/05/2019 09:10:00	Hg, ICP-AES, ICP-MS
MH0044	9060159-05	Tailings	06/05/2019 09:14:00	Hg, ICP-AES, ICP-MS
MH0045	9060159-06	Tailings	06/05/2019 09:35:00	Hg, ICP-AES, ICP-MS
MH0046	9060159-07	Tailings	06/05/2019 09:55:00	Hg, ICP-AES, ICP-MS
MH0047	9060159-08	Tailings	06/05/2019 10:00:00	Hg, ICP-AES, ICP-MS
MH0048	9060159-09	Tailings	06/05/2019 09:30:00	Hg, ICP-AES, ICP-MS
MH0049	9060159-10	Tailings	06/05/2019 09:33:00	Hg, ICP-AES, ICP-MS
MH0059	9060159-11	Surface Soil	06/03/2019 16:25:00	Hg, ICP-AES, ICP-MS
MH0060	9060159-12	Surface Soil	06/04/2019 08:42:00	Hg, ICP-AES, ICP-MS



II. Sample Management

According to the Sample Receipt Forms the samples were received intact and properly preserved. All coolers were received at 0°C; however, as no samples were noted as broken, no qualifications were assigned. The chains of custody (COC) were signed and dated by field and/or laboratory personnel. Custody seals were present and intact.

Data Qualifier Reference Table

Qualifier	Organics	Inorganics
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit. The associated value is the quantitation limit or the estimated detection limit for dioxins or PCB congeners.	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit. The associated value is the sample detection limit or the quantitation limit for perchlorate only.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J+	Not applicable	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, and may have a potential positive bias.
J-	Not applicable	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, and may have a potential negative bias.
UJ	The analyte was not deemed above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.	The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."	Not applicable.



Qualifier	Organics	Inorganics
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.	Not applicable.
R	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.

Qualification Code Reference Table

Qualifier	Organics	Inorganics
H	Holding times were exceeded.	Holding times were exceeded.
S	Surrogate recovery was outside QC limits.	The sequence or number of standards used for the calibration was incorrect
C	Calibration %RSD or %D was noncompliant.	Correlation coefficient is <0.995 or calibration was noncompliant.
R	Calibration RRF was <0.05.	%R for calibration is not within control limits.
B	Presumed contamination as indicated by the preparation (method) blank results.	Presumed contamination as indicated by the preparation (method) or calibration blank results.
L	Laboratory Blank Spike/Blank Spike Duplicate %R was not within control limits.	Laboratory Control Sample %R was not within control limits.
L1	LCS/LCSD RPD was outside control limits.	LCS/LCSD RPD was outside control limits.
Q	MS/MSD recovery was poor.	MS recovery was poor.
Q1	MS/MSD RPD was outside control limits.	MS/MSD RPD was outside control limits.
E	Not applicable.	Duplicates showed poor agreement.
I	Internal standard performance was unsatisfactory.	ICP ICS results were unsatisfactory.
A	Not applicable.	ICP Serial Dilution %D were not within control limits.
M	Tuning (BFB or DFTPP) was noncompliant.	ICPMS tune was not compliant.
T	Presumed contamination as indicated by the trip blank results.	Not applicable.
+	False positive – reported compound was not present.	Not applicable.
-	False negative – compound was present but not reported.	Not applicable.
F	Presumed contamination as indicated by the FB or ER results.	Presumed contamination as indicated by the FB or ER results.
F1	Field duplicate results were outside the control limit.	Field duplicate results were outside the control limit.
\$	Reported result or other information was incorrect.	Reported result or other information was incorrect.
?	TIC identity or reported retention time has been changed.	Not applicable.



Qualifier	Organics	Inorganics
D	The analysis with this flag should not be used because another more technically sound analysis is available.	The analysis with this flag should not be used because another more technically sound analysis is available.
P	Instrument performance for pesticides was poor.	Post Digestion Spike recovery was not within control limits.
*II, *III	Unusual problems found with the data that have been described in Section II, "Sample Management," or Section III, "Method Analyses." The number following the asterisk (*) will indicate the report section where a description of the problem can be found.	Unusual problems found with the data that have been described in Section II, "Sample Management," or Section III, "Method Analyses." The number following the asterisk (*) will indicate the report section where a description of the problem can be found.

III. Method Analyses

A. **Methods 200.7, 200.8 and 245.1—Metals and Mercury**

Reviewed By: M. Hilchey

Date Reviewed: July 23, 2019

The samples listed in Table 1 for these analyses were validated based on the guidelines outlined in the *Quality Assurance Project Plan for U. S. EPA Region 8 CERCLA Site Assessment* (Rev. 2015), *United States Environmental Protection Agency Methods 200.7, 200.8 and 245.1* and the *National Functional Guidelines for Inorganic Superfund Methods Data Review* (January 2017).

- Holding Times: The analytical holding times, 28 days for mercury and six months for the remaining metals, were met.
- Instrument tune: According to summary reports, ICP-MS instrument tuning requirements were met.
- Calibration:
 - Initial calibration: According to the calibration summaries, correlation coefficients and %Ds met National Functional Guideline (NFG) acceptance requirements.
 - Initial (ICV) and continuing calibration (CCV) verification: ICV and CCV frequency requirements were met. ICV and CCV recoveries were within 90-110% for ICP-MS and ICP-AES, and 85-115% for mercury.
- Method Blanks: No target analytes were reported in the method blanks (MB) or calibration blanks (ICB/CCB) of sufficient concentration to qualify site sample results except as noted in the table below. For positive blank concentrations, associated detected sample results that were below the reporting limit (RL) were qualified as nondetect (U) at the RL. Associated detected sample results that were below the RL and >10× the blank concentration were not qualified, based on professional judgment. For negative blank concentrations greater than the absolute value of the MDL, associated nondetect results were qualified as estimated (UJ), and associated results <5× the absolute value of the negative blank result were qualified as estimated with low potential bias (J-).

Analyte	Blank concentration	Qualified Samples
antimony	2.3 µg/L (ICB)	MH0039
sodium	74.0 µg/L (CCB)	MH0039, MH0043, MH0044, MH0045, MH0046, MH0047
	40.2 µg/L (CCB)	MH0041, MH0042
selenium	-0.42 µg/L (ICB)	All site samples
thallium	0.04 mg/Kg (MB)	MH0039, MH0043, MH0044, MH0059
mercury	-0.047 µg/L (ICB)	MH0039, MH0043

- Interference Check Samples (ICSA/B): ICSA/B data are not reviewed at a Stage 2B validation.

- Laboratory Control Samples (LCS): The LCS recoveries were within 80-120% for ICP-MS and ICP-AES.
- Laboratory Duplicates: Laboratory duplicate analysis was performed on sample MH0039 for all methods. RPDs met the control limits of $\leq 20\%$ for sample results $> 5 \times \text{RL}$ and $\pm \text{RL}$ for sample results $< 5 \times \text{RL}$ for all target analytes except barium (40%), cadmium (45%), cobalt ($> \text{RL}$) and nickel (26%). Associated results for all site samples of similar matrix (surface soil) were qualified as estimated (J).
- Matrix Spike: Matrix spike (MS) analysis was performed on sample MH0039 for all methods. It should be noted that MS results were not reported for ICP-AES analytes aluminum, calcium, iron, magnesium, sodium and potassium. MS recoveries were not assessed when the parent sample concentrations were more than $4 \times$ the spike amount. Recoveries met control limits of 75-125% for all target analytes except antimony (24%). Associated results for all site samples of similar matrix (surface soil) were qualified as estimated with low potential bias (J- for detects, UJ for nondetects).
- Post Digestion Spike: Post digestion spike (PDS) analysis was performed on sample MH0039 for antimony only. The PDS recovery was within 75-125%. Bias was removed from the matrix spike qualifiers (see above) for detected antimony due to acceptable PDS recovery.
- Serial Dilution: Serial dilution analysis was performed on sample MH0039 for ICP-AES and ICP-MS. Results were not assessed unless the parent sample concentration was $> 50 \times$ the MDL. The control limit of $\leq 10\%$ difference (%D) of the original sample results was met for all target analytes except arsenic (11%), barium (13%), cadmium (24%), chromium (29%), cobalt (14%), nickel (13%) and vanadium (49%). Associated results for all samples of similar matrix (surface soil) were qualified as estimated (J).
- Internal Standards: Several ICP-MS sample internal standard intensities failed to meet the control limits of 60-125% of the calibration blank. These samples were diluted $2 \times$ and analyzed for affected analytes, with acceptable internal standard intensities for the diluted analyses. The affected sample results were reported from the diluted analyses. No qualifications were applied.
- Sample Result Verification: Sample results are not verified at a Stage 2B validation. Detects below the reporting limit were qualified as estimated (J). Nondetects are valid to the reporting limit.

Several samples were diluted for various target analytes due to high analyte concentration and for poor internal standard performance. All reporting limits were adjusted appropriately. Detected results for dilutions were flagged with "D" by the laboratory.

- Field QC Samples: MEC^x evaluated field QC samples, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. MEC^x used the remaining detects to evaluate the associated site samples. Findings associated with field QC samples are summarized below.
 - Field Blanks and Equipment Blanks: Field blanks and equipment blanks were not identified for this SDG.
 - Field Duplicates: Field duplicate samples were not identified for this SDG.

Validated Sample Result Forms MH0039

Analysis Method Hg

Lab Sample Name: 9060159-01

Sample No: MH0039

Sample Date: 06/04/2019 15:46:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Mercury	7439-97-6	0.19	0.11	0.018	mg/kg			

Lab Sample Name: 9060159-02

Sample No: MH0041

Sample Date: 06/04/2019 16:37:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.54 0.11 0.017 mg/kg

Lab Sample Name: 9060159-03

Sample No: MH0042

Sample Date: 06/04/2019 16:49:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.44 0.11 0.018 mg/kg

Lab Sample Name: 9060159-04

Sample No: MH0043

Sample Date: 06/05/2019 09:10:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.044 0.10 0.016 mg/kg

Lab Sample Name: 9060159-05

Sample No: MH0044

Sample Date: 06/05/2019 09:14:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.074 0.10 0.017 mg/kg

Lab Sample Name: 9060159-06

Sample No: MH0045

Sample Date: 06/05/2019 09:35:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.86 0.097 0.016 mg/kg

Lab Sample Name: 9060159-07

Sample No: MH0046

Sample Date: 06/05/2019 09:55:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.33 0.11 0.018 mg/kg

Analysis Method Hg

Lab Sample Name: 9060159-08 Sample No: MH0047 Sample Date: 06/05/2019 10:00:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.38 0.12 0.019 mg/kg

Lab Sample Name: 9060159-09 Sample No: MH0048 Sample Date: 06/05/2019 09:30:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 1.0 0.11 0.018 mg/kg

Lab Sample Name: 9060159-10 Sample No: MH0049 Sample Date: 06/05/2019 09:33:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.12 0.10 0.017 mg/kg

Lab Sample Name: 9060159-11 Sample No: MH0059 Sample Date: 06/03/2019 16:25:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 1.5 0.55 0.089 mg/kg D

Lab Sample Name: 9060159-12 Sample No: MH0060 Sample Date: 06/04/2019 08:42:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 262 27.5 4.4 mg/kg D

Analysis Method ICP_AES

Lab Sample Name: 9060159-01 Sample No: MH0039 Sample Date: 06/04/2019 15:46:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Aluminum 7429-90-5 8480 24.1 0.66 mg/kg

Antimony 7440-36-0 7.2 7.2 0.24 mg/kg J* UJ B, Q

Arsenic 7440-38-2 60.1 1.2 0.012 mg/kg * J A

Calcium 7440-70-2 2140 604 5.7 mg/kg

Copper 7440-50-8 29.6 3.0 0.059 mg/kg

Iron 7439-89-6 10400 12.1 0.93 mg/kg

Lead 7439-92-1 142 1.2 0.17 mg/kg

Magnesium 7439-95-4 2540 604 2.4 mg/kg

Manganese 7439-96-5 1790 1.8 0.092 mg/kg

Potassium 7440-09-7 1580 604 9.2 mg/kg

Analysis Method ICP_AES

Silver	7440-22-4	1.2	1.2	0.040	mg/kg			
Sodium	7440-23-5	604	604	2.8	mg/kg	J	U	B
Zinc	7440-66-6	224	7.2	0.063	mg/kg			

Lab Sample Name: 9060159-02 Sample No: MH0041 Sample Date: 06/04/2019 16:37:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	14000	246	6.8	mg/kg	D		
Antimony	7440-36-0	187	73.8	2.5	mg/kg	D*		
Arsenic	7440-38-2	78000	246	2.5	mg/kg	D*		
Calcium	7440-70-2	66000	6150	57.8	mg/kg	D		
Copper	7440-50-8	1420	30.7	0.60	mg/kg	D		
Iron	7439-89-6	221000	123	9.5	mg/kg	D		
Lead	7439-92-1	2550	12.3	1.7	mg/kg	D		
Magnesium	7439-95-4	6670	6150	24.6	mg/kg	D		
Manganese	7439-96-5	1430	18.4	0.93	mg/kg	D		
Potassium	7440-09-7	6150	6150	93.5	mg/kg	JD	J	
Silver	7440-22-4	35.7	12.3	0.41	mg/kg	D		
Sodium	7440-23-5	6150	6150	28.3	mg/kg	JD	U	B
Zinc	7440-66-6	874	73.8	0.64	mg/kg	D		

Lab Sample Name: 9060159-03 Sample No: MH0042 Sample Date: 06/04/2019 16:49:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	6600	233	6.4	mg/kg	D		
Antimony	7440-36-0	190	69.9	2.3	mg/kg	D*		
Arsenic	7440-38-2	102000	408	4.1	mg/kg	D*		
Calcium	7440-70-2	69400	5830	54.8	mg/kg	D		
Copper	7440-50-8	784	29.1	0.57	mg/kg	D		
Iron	7439-89-6	247000	117	9.0	mg/kg	D		
Lead	7439-92-1	5550	11.7	1.6	mg/kg	D		
Magnesium	7439-95-4	5830	5830	23.3	mg/kg	JD	J	
Manganese	7439-96-5	670	17.5	0.89	mg/kg	D		
Potassium	7440-09-7	5830	5830	88.6	mg/kg	JD	J	
Silver	7440-22-4	36.4	11.7	0.38	mg/kg	D		
Sodium	7440-23-5	5830	5830	26.8	mg/kg	JD	U	B
Zinc	7440-66-6	783	69.9	0.61	mg/kg	D		

Lab Sample Name: 9060159-04 Sample No: MH0043 Sample Date: 06/05/2019 09:10:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	6120	20.8	0.57	mg/kg			

Analysis Method ICP_AES

Antimony	7440-36-0	63.5	6.2	0.21	mg/kg	*		
Arsenic	7440-38-2	319	1.0	0.010	mg/kg	*		
Calcium	7440-70-2	304000	7790	73.2	mg/kg	D		
Copper	7440-50-8	55.9	2.6	0.051	mg/kg			
Iron	7439-89-6	10200	10.4	0.80	mg/kg			
Lead	7439-92-1	1420	1.0	0.15	mg/kg			
Magnesium	7439-95-4	11600	519	2.1	mg/kg			
Manganese	7439-96-5	331	1.6	0.079	mg/kg			
Potassium	7440-09-7	519	519	7.9	mg/kg	J	J	
Silver	7440-22-4	40.3	1.0	0.034	mg/kg			
Sodium	7440-23-5	519	519	2.4	mg/kg	J	U	B
Zinc	7440-66-6	292	6.2	0.054	mg/kg			

Lab Sample Name: 9060159-05

Sample No: MH0044

Sample Date: 06/05/2019 09:14:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	4730	21.0	0.58	mg/kg			
Antimony	7440-36-0	16.0	6.3	0.21	mg/kg	*		
Arsenic	7440-38-2	407	10.5	0.10	mg/kg	D*		
Calcium	7440-70-2	294000	5250	49.3	mg/kg	D		
Copper	7440-50-8	66.5	2.6	0.051	mg/kg			
Iron	7439-89-6	8300	10.5	0.81	mg/kg			
Lead	7439-92-1	1720	1.0	0.15	mg/kg			
Magnesium	7439-95-4	12200	525	2.1	mg/kg			
Manganese	7439-96-5	246	1.6	0.080	mg/kg			
Potassium	7440-09-7	525	525	8.0	mg/kg	J	J	
Silver	7440-22-4	3.9	1.0	0.035	mg/kg			
Sodium	7440-23-5	525	525	2.4	mg/kg	J	U	B
Zinc	7440-66-6	252	6.3	0.055	mg/kg			

Lab Sample Name: 9060159-06

Sample No: MH0045

Sample Date: 06/05/2019 09:35:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	6680	20.8	0.57	mg/kg			
Antimony	7440-36-0	217	6.2	0.21	mg/kg	*		
Arsenic	7440-38-2	15500	52.0	0.52	mg/kg	D*		
Calcium	7440-70-2	34300	520	4.9	mg/kg			
Copper	7440-50-8	1830	65.0	1.3	mg/kg	D		
Iron	7439-89-6	119000	260	20.0	mg/kg	D		
Lead	7439-92-1	3950	26.0	3.6	mg/kg	D		
Magnesium	7439-95-4	3410	520	2.1	mg/kg			
Manganese	7439-96-5	2370	39.0	2.0	mg/kg	D		

Analysis Method ICP_AES

Potassium	7440-09-7	520	520	7.9	mg/kg	J	J	
Silver	7440-22-4	12.4	1.0	0.034	mg/kg			
Sodium	7440-23-5	520	520	2.4	mg/kg	J	U	B
Zinc	7440-66-6	3280	6.2	0.054	mg/kg			

Lab Sample Name: 9060159-07

Sample No: MH0046

Sample Date: 06/05/2019 09:55:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	4880	23.6	0.65	mg/kg			
Antimony	7440-36-0	220	7.1	0.24	mg/kg	*		
Arsenic	7440-38-2	33200	148	1.5	mg/kg	D*		
Calcium	7440-70-2	24500	591	5.6	mg/kg			
Copper	7440-50-8	1810	73.9	1.4	mg/kg	D		
Iron	7439-89-6	242000	296	22.8	mg/kg	D		
Lead	7439-92-1	16600	29.6	4.1	mg/kg	D		
Magnesium	7439-95-4	2140	591	2.4	mg/kg			
Manganese	7439-96-5	797	1.8	0.090	mg/kg			
Potassium	7440-09-7	591	591	9.0	mg/kg	J	J	
Silver	7440-22-4	72.0	29.6	0.98	mg/kg	D		
Sodium	7440-23-5	591	591	2.7	mg/kg	J	U	B
Zinc	7440-66-6	1300	7.1	0.061	mg/kg			

Lab Sample Name: 9060159-08

Sample No: MH0047

Sample Date: 06/05/2019 10:00:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	2550	22.9	0.63	mg/kg			
Antimony	7440-36-0	278	6.9	0.23	mg/kg	*		
Arsenic	7440-38-2	21400	85.9	0.86	mg/kg	D*		
Calcium	7440-70-2	5580	572	5.4	mg/kg			
Copper	7440-50-8	1760	71.6	1.4	mg/kg	D		
Iron	7439-89-6	204000	286	22.0	mg/kg	D		
Lead	7439-92-1	38200	28.6	4.0	mg/kg	D		
Magnesium	7439-95-4	1200	572	2.3	mg/kg			
Manganese	7439-96-5	562	1.7	0.087	mg/kg			
Potassium	7440-09-7	572	572	8.7	mg/kg	J	J	
Silver	7440-22-4	52.6	1.1	0.038	mg/kg			
Sodium	7440-23-5	572	572	2.6	mg/kg	J	U	B
Zinc	7440-66-6	1130	6.9	0.060	mg/kg			

Lab Sample Name: 9060159-09

Sample No: MH0048

Sample Date: 06/05/2019 09:30:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Analysis Method ICP_AES

Aluminum	7429-90-5	9100	23.1	0.63	mg/kg	
Antimony	7440-36-0	126	6.9	0.23	mg/kg	*
Arsenic	7440-38-2	29500	144	1.4	mg/kg	D*
Calcium	7440-70-2	93900	14400	135	mg/kg	D
Copper	7440-50-8	1500	72.0	1.4	mg/kg	D
Iron	7439-89-6	151000	288	22.2	mg/kg	D
Lead	7439-92-1	5120	28.8	4.0	mg/kg	D
Magnesium	7439-95-4	8930	576	2.3	mg/kg	
Manganese	7439-96-5	1450	1.7	0.088	mg/kg	
Potassium	7440-09-7	667	576	8.8	mg/kg	
Silver	7440-22-4	23.5	1.2	0.038	mg/kg	
Sodium	7440-23-5	576	576	2.7	mg/kg	J
Zinc	7440-66-6	1840	6.9	0.060	mg/kg	

Lab Sample Name: 9060159-10 Sample No: MH0049 Sample Date: 06/05/2019 09:33:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	9710	24.1	0.66	mg/kg			
Antimony	7440-36-0	203	7.2	0.24	mg/kg	*		
Arsenic	7440-38-2	38800	151	1.5	mg/kg	D*		
Calcium	7440-70-2	36200	603	5.7	mg/kg			
Copper	7440-50-8	1290	75.4	1.5	mg/kg	D		
Iron	7439-89-6	205000	301	23.2	mg/kg	D		
Lead	7439-92-1	11000	30.1	4.2	mg/kg	D		
Magnesium	7439-95-4	3890	603	2.4	mg/kg			
Manganese	7439-96-5	1100	1.8	0.092	mg/kg			
Potassium	7440-09-7	710	603	9.2	mg/kg			
Silver	7440-22-4	43.9	1.2	0.040	mg/kg			
Sodium	7440-23-5	603	603	2.8	mg/kg	J	J	
Zinc	7440-66-6	655	7.2	0.063	mg/kg			

Lab Sample Name: 9060159-11 Sample No: MH0059 Sample Date: 06/03/2019 16:25:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	18400	28.8	0.79	mg/kg			
Antimony	7440-36-0	17.2	8.6	0.29	mg/kg	*	J	Q
Arsenic	7440-38-2	84.3	1.4	0.014	mg/kg	*	J	A
Calcium	7440-70-2	6790	719	6.8	mg/kg			
Copper	7440-50-8	114	3.6	0.070	mg/kg			
Iron	7439-89-6	31400	14.4	1.1	mg/kg			
Lead	7439-92-1	521	1.4	0.20	mg/kg			
Magnesium	7439-95-4	8050	719	2.9	mg/kg			

Analysis Method ICP_AES

Manganese	7439-96-5	1260	2.2	0.11	mg/kg		
Potassium	7440-09-7	4880	719	10.9	mg/kg		
Silver	7440-22-4	8.0	1.4	0.047	mg/kg		
Sodium	7440-23-5	719	719	3.3	mg/kg	J	J
Zinc	7440-66-6	1240	8.6	0.075	mg/kg		

Lab Sample Name: 9060159-12 Sample No: MH0060 Sample Date: 06/04/2019 08:42:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	6170	29.7	0.82	mg/kg			
Antimony	7440-36-0	558	8.9	0.30	mg/kg	*	J	Q
Arsenic	7440-38-2	797	22.3	0.22	mg/kg	D*	J	A
Calcium	7440-70-2	85500	11100	105	mg/kg	D		
Copper	7440-50-8	2410	55.7	1.1	mg/kg	D		
Iron	7439-89-6	25000	14.9	1.1	mg/kg			
Lead	7439-92-1	11600	22.3	3.1	mg/kg	D		
Magnesium	7439-95-4	48700	743	3.0	mg/kg			
Manganese	7439-96-5	2840	33.4	1.7	mg/kg	D		
Potassium	7440-09-7	743	743	11.3	mg/kg	J	J	
Silver	7440-22-4	333	22.3	0.74	mg/kg	D		
Sodium	7440-23-5	1620	743	3.4	mg/kg			
Zinc	7440-66-6	53900	134	1.2	mg/kg	D		

Analysis Method ICP_MS

Lab Sample Name: 9060159-01 Sample No: MH0039 Sample Date: 06/04/2019 15:46:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	134	6.0	0.062	mg/kg	*	J	E, A
Beryllium	7440-41-7	0.34	0.60	0.042	mg/kg	J	J	
Cadmium	7440-43-9	4.8	0.60	0.071	mg/kg	*	J	E, A
Chromium	7440-47-3	4.6	1.2	0.037	mg/kg	*	J	A
Cobalt	7440-48-4	3.0	0.60	0.030	mg/kg	*	J	E, A
Nickel	7440-02-0	5.3	0.60	0.028	mg/kg	*	J	E, A
Selenium	7782-49-2	3.0	3.0	0.22	mg/kg	U	UJ	B
Thallium	7440-28-0	0.60	0.60	0.022	mg/kg	J	U	B
Vanadium	7440-62-2	15.7	3.0	0.024	mg/kg	*	J	A

Lab Sample Name: 9060159-02 Sample No: MH0041 Sample Date: 06/04/2019 16:37:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	256	12.2	0.12	mg/kg	D*		

Analysis Method ICP_MS

Beryllium	7440-41-7	1.5	0.61	0.043	mg/kg			
Cadmium	7440-43-9	16.8	1.2	0.14	mg/kg	D*		
Chromium	7440-47-3	21.0	1.2	0.038	mg/kg	*		
Cobalt	7440-48-4	5.5	0.61	0.030	mg/kg	*		
Nickel	7440-02-0	39.3	0.61	0.028	mg/kg	*		
Selenium	7782-49-2	3.0	3.0	0.22	mg/kg	U	UJ	B
Thallium	7440-28-0	0.78	0.61	0.022	mg/kg			
Vanadium	7440-62-2	320	3.0	0.024	mg/kg	*		

Lab Sample Name: 9060159-03

Sample No: MH0042

Sample Date: 06/04/2019 16:49:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	216	11.9	0.12	mg/kg	D*		
Beryllium	7440-41-7	1.2	0.59	0.042	mg/kg			
Cadmium	7440-43-9	11.2	1.2	0.14	mg/kg	D*		
Chromium	7440-47-3	22.2	1.2	0.037	mg/kg	*		
Cobalt	7440-48-4	3.8	0.59	0.030	mg/kg	*		
Nickel	7440-02-0	30.3	0.59	0.027	mg/kg	*		
Selenium	7782-49-2	3.0	3.0	0.21	mg/kg	U	UJ	B
Thallium	7440-28-0	0.91	0.59	0.021	mg/kg			
Vanadium	7440-62-2	300	3.0	0.024	mg/kg	*		

Lab Sample Name: 9060159-04

Sample No: MH0043

Sample Date: 06/05/2019 09:10:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	48.2	5.0	0.051	mg/kg	*		
Beryllium	7440-41-7	0.74	0.50	0.035	mg/kg			
Cadmium	7440-43-9	4.0	0.50	0.058	mg/kg	*		
Chromium	7440-47-3	6.6	0.99	0.031	mg/kg	*		
Cobalt	7440-48-4	3.0	0.50	0.025	mg/kg	*		
Nickel	7440-02-0	17.3	0.50	0.023	mg/kg	*		
Selenium	7782-49-2	2.5	2.5	0.18	mg/kg	U	UJ	B
Thallium	7440-28-0	0.50	0.50	0.018	mg/kg	J	U	B
Vanadium	7440-62-2	65.8	2.5	0.020	mg/kg	*		

Lab Sample Name: 9060159-05

Sample No: MH0044

Sample Date: 06/05/2019 09:14:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	21.8	5.2	0.053	mg/kg	*		
Beryllium	7440-41-7	0.45	0.52	0.036	mg/kg	J	J	
Cadmium	7440-43-9	3.8	0.52	0.061	mg/kg	*		
Chromium	7440-47-3	5.3	1.0	0.032	mg/kg	*		

Analysis Method ICP_MS

Cobalt	7440-48-4	2.1	0.52	0.026	mg/kg	*		
Nickel	7440-02-0	15.0	0.52	0.024	mg/kg	*		
Selenium	7782-49-2	2.6	2.6	0.19	mg/kg	U	UJ	B
Thallium	7440-28-0	0.52	0.52	0.019	mg/kg	J	U	B
Vanadium	7440-62-2	225	2.6	0.021	mg/kg	*		

Lab Sample Name: 9060159-06 Sample No: MH0045 Sample Date: 06/05/2019 09:35:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	158	5.1	0.053	mg/kg	*		
Beryllium	7440-41-7	2.1	0.51	0.036	mg/kg			
Cadmium	7440-43-9	39.8	0.51	0.061	mg/kg	*		
Chromium	7440-47-3	10.2	1.0	0.032	mg/kg	*		
Cobalt	7440-48-4	4.1	0.51	0.026	mg/kg	*		
Nickel	7440-02-0	23.9	0.51	0.024	mg/kg	*		
Selenium	7782-49-2	2.6	2.6	0.19	mg/kg	U	UJ	B
Thallium	7440-28-0	0.78	0.51	0.019	mg/kg			
Vanadium	7440-62-2	1060	7.7	0.062	mg/kg	D*		

Lab Sample Name: 9060159-07 Sample No: MH0046 Sample Date: 06/05/2019 09:55:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	112	6.0	0.061	mg/kg	*		
Beryllium	7440-41-7	4.9	0.60	0.042	mg/kg			
Cadmium	7440-43-9	11.1	0.60	0.070	mg/kg	*		
Chromium	7440-47-3	50.4	1.2	0.037	mg/kg	*		
Cobalt	7440-48-4	6.6	0.60	0.030	mg/kg	*		
Nickel	7440-02-0	54.0	0.60	0.027	mg/kg	*		
Selenium	7782-49-2	3.0	3.0	0.21	mg/kg	U	UJ	B
Thallium	7440-28-0	1.2	0.60	0.021	mg/kg			
Vanadium	7440-62-2	2030	14.9	0.12	mg/kg	D*		

Lab Sample Name: 9060159-08 Sample No: MH0047 Sample Date: 06/05/2019 10:00:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	82.4	12.0	0.12	mg/kg	D*		
Beryllium	7440-41-7	4.4	0.60	0.042	mg/kg			
Cadmium	7440-43-9	7.4	1.2	0.14	mg/kg	D*		
Chromium	7440-47-3	45.6	1.2	0.037	mg/kg	*		
Cobalt	7440-48-4	5.2	0.60	0.030	mg/kg	*		
Nickel	7440-02-0	39.6	0.60	0.028	mg/kg	*		
Selenium	7782-49-2	3.0	3.0	0.22	mg/kg	U	UJ	B

Analysis Method ICP_MS

Thallium	7440-28-0	0.90	0.60	0.022	mg/kg			
Vanadium	7440-62-2	2410	15.0	0.12	mg/kg	D*		

Lab Sample Name: 9060159-09

Sample No: MH0048

Sample Date: 06/05/2019 09:30:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	165	5.6	0.057	mg/kg	*		
Beryllium	7440-41-7	1.1	0.56	0.039	mg/kg			
Cadmium	7440-43-9	15.7	0.56	0.066	mg/kg	*		
Chromium	7440-47-3	10.1	1.1	0.035	mg/kg	*		
Cobalt	7440-48-4	3.8	0.56	0.028	mg/kg	*		
Nickel	7440-02-0	19.3	0.56	0.026	mg/kg	*		
Selenium	7782-49-2	2.8	2.8	0.20	mg/kg	U	UJ	B
Thallium	7440-28-0	0.57	0.56	0.020	mg/kg			
Vanadium	7440-62-2	404	2.8	0.022	mg/kg	*		

Lab Sample Name: 9060159-10

Sample No: MH0049

Sample Date: 06/05/2019 09:33:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	142	5.6	0.058	mg/kg	*		
Beryllium	7440-41-7	1.2	0.56	0.039	mg/kg			
Cadmium	7440-43-9	7.4	0.56	0.067	mg/kg	*		
Chromium	7440-47-3	16.5	1.1	0.035	mg/kg	*		
Cobalt	7440-48-4	4.8	0.56	0.028	mg/kg	*		
Nickel	7440-02-0	23.9	0.56	0.026	mg/kg	*		
Selenium	7782-49-2	2.8	2.8	0.20	mg/kg	U	UJ	B
Thallium	7440-28-0	0.86	0.56	0.020	mg/kg			
Vanadium	7440-62-2	520	2.8	0.023	mg/kg	*		

Lab Sample Name: 9060159-11

Sample No: MH0059

Sample Date: 06/03/2019 16:25:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	148	7.1	0.073	mg/kg	*	J	E, A
Beryllium	7440-41-7	0.80	0.71	0.050	mg/kg			
Cadmium	7440-43-9	6.0	0.71	0.084	mg/kg	*	J	E, A
Chromium	7440-47-3	17.1	1.4	0.044	mg/kg	*	J	A
Cobalt	7440-48-4	9.9	0.71	0.036	mg/kg	*	J	E, A
Nickel	7440-02-0	18.4	0.71	0.033	mg/kg	*	J	E, A
Selenium	7782-49-2	3.6	3.6	0.26	mg/kg	U	UJ	B
Thallium	7440-28-0	0.71	0.71	0.026	mg/kg	J	U	B
Vanadium	7440-62-2	18.5	3.6	0.028	mg/kg	*	J	A

Analysis Method ICP_MS

Lab Sample Name: 9060159-12 Sample No: MH0060 Sample Date: 06/04/2019 08:42:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	29.5	7.0	0.071	mg/kg	*	J	E, A
Beryllium	7440-41-7	0.14	0.70	0.049	mg/kg	J	J	
Cadmium	7440-43-9	252	0.70	0.082	mg/kg	*	J	E, A
Chromium	7440-47-3	2.7	1.4	0.043	mg/kg	*	J	A
Cobalt	7440-48-4	1.9	0.70	0.035	mg/kg	*	J	E, A
Nickel	7440-02-0	5.2	0.70	0.032	mg/kg	*	J	E, A
Selenium	7782-49-2	3.5	3.5	0.25	mg/kg	U	UJ	B
Thallium	7440-28-0	0.70	0.70	0.025	mg/kg	U	U	
Vanadium	7440-62-2	14.1	3.5	0.028	mg/kg	*	J	A



DATA VALIDATION REPORT

Elkhorn Mining Site Inspection

SAMPLE DELIVERY GROUP: MH0040

Prepared by

MEC^x
12269 East Vassar Drive
Aurora, CO 80014

I. INTRODUCTION

Task Order Title: Elkhorn Mining Site Inspection
Contract Task Order: 20408.012.004.0621.00
Sample Delivery Group: MH0040
Weston Project Manager: Natalie Quiet
EPA Project Manager: Joseph Chisholm
TDD No.: 0004/1807-06
Case No.: 48289
Matrix: Soils/Solids
QC Level: Stage 2B
No. of Samples: 9
No. of Reanalyses/Dilutions: 0
Laboratory: Bonner Analytical Testing Co.

Table 1. Sample Identification

<i>Sample No.</i>	<i>Lab Sample Name</i>	<i>Matrix Type</i>	<i>Collection Date</i>	<i>Method</i>
MH0040	9060154-01	Surface Soil	06/04/2019 15:50:00	Hg, ICP-AES, ICP-MS
		Waste		Hg, ICP-AES, ICP-MS
MH0074	9060154-02	Material	06/03/2019 10:54:00	
		Waste		Hg, ICP-AES, ICP-MS
MH0075	9060154-03	Material	06/03/2019 11:05:00	
		Waste		Hg, ICP-AES, ICP-MS
MH0076	9060154-04	Material	06/03/2019 12:09:00	
		Waste		Hg, ICP-AES, ICP-MS
MH0099	9060154-05	Material	06/05/2019 14:55:00	
		Waste		Hg, ICP-AES, ICP-MS
MH00A0	9060154-06	Material	06/05/2019 14:25:00	
		Waste		Hg, ICP-AES, ICP-MS
MH00A1	9060154-07	Material	06/05/2019 14:55:00	
MH00A2	9060154-08	Surface Soil	06/05/2019 15:04:00	Hg, ICP-AES, ICP-MS
MH00A9	9060154-09	Tailings	06/04/2019 12:30:00	Hg, ICP-AES, ICP-MS



II. Sample Management

According to the Sample Receipt Forms the samples were received intact and properly preserved. All coolers were received at 0°C; however, as no samples were noted as broken no qualifications were applied. The chains of custody (COC) were signed and dated by field and/or laboratory personnel. Custody seals were present and intact.

Data Qualifier Reference Table

Qualifier	Organics	Inorganics
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit. The associated value is the quantitation limit or the estimated detection limit for dioxins or PCB congeners.	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit. The associated value is the sample detection limit or the quantitation limit for perchlorate only.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J+	Not applicable	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, and may have a potential positive bias.
J-	Not applicable	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, and may have a potential negative bias.
UJ	The analyte was not deemed above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.	The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."	Not applicable.



Qualifier	Organics	Inorganics
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.	Not applicable.
R	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.

Qualification Code Reference Table

Qualifier	Organics	Inorganics
H	Holding times were exceeded.	Holding times were exceeded.
S	Surrogate recovery was outside QC limits.	The sequence or number of standards used for the calibration was incorrect
C	Calibration %RSD or %D was noncompliant.	Correlation coefficient is <0.995 or calibration was noncompliant.
R	Calibration RRF was <0.05.	%R for calibration is not within control limits.
B	Presumed contamination as indicated by the preparation (method) blank results.	Presumed contamination as indicated by the preparation (method) or calibration blank results.
L	Laboratory Blank Spike/Blank Spike Duplicate %R was not within control limits.	Laboratory Control Sample %R was not within control limits.
L1	LCS/LCSD RPD was outside control limits.	LCS/LCSD RPD was outside control limits.
Q	MS/MSD recovery was poor.	MS recovery was poor.
Q1	MS/MSD RPD was outside control limits.	MS/MSD RPD was outside control limits.
E	Not applicable.	Duplicates showed poor agreement.
I	Internal standard performance was unsatisfactory.	ICP ICS results were unsatisfactory.
A	Not applicable.	ICP Serial Dilution %D were not within control limits.
M	Tuning (BFB or DFTPP) was noncompliant.	ICPMS tune was not compliant.
T	Presumed contamination as indicated by the trip blank results.	Not applicable.
+	False positive – reported compound was not present.	Not applicable.
-	False negative – compound was present but not reported.	Not applicable.
F	Presumed contamination as indicated by the FB or ER results.	Presumed contamination as indicated by the FB or ER results.
F1	Field duplicate results were outside the control limit.	Field duplicate results were outside the control limit.
\$	Reported result or other information was incorrect.	Reported result or other information was incorrect.
?	TIC identity or reported retention time has been changed.	Not applicable.



Qualifier	Organics	Inorganics
D	The analysis with this flag should not be used because another more technically sound analysis is available.	The analysis with this flag should not be used because another more technically sound analysis is available.
P	Instrument performance for pesticides was poor.	Post Digestion Spike recovery was not within control limits.
*II, *III	Unusual problems found with the data that have been described in Section II, "Sample Management," or Section III, "Method Analyses." The number following the asterisk (*) will indicate the report section where a description of the problem can be found.	Unusual problems found with the data that have been described in Section II, "Sample Management," or Section III, "Method Analyses." The number following the asterisk (*) will indicate the report section where a description of the problem can be found.

III. Method Analyses

A. **Methods 200.7, 200.8 and 245.1—Metals and Mercury**

Reviewed By: M. Hilchey

Date Reviewed: July 24, 2019

The samples listed in Table 1 for these analyses were validated based on the guidelines outlined in the *Quality Assurance Project Plan for U. S. EPA Region 8 CERCLA Site Assessment* (Rev. 2015), *United States Environmental Protection Agency Methods 200.7, 200.8 and 245.1* and the *National Functional Guidelines for Inorganic Superfund Methods Data Review* (January 2017).

- Holding Times: The analytical holding times, 28 days for mercury and six months for the remaining metals, were met.
- Instrument tune: According to summary reports, ICP-MS instrument tuning requirements were met.
- Calibration:
 - Initial calibration: According to the calibration summaries, correlation coefficients and %Ds met National Functional Guideline (NFG) acceptance requirements.
 - Initial (ICV) and continuing calibration (CCV) verification: ICV and CCV frequency requirements were met. ICV and CCV recoveries were within 90-110% for ICP-MS and ICP-AES, and 85-115% for mercury.
- Method Blanks: No target analytes were reported in the method blanks (MB) or calibration blanks of sufficient concentration to qualify site sample results except as noted in the table below. Associated detected sample results that were below the reporting limit (RL) were qualified as nondetect (U) at the RL.

Analyte	Blank concentration	Qualified Samples
thallium	0.049 mg/Kg (MB)	MH0040, MH0099, MH00A0, MH00A1, MH00A2, MH00A9

- Interference Check Samples (ICSA/B): ICSA/B data are not reviewed at a Stage 2B validation.
- Laboratory Control Samples (LCS): The LCS recoveries were within 80-120% for ICP-MS and ICP-AES.
- Laboratory Duplicates: Laboratory duplicate analysis was performed on sample MH0040 for all methods. RPDs met the control limits of $\leq 20\%$ for sample results $> 5 \times \text{RL}$ and $\pm \text{RL}$ for sample results $< 5 \times \text{RL}$ for all target analytes except arsenic (21%), copper (29%), lead (39%), manganese (23%) and cobalt (28%). Associated results for all site samples of similar matrix (surface soil) were qualified as estimated (J).
- Matrix Spike: Matrix spike (MS) analysis was performed on sample MH0040 for all methods. It should be noted that MS results were not reported for ICP-AES analytes aluminum, calcium, iron,

magnesium, sodium and potassium. MS recoveries were not assessed when the parent sample concentrations were more than 4× the spike amount. Recoveries met control limits of 75-125% for all target analytes except antimony (37%), barium (139%), beryllium (126%), cadmium (137%) and vanadium (127%). Antimony results for all site samples of similar matrix (surface soil) were qualified as estimated with low potential bias (J). Barium, beryllium, cadmium and vanadium results for all site samples of similar matrix (surface soil) were qualified as estimated with high potential bias (J+).

- Post Digestion Spike: Post digestion spike (PDS) analysis was performed on sample MH0040 for antimony, barium, beryllium, cadmium and vanadium. The PDS recovery was within 75-125% for all applicable analytes except vanadium (238%). Vanadium results for all site samples of similar matrix (surface soil) were qualified as estimated with high potential bias (J+). Bias was removed from the matrix spike qualifiers (see above) for the remaining applicable analytes due to acceptable PDS recoveries.
- Serial Dilution: Serial dilution analysis was performed on sample MH0040 for ICP-AES and ICP-MS. Results were not assessed unless the parent sample concentration was >50× the MDL. The control limit of ≤10% difference (%D) of the original sample results was met for all target analytes except cadmium (25%) and cobalt (28%). Associated results for all samples of similar matrix (surface soil) were qualified as estimated (J).
- Internal Standards: Several ICP-MS sample internal standard intensities failed to meet the control limits of 60-125% of the calibration blank. These samples were diluted 2× and analyzed for affected analytes, with acceptable internal standard intensities for the diluted analyses. The affected sample results were reported from the diluted analyses. No qualifications were applied.
- Sample Result Verification: Sample results are not verified at a Stage 2B validation. Detects below the reporting limit were qualified as estimated (J). Nondetects are valid to the reporting limit.

Several samples were diluted for various target analytes due to high analyte concentration and for poor internal standard performance. All reporting limits were adjusted appropriately. Detected results for dilutions were flagged with “D” by the laboratory.

- Field QC Samples: MEC^x evaluated field QC samples, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. MEC^x used the remaining detects to evaluate the associated site samples. Findings associated with field QC samples are summarized below.
 - Field Blanks and Equipment Blanks: Field blanks and equipment blanks were not identified for this SDG.
 - Field Duplicates: Field duplicate (FD) pairs were identified as noted in the table below. The RPD control limit of ≤50% for all target analytes greater than RL and ±RL for all results <RL were met except as noted in the table. Associated results for the applicable field duplicate pair were qualified as estimated (J for detects, UJ for nondetects).



Parent sample number	Field Duplicate sample number	analyte	Field duplicate RPD
MH0098 SDG MH0030	MH00A0	chromium	95%
		nickel	55%
		selenium	73%
		vanadium	86%
		barium	52%
MH0099	MH00A1	lead	64%
		magnesium	93%
		manganese	52%
		zinc	76%
		cadmium	87%

Validated Sample Result Forms MH0040

Analysis Method Hg

Lab Sample Name: 9060154-01

Sample No: MH0040

Sample Date: 06/04/2019 15:50:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Mercury	7439-97-6	0.26	0.13	0.021	mg/kg			

Lab Sample Name: 9060154-02

Sample No: MH0074

Sample Date: 06/03/2019 10:54:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.32 0.098 0.016 mg/kg

Lab Sample Name: 9060154-03

Sample No: MH0075

Sample Date: 06/03/2019 11:05:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.36 0.10 0.017 mg/kg

Lab Sample Name: 9060154-04

Sample No: MH0076

Sample Date: 06/03/2019 12:09:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.31 0.14 0.022 mg/kg

Lab Sample Name: 9060154-05

Sample No: MH0099

Sample Date: 06/05/2019 14:55:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 3.2 0.49 0.078 mg/kg D

Lab Sample Name: 9060154-06

Sample No: MH00A0

Sample Date: 06/05/2019 14:25:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 1.7 0.20 0.032 mg/kg D

Lab Sample Name: 9060154-07

Sample No: MH00A1

Sample Date: 06/05/2019 14:55:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 3.8 0.41 0.066 mg/kg D

Analysis Method Hg

Lab Sample Name: 9060154-08 Sample No: MH00A2 Sample Date: 06/05/2019 15:04:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.15 0.15 0.025 mg/kg

Lab Sample Name: 9060154-09 Sample No: MH00A9 Sample Date: 06/04/2019 12:30:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.25 0.11 0.017 mg/kg

Analysis Method ICP_AES

Lab Sample Name: 9060154-01 Sample No: MH0040 Sample Date: 06/04/2019 15:50:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Aluminum 7429-90-5 9620 26.8 4.8 mg/kg

Antimony 7440-36-0 3.1 8.1 0.21 mg/kg J* J Q

Arsenic 7440-38-2 76.3 1.3 0.28 mg/kg * J E

Calcium 7440-70-2 2950 671 5.2 mg/kg

Copper 7440-50-8 45.3 3.4 0.12 mg/kg * J E

Iron 7439-89-6 11700 13.4 1.5 mg/kg

Lead 7439-92-1 269 1.3 0.19 mg/kg * J E

Magnesium 7439-95-4 2540 671 3.2 mg/kg

Manganese 7439-96-5 1890 2.0 0.097 mg/kg * J E

Potassium 7440-09-7 1800 671 5.0 mg/kg

Silver 7440-22-4 1.9 1.3 0.066 mg/kg

Sodium 7440-23-5 75.1 671 4.0 mg/kg J J

Zinc 7440-66-6 273 8.1 0.097 mg/kg

Lab Sample Name: 9060154-02 Sample No: MH0074 Sample Date: 06/03/2019 10:54:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Aluminum 7429-90-5 8180 20.4 3.7 mg/kg

Antimony 7440-36-0 32.6 6.1 0.16 mg/kg *

Arsenic 7440-38-2 3630 10.2 2.1 mg/kg D*

Calcium 7440-70-2 110000 5090 39.7 mg/kg D

Copper 7440-50-8 47.1 2.5 0.094 mg/kg *

Iron 7439-89-6 59100 102 11.2 mg/kg D

Lead 7439-92-1 6660 10.2 1.4 mg/kg D*

Magnesium 7439-95-4 65800 5090 24.4 mg/kg D

Manganese 7439-96-5 1630 1.5 0.073 mg/kg *

Analysis Method ICP_AES

Potassium	7440-09-7	1190	509	3.8	mg/kg		
Silver	7440-22-4	18.9	1.0	0.050	mg/kg		
Sodium	7440-23-5	66.8	509	3.1	mg/kg	J	J
Zinc	7440-66-6	8500	61.1	0.73	mg/kg	D	

Lab Sample Name: 9060154-03

Sample No: MH0075

Sample Date: 06/03/2019 11:05:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	14800	21.1	3.8	mg/kg			
Antimony	7440-36-0	32.9	6.3	0.17	mg/kg	*		
Arsenic	7440-38-2	2780	10.6	0.11	mg/kg	D*		
Calcium	7440-70-2	93000	2640	20.6	mg/kg	D		
Copper	7440-50-8	67.1	2.6	0.097	mg/kg	*		
Iron	7439-89-6	61200	52.8	5.8	mg/kg	D		
Lead	7439-92-1	3300	5.3	0.74	mg/kg	D*		
Magnesium	7439-95-4	38800	528	2.5	mg/kg			
Manganese	7439-96-5	4360	7.9	0.38	mg/kg	D*		
Potassium	7440-09-7	1260	528	3.9	mg/kg			
Silver	7440-22-4	12.0	1.1	0.052	mg/kg			
Sodium	7440-23-5	43.1	528	3.2	mg/kg	J	J	
Zinc	7440-66-6	9420	31.7	0.38	mg/kg	D		

Lab Sample Name: 9060154-04

Sample No: MH0076

Sample Date: 06/03/2019 12:09:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	19200	24.9	4.5	mg/kg			
Antimony	7440-36-0	15.5	7.5	0.20	mg/kg	*		
Arsenic	7440-38-2	1170	6.2	0.062	mg/kg	D*		
Calcium	7440-70-2	11700	623	4.9	mg/kg			
Copper	7440-50-8	61.7	3.1	0.11	mg/kg	*		
Iron	7439-89-6	34900	12.5	1.4	mg/kg			
Lead	7439-92-1	583	1.2	0.17	mg/kg	*		
Magnesium	7439-95-4	5550	623	3.0	mg/kg			
Manganese	7439-96-5	1940	1.9	0.090	mg/kg	*		
Potassium	7440-09-7	1780	623	4.6	mg/kg			
Silver	7440-22-4	2.6	1.2	0.061	mg/kg			
Sodium	7440-23-5	50.8	623	3.7	mg/kg	J	J	
Zinc	7440-66-6	3650	7.5	0.090	mg/kg			

Lab Sample Name: 9060154-05

Sample No: MH0099

Sample Date: 06/05/2019 14:55:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Analysis Method ICP_AES

Aluminum	7429-90-5	1620	19.8	3.6	mg/kg			
Antimony	7440-36-0	485	5.9	0.16	mg/kg	*		
Arsenic	7440-38-2	146	0.99	0.21	mg/kg	*		
Calcium	7440-70-2	1980	496	3.9	mg/kg			
Copper	7440-50-8	936	2.5	0.091	mg/kg	*		
Iron	7439-89-6	13900	9.9	1.1	mg/kg			
Lead	7439-92-1	33700	19.8	2.8	mg/kg	D*	J	F1
Magnesium	7439-95-4	915	496	2.4	mg/kg		J	F1
Manganese	7439-96-5	1190	1.5	0.071	mg/kg	*	J	F1
Potassium	7440-09-7	688	496	3.7	mg/kg			
Silver	7440-22-4	350	19.8	0.97	mg/kg	D		
Sodium	7440-23-5	9.2	496	3.0	mg/kg	J	J	
Zinc	7440-66-6	17100	119	1.4	mg/kg	D	J	F1

Lab Sample Name: 9060154-06 Sample No: MH00A0 Sample Date: 06/05/2019 14:25:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	3710	20.2	3.6	mg/kg			
Antimony	7440-36-0	142	6.1	0.16	mg/kg	*		
Arsenic	7440-38-2	265	1.0	0.21	mg/kg	*		
Calcium	7440-70-2	5700	505	3.9	mg/kg			
Copper	7440-50-8	415	2.5	0.093	mg/kg	*		
Iron	7439-89-6	21000	10.1	1.1	mg/kg			
Lead	7439-92-1	8390	5.1	0.71	mg/kg	D*		
Magnesium	7439-95-4	1410	505	2.4	mg/kg			
Manganese	7439-96-5	514	1.5	0.073	mg/kg	*		
Potassium	7440-09-7	941	505	3.7	mg/kg			
Silver	7440-22-4	159	5.1	0.25	mg/kg	D		
Sodium	7440-23-5	32.0	505	3.0	mg/kg	J	J	
Zinc	7440-66-6	5410	30.3	0.36	mg/kg	D		

Lab Sample Name: 9060154-07 Sample No: MH00A1 Sample Date: 06/05/2019 14:55:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	1360	20.4	3.7	mg/kg			
Antimony	7440-36-0	375	6.1	0.16	mg/kg	*		
Arsenic	7440-38-2	97.9	1.0	0.21	mg/kg	*		
Calcium	7440-70-2	1840	511	4.0	mg/kg			
Copper	7440-50-8	629	2.6	0.094	mg/kg	*		
Iron	7439-89-6	10800	10.2	1.1	mg/kg			
Lead	7439-92-1	17300	10.2	1.4	mg/kg	D*	J	F1
Magnesium	7439-95-4	332	511	2.5	mg/kg	J	J	F1

Analysis Method ICP_AES

Manganese	7439-96-5	696	1.5	0.074	mg/kg	*	J	F1
Potassium	7440-09-7	677	511	3.8	mg/kg			
Silver	7440-22-4	241	10.2	0.50	mg/kg	D		
Sodium	7440-23-5	6.8	511	3.1	mg/kg	J	J	
Zinc	7440-66-6	7660	61.3	0.74	mg/kg	D	J	F1

Lab Sample Name: 9060154-08 Sample No: MH00A2 Sample Date: 06/05/2019 15:04:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	17300	32.4	5.8	mg/kg			
Antimony	7440-36-0	2.4	9.7	0.26	mg/kg	J*	J	Q
Arsenic	7440-38-2	98.4	1.6	0.34	mg/kg	*	J	E
Calcium	7440-70-2	12800	811	6.3	mg/kg			
Copper	7440-50-8	45.7	4.1	0.15	mg/kg	*	J	E
Iron	7439-89-6	20700	16.2	1.8	mg/kg			
Lead	7439-92-1	89.3	1.6	0.23	mg/kg	*	J	E
Magnesium	7439-95-4	5810	811	3.9	mg/kg			
Manganese	7439-96-5	574	2.4	0.12	mg/kg	*	J	E
Potassium	7440-09-7	2690	811	6.0	mg/kg			
Silver	7440-22-4	0.77	1.6	0.079	mg/kg	J	J	
Sodium	7440-23-5	87.7	811	4.9	mg/kg	J	J	
Zinc	7440-66-6	233	9.7	0.12	mg/kg			

Lab Sample Name: 9060154-09 Sample No: MH00A9 Sample Date: 06/04/2019 12:30:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	9310	23.0	4.1	mg/kg			
Antimony	7440-36-0	14.8	6.9	0.18	mg/kg	*		
Arsenic	7440-38-2	2110	5.8	1.2	mg/kg	D*		
Calcium	7440-70-2	15500	575	4.5	mg/kg			
Copper	7440-50-8	2090	14.4	0.53	mg/kg	D*		
Iron	7439-89-6	141000	57.5	6.3	mg/kg	D		
Lead	7439-92-1	248	1.2	0.16	mg/kg	*		
Magnesium	7439-95-4	674	575	2.8	mg/kg			
Manganese	7439-96-5	5270	8.6	0.41	mg/kg	D*		
Potassium	7440-09-7	1350	575	4.3	mg/kg			
Silver	7440-22-4	0.61	1.2	0.056	mg/kg	J	J	
Sodium	7440-23-5	124	575	3.5	mg/kg	J	J	
Zinc	7440-66-6	21900	69.0	0.83	mg/kg	D		

Analysis Method ICP_MS

Lab Sample Name: 9060154-01

Sample No: MH0040

Sample Date: 06/04/2019 15:50:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	183	6.9	0.070	mg/kg	*	J	Q
Beryllium	7440-41-7	0.35	0.69	0.048	mg/kg	J*	J	Q
Cadmium	7440-43-9	7.7	0.69	0.081	mg/kg	*	J	Q, A
Chromium	7440-47-3	5.2	1.4	0.043	mg/kg			
Cobalt	7440-48-4	3.1	0.69	0.035	mg/kg	*	J	E, A
Nickel	7440-02-0	6.0	0.69	0.032	mg/kg			
Selenium	7782-49-2	0.59	3.5	0.25	mg/kg	J	J	
Thallium	7440-28-0	0.69	0.69	0.025	mg/kg	J	U	B
Vanadium	7440-62-2	15.8	3.5	0.028	mg/kg	*	J+	Q, P

Lab Sample Name: 9060154-02

Sample No: MH0074

Sample Date: 06/03/2019 10:54:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	144	5.0	0.051	mg/kg	*		
Beryllium	7440-41-7	1.3	0.50	0.035	mg/kg	*		
Cadmium	7440-43-9	58.1	0.50	0.059	mg/kg	*		
Chromium	7440-47-3	7.6	1.0	0.031	mg/kg			
Cobalt	7440-48-4	28.0	0.50	0.025	mg/kg	*		
Nickel	7440-02-0	30.0	0.50	0.023	mg/kg			
Selenium	7782-49-2	0.83	2.5	0.18	mg/kg	J	J	
Thallium	7440-28-0	31.5	0.50	0.018	mg/kg			
Vanadium	7440-62-2	18.1	2.5	0.020	mg/kg	*		

Lab Sample Name: 9060154-03

Sample No: MH0075

Sample Date: 06/03/2019 11:05:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	306	5.4	0.055	mg/kg	*		
Beryllium	7440-41-7	2.0	0.54	0.038	mg/kg	*		
Cadmium	7440-43-9	62.2	0.54	0.064	mg/kg	*		
Chromium	7440-47-3	6.1	1.1	0.034	mg/kg			
Cobalt	7440-48-4	63.4	0.54	0.027	mg/kg	*		
Nickel	7440-02-0	54.7	0.54	0.025	mg/kg			
Selenium	7782-49-2	1.5	2.7	0.20	mg/kg	J	J	
Thallium	7440-28-0	11.4	0.54	0.020	mg/kg			
Vanadium	7440-62-2	17.6	2.7	0.022	mg/kg	*		

Analysis Method ICP_MS

Lab Sample Name: 9060154-04 Sample No: MH0076 Sample Date: 06/03/2019 12:09:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	354	7.0	0.072	mg/kg	*		
Beryllium	7440-41-7	3.2	0.70	0.049	mg/kg	*		
Cadmium	7440-43-9	20.7	0.70	0.083	mg/kg	*		
Chromium	7440-47-3	20.7	2.8	0.087	mg/kg	D		
Cobalt	7440-48-4	52.0	0.70	0.035	mg/kg	*		
Nickel	7440-02-0	107	0.70	0.032	mg/kg			
Selenium	7782-49-2	2.0	3.5	0.25	mg/kg	J	J	
Thallium	7440-28-0	2.1	0.70	0.025	mg/kg			
Vanadium	7440-62-2	32.3	7.0	0.056	mg/kg	D*		

Lab Sample Name: 9060154-05 Sample No: MH0099 Sample Date: 06/05/2019 14:55:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	11.3	5.2	0.054	mg/kg	*		
Beryllium	7440-41-7	0.24	0.52	0.037	mg/kg	J*	J	
Cadmium	7440-43-9	463	0.52	0.062	mg/kg	*	J	F1
Chromium	7440-47-3	0.86	1.0	0.033	mg/kg	J	J	
Cobalt	7440-48-4	8.3	0.52	0.026	mg/kg	*		
Nickel	7440-02-0	61.9	0.52	0.024	mg/kg			
Selenium	7782-49-2	11.8	2.6	0.19	mg/kg			
Thallium	7440-28-0	0.52	0.52	0.019	mg/kg	J	U	B
Vanadium	7440-62-2	3.5	2.6	0.021	mg/kg	*		

Lab Sample Name: 9060154-06 Sample No: MH00A0 Sample Date: 06/05/2019 14:25:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	16.4	5.2	0.054	mg/kg	*	J	F1
Beryllium	7440-41-7	0.47	0.52	0.037	mg/kg	J*	J	
Cadmium	7440-43-9	98.5	0.52	0.062	mg/kg	*		
Chromium	7440-47-3	6.5	2.1	0.065	mg/kg	D	J	F1
Cobalt	7440-48-4	11.7	0.52	0.026	mg/kg	*		
Nickel	7440-02-0	138	0.52	0.024	mg/kg		J	F1
Selenium	7782-49-2	10.3	2.6	0.19	mg/kg		J	F1
Thallium	7440-28-0	0.52	0.52	0.019	mg/kg	J	U	B
Vanadium	7440-62-2	40.9	5.2	0.042	mg/kg	D*	J	F1

Analysis Method ICP_MS

Lab Sample Name: 9060154-07

Sample No: MH00A1

Sample Date: 06/05/2019 14:55:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	7.1	4.7	0.048	mg/kg	*		
Beryllium	7440-41-7	0.24	0.47	0.033	mg/kg	J*	J	
Cadmium	7440-43-9	183	0.47	0.056	mg/kg	*	J	F1
Chromium	7440-47-3	0.74	0.95	0.029	mg/kg	J	J	
Cobalt	7440-48-4	5.5	0.47	0.024	mg/kg	*		
Nickel	7440-02-0	51.6	0.47	0.022	mg/kg			
Selenium	7782-49-2	10.0	2.4	0.17	mg/kg			
Thallium	7440-28-0	0.47	0.47	0.017	mg/kg	J	U	B
Vanadium	7440-62-2	3.1	2.4	0.019	mg/kg	*		

Lab Sample Name: 9060154-08

Sample No: MH00A2

Sample Date: 06/05/2019 15:04:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	116	8.0	0.081	mg/kg	*	J	Q
Beryllium	7440-41-7	0.98	0.80	0.056	mg/kg	*	J	Q
Cadmium	7440-43-9	7.5	0.80	0.094	mg/kg	*	J	Q, A
Chromium	7440-47-3	23.0	1.6	0.049	mg/kg			
Cobalt	7440-48-4	6.4	0.80	0.040	mg/kg	*	J	E, A
Nickel	7440-02-0	18.7	0.80	0.037	mg/kg			
Selenium	7782-49-2	1.2	4.0	0.29	mg/kg	J	J	
Thallium	7440-28-0	0.80	0.80	0.029	mg/kg	J	U	B
Vanadium	7440-62-2	37.9	4.0	0.032	mg/kg	*	J+	Q, P

Lab Sample Name: 9060154-09

Sample No: MH00A9

Sample Date: 06/04/2019 12:30:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	287	5.9	0.060	mg/kg	*		
Beryllium	7440-41-7	6.8	0.59	0.041	mg/kg	*		
Cadmium	7440-43-9	49.0	0.59	0.069	mg/kg	*		
Chromium	7440-47-3	1.6	1.2	0.036	mg/kg			
Cobalt	7440-48-4	260	0.59	0.029	mg/kg	*		
Nickel	7440-02-0	139	0.59	0.027	mg/kg			
Selenium	7782-49-2	0.90	2.9	0.21	mg/kg	J	J	
Thallium	7440-28-0	0.59	0.59	0.021	mg/kg	J	U	B
Vanadium	7440-62-2	4.1	2.9	0.023	mg/kg	*		



DATA VALIDATION REPORT

Elkhorn Mining Site Inspection

SAMPLE DELIVERY GROUP: MH0061

Prepared by

MEC^x
12269 East Vassar Drive
Aurora, CO 80014

I. INTRODUCTION

Task Order Title: Elkhorn Mining Site Inspection
Contract Task Order: 20408.012.004.0621.00
Sample Delivery Group: MH0061
Weston Project Manager: Natalie Quiet
EPA Project Manager: Joseph Chisholm
TDD No.: 0004/1807-06
Case No.: 48289
Matrix: Soils/Solids
QC Level: Stage 2B
No. of Samples: 10
No. of Reanalyses/Dilutions: 0
Laboratory: Bonner Analytical Testing Co.

Table 1. Sample Identification

<i>Sample No.</i>	<i>Lab Sample Name</i>	<i>Matrix Type</i>	<i>Collection Date</i>	<i>Method</i>
MH0061	9060151-01	Waste Material	06/03/2019 17:36:00	CN, Hg, ICP-AES, ICP-MS
MH0062	9060151-02	Tailings	06/03/2019 17:41:00	CN, Hg, ICP-AES, ICP-MS
MH0063	9060151-03	Tailings	06/03/2019 17:22:00	CN, Hg, ICP-AES, ICP-MS
MH0064	9060151-04	Tailings	06/03/2019 16:42:00	CN, Hg, ICP-AES, ICP-MS
MH0065	9060151-05	Tailings	06/03/2019 15:08:00	CN, Hg, ICP-AES, ICP-MS
MH0066	9060151-06	Tailings	06/03/2019 15:15:00	CN, Hg, ICP-AES, ICP-MS
MH0085	9060151-07	Surface Soil	06/04/2019 10:22:00	CN, Hg, ICP-AES, ICP-MS
MH0086	9060151-08	Surface Soil	06/04/2019 10:33:00	CN, Hg, ICP-AES, ICP-MS
MH0087	9060151-09	Surface Soil	06/04/2019 10:04:00	CN, Hg, ICP-AES, ICP-MS
MH0088	9060151-10	Surface Soil	06/04/2019 10:11:00	CN, Hg, ICP-AES, ICP-MS



II. Sample Management

According to the Sample Receipt Forms the samples were received intact and properly preserved. All coolers were received at 0°C; however, as no samples were noted to be broken, no qualifications were applied. The chains of custody (COC) were signed and dated by field and/or laboratory personnel. Custody seals were present and intact.

Data Qualifier Reference Table

Qualifier	Organics	Inorganics
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit. The associated value is the quantitation limit or the estimated detection limit for dioxins or PCB congeners.	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit. The associated value is the sample detection limit or the quantitation limit for perchlorate only.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J+	Not applicable	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, and may have a potential positive bias.
J-	Not applicable	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, and may have a potential negative bias.
UJ	The analyte was not deemed above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.	The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."	Not applicable.



Qualifier	Organics	Inorganics
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.	Not applicable.
R	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.

Qualification Code Reference Table

Qualifier	Organics	Inorganics
H	Holding times were exceeded.	Holding times were exceeded.
S	Surrogate recovery was outside QC limits.	The sequence or number of standards used for the calibration was incorrect
C	Calibration %RSD or %D was noncompliant.	Correlation coefficient is <0.995 or calibration was noncompliant.
R	Calibration RRF was <0.05.	%R for calibration is not within control limits.
B	Presumed contamination as indicated by the preparation (method) blank results.	Presumed contamination as indicated by the preparation (method) or calibration blank results.
L	Laboratory Blank Spike/Blank Spike Duplicate %R was not within control limits.	Laboratory Control Sample %R was not within control limits.
L1	LCS/LCSD RPD was outside control limits.	LCS/LCSD RPD was outside control limits.
Q	MS/MSD recovery was poor.	MS recovery was poor.
Q1	MS/MSD RPD was outside control limits.	MS/MSD RPD was outside control limits.
E	Not applicable.	Duplicates showed poor agreement.
I	Internal standard performance was unsatisfactory.	ICP ICS results were unsatisfactory.
A	Not applicable.	ICP Serial Dilution %D were not within control limits.
M	Tuning (BFB or DFTPP) was noncompliant.	ICPMS tune was not compliant.
T	Presumed contamination as indicated by the trip blank results.	Not applicable.
+	False positive – reported compound was not present.	Not applicable.
-	False negative – compound was present but not reported.	Not applicable.
F	Presumed contamination as indicated by the FB or ER results.	Presumed contamination as indicated by the FB or ER results.
F1	Field duplicate results were outside the control limit.	Field duplicate results were outside the control limit.
\$	Reported result or other information was incorrect.	Reported result or other information was incorrect.
?	TIC identity or reported retention time has been changed.	Not applicable.



Qualifier	Organics	Inorganics
D	The analysis with this flag should not be used because another more technically sound analysis is available.	The analysis with this flag should not be used because another more technically sound analysis is available.
P	Instrument performance for pesticides was poor.	Post Digestion Spike recovery was not within control limits.
*II, *III	Unusual problems found with the data that have been described in Section II, "Sample Management," or Section III, "Method Analyses." The number following the asterisk (*) will indicate the report section where a description of the problem can be found.	Unusual problems found with the data that have been described in Section II, "Sample Management," or Section III, "Method Analyses." The number following the asterisk (*) will indicate the report section where a description of the problem can be found.

III. Method Analyses

A. **Methods 200.7, 200.8 and 245.1—Metals and Mercury**

Reviewed By: M. Hilchey

Date Reviewed: July 30, 2019

The samples listed in Table 1 for these analyses were validated based on the guidelines outlined in the *Quality Assurance Project Plan for U. S. EPA Region 8 CERCLA Site Assessment* (Rev. 2015), *United States Environmental Protection Agency Methods 200.7, 200.8 and 245.1* and the *National Functional Guidelines for Inorganic Superfund Methods Data Review* (January 2017).

- Holding Times: The analytical holding times, 28 days for mercury and six months for the remaining metals, were met.
- Instrument tune: According to summary reports, ICP-MS instrument tuning requirements were met.
- Calibration:
 - Initial calibration: According to the calibration summaries, correlation coefficients and %Ds met National Functional Guideline (NFG) acceptance requirements.
 - Initial (ICV) and continuing calibration (CCV) verification: ICV and CCV frequency requirements were met. ICV and CCV recoveries were within 90-110% for ICP-MS and ICP-AES, and 85-115% for mercury.
- Method Blanks: No target analytes were reported in the method blanks (MB) or calibration blanks (ICB/CCB) of sufficient concentration to qualify site sample results except as noted in the table below. For positive blank concentrations, associated detected sample results that were below the reporting limit (RL) were qualified as nondetect (U) at the RL. For negative blank concentrations greater than the absolute value of the MDL, associated results <5× the absolute value of the negative blank result were qualified as estimated with low potential bias (J-).

Analyte	Blank concentration	Qualified Samples
silver	-0.058 mg/Kg (MB)	MH0085
thallium	0.43 µg/L (CCB)	All site samples
selenium	0.54 µg/L (CCB)	
mercury	-0.054 µg/L (CCB)	MH0085, MH0086, MH0088

- Interference Check Samples (ICSA/B): ICSA/B data are not reviewed at a Stage 2B validation.
- Laboratory Control Samples (LCS): The LCS recoveries were within 80-120% for ICP-MS and ICP-AES.
- Laboratory Duplicates: Laboratory duplicate analyses were performed on sample MH0087 for all methods. RPDs met the control limits of ≤20% for sample results >5× RL and ±RL for sample results

<5× RL for all target analytes except aluminum (52%), antimony (57%), arsenic (53%), calcium (57%), copper (59%), iron (53%), lead (68%), manganese (59%), potassium (>RL), silver (>RL) and zinc (63%). Associated results for all site samples of similar matrix (surface soil) were qualified as estimated (J).

- **Matrix Spike:** Matrix spike (MS) analysis was performed on sample MH0087 for all methods. It should be noted that MS results were not reported for ICP-AES analytes aluminum, calcium, iron, magnesium, sodium and potassium. MS recoveries were not assessed when the parent sample concentrations were more than 4× the spike amount. Recoveries met control limits of 75-125% for all target analytes except antimony (-11%), copper (25%), silver (36%) and cadmium (138%). Antimony, copper and silver results for all site samples of similar matrix (surface soil) were qualified as estimated with low potential bias (J-). Cadmium results for all site samples of similar matrix (surface soil) were qualified as estimated with high potential bias (J+).
- **Post Digestion Spike:** Post digestion spike (PDS) analysis was performed on sample MH0087 for antimony, copper and cadmium. The PDS recoveries were within 75-125% for all applicable analytes. Bias was removed from the matrix spike qualifiers (see above) for these analytes due to acceptable PDS recoveries.
- **Serial Dilution:** Serial dilution analysis was performed on sample MH0087 for ICP-AES and ICP-MS. Results were not assessed unless the parent sample concentration was >50× the MDL. The control limit of ≤10% difference (%D) of the original sample results was met for all target analytes except aluminum (16%), antimony (100%), arsenic (96%), calcium (23%), copper (14%), iron (24%), lead (100%), magnesium (20%), manganese (23%), potassium (17%) sodium (12%), zinc (100%), cadmium (11%), chromium (23%), cobalt (18%), nickel (21%) and vanadium (22%). Associated results for all samples of similar matrix (surface soil) were qualified as estimated (J).
- **Internal Standards:** Several ICP-MS sample internal standard intensities failed to meet the control limits of 60-125% of the calibration blank. These samples were diluted 2× and analyzed for affected analytes, with acceptable internal standard intensities for the diluted analyses. The affected sample results were reported from the diluted analyses. No qualifications were applied.
- **Sample Result Verification:** Sample results are not verified at a Stage 2B validation. Detects below the reporting limit were qualified as estimated (J). Nondetects are valid to the reporting limit.

Several samples were diluted for various target analytes due to high analyte concentration and for poor internal standard performance. All reporting limits were adjusted appropriately. Detected results for dilutions were flagged with "D" by the laboratory.

- **Field QC Samples:** MEC^x evaluated field QC samples, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. MEC^x used the remaining detects to evaluate the associated site samples. Findings associated with field QC samples are summarized below.
 - **Field Blanks and Equipment Blanks:** Field blanks and equipment blanks were not identified for this SDG.

- Field Duplicates: Field duplicate samples were not identified for this SDG.

B. METHOD - Cyanide

Reviewed By: M. Hilchey

Date Reviewed: July 30, 2019

The samples listed in Table 1 for this analysis were validated based on the guidelines outlined in the *Quality Assurance Project Plan for U. S. EPA Region 8 CERCLA Site Assessment* (Rev. 2015) and the *National Functional Guidelines for Inorganic Superfund Methods Data Review* (2017).

- Holding Times: The analytical holding time, 14 days for cyanide, was met.
- Calibration: According to the initial calibration summary, calibration requirements were met. (ICV) and continuing calibration (CCV) frequency requirements were met. ICV and CCV recoveries were within 90-110%.
- Blanks: Cyanide was not detected in the method blank or calibration blanks.
- Laboratory Control Samples: A laboratory control sample analysis was not performed.
- Laboratory Duplicates: Laboratory duplicate analysis was performed on sample MH0087. The RPD met the laboratory control limit.
- Matrix Spike/Matrix Spike Duplicate: Matrix spike analysis was performed on sample MH0087. The recovery met laboratory control limits.
- Sample Result Verification: Sample results are not verified at a Stage 2B validation. Detects below the reporting limit were qualified as estimated (J). Nondetects are valid to the RL.
- Field QC Samples: MEC^x evaluated field QC samples, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. MEC^x used the remaining detects to evaluate the associated site samples. Findings associated with field QC samples are summarized below.
 - Field Blanks and Equipment No field blanks or equipment blank samples were identified for this SDG.
 - Field Duplicates: Field duplicate samples were not identified for this SDG.

Validated Sample Result Forms MH0061

Analysis Method CN

Lab Sample Name: 9060151-01

Sample No: MH0061

Sample Date: 06/03/2019 17:36:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Cyanide	57-12-5	24.9	0.54	0.22	mg/kg		J	H

Lab Sample Name: 9060151-02

Sample No: MH0062

Sample Date: 06/03/2019 17:41:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Cyanide

57-12-5

21.5

0.54

0.22

mg/kg

J

H

Lab Sample Name: 9060151-03

Sample No: MH0063

Sample Date: 06/03/2019 17:22:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Cyanide

57-12-5

0.31

0.68

0.27

mg/kg

J

J

H

Lab Sample Name: 9060151-04

Sample No: MH0064

Sample Date: 06/03/2019 16:42:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Cyanide

57-12-5

0.30

0.60

0.24

mg/kg

J

J

H

Lab Sample Name: 9060151-05

Sample No: MH0065

Sample Date: 06/03/2019 15:08:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Cyanide

57-12-5

24.3

0.56

0.22

mg/kg

J

H

Lab Sample Name: 9060151-06

Sample No: MH0066

Sample Date: 06/03/2019 15:15:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Cyanide

57-12-5

2.1

0.56

0.22

mg/kg

J

H

Lab Sample Name: 9060151-07

Sample No: MH0085

Sample Date: 06/04/2019 10:22:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Cyanide

57-12-5

0.61

0.61

0.24

mg/kg

U

U

Analysis Method CN

Lab Sample Name: 9060151-08 Sample No: MH0086 Sample Date: 06/04/2019 10:33:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Cyanide 57-12-5 0.54 0.54 0.22 mg/kg U **U**

Lab Sample Name: 9060151-09 Sample No: MH0087 Sample Date: 06/04/2019 10:04:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Cyanide 57-12-5 0.44 0.57 0.23 mg/kg J **J**

Lab Sample Name: 9060151-10 Sample No: MH0088 Sample Date: 06/04/2019 10:11:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Cyanide 57-12-5 0.49 0.53 0.21 mg/kg J **J**

Analysis Method Hg

Lab Sample Name: 9060151-01 Sample No: MH0061 Sample Date: 06/03/2019 17:36:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 5.3 1.1 0.18 mg/kg D

Lab Sample Name: 9060151-02 Sample No: MH0062 Sample Date: 06/03/2019 17:41:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 6.8 1.2 0.19 mg/kg D

Lab Sample Name: 9060151-03 Sample No: MH0063 Sample Date: 06/03/2019 17:22:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 54.9 13.0 2.1 mg/kg D

Lab Sample Name: 9060151-04 Sample No: MH0064 Sample Date: 06/03/2019 16:42:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 126 25.4 4.1 mg/kg D

Analysis Method Hg

Lab Sample Name: 9060151-05

Sample No: MH0065

Sample Date: 06/03/2019 15:08:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 1.2 0.11 0.018 mg/kg

Lab Sample Name: 9060151-06

Sample No: MH0066

Sample Date: 06/03/2019 15:15:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 2.8 0.45 0.072 mg/kg D

Lab Sample Name: 9060151-07

Sample No: MH0085

Sample Date: 06/04/2019 10:22:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.053 0.12 0.019 mg/kg J

J-

B

Lab Sample Name: 9060151-08

Sample No: MH0086

Sample Date: 06/04/2019 10:33:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.033 0.11 0.018 mg/kg J

J-

B

Lab Sample Name: 9060151-09

Sample No: MH0087

Sample Date: 06/04/2019 10:04:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.23 0.12 0.018 mg/kg

Lab Sample Name: 9060151-10

Sample No: MH0088

Sample Date: 06/04/2019 10:11:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.039 0.11 0.017 mg/kg J

J-

B

Analysis Method ICP_AES

Lab Sample Name: 9060151-01

Sample No: MH0061

Sample Date: 06/03/2019 17:36:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Aluminum 7429-90-5 2640 22.5 4.1 mg/kg *

Antimony 7440-36-0 431 6.8 0.18 mg/kg *

Arsenic 7440-38-2 357 1.1 0.24 mg/kg *

Calcium 7440-70-2 129000 2820 22.0 mg/kg D*

Copper 7440-50-8 619 2.8 0.10 mg/kg *

Analysis Method ICP_AES

Iron	7439-89-6	13100	11.3	1.2	mg/kg	*	
Lead	7439-92-1	7600	5.6	0.79	mg/kg	D*	
Magnesium	7439-95-4	71400	2820	13.5	mg/kg	D*	
Manganese	7439-96-5	3100	8.5	0.41	mg/kg	D*	
Potassium	7440-09-7	863	564	4.2	mg/kg	*	
Silver	7440-22-4	102	1.1	0.055	mg/kg	*	
Sodium	7440-23-5	34.7	564	3.4	mg/kg	J*	J
Zinc	7440-66-6	17700	33.8	0.41	mg/kg	D*	

Lab Sample Name: 9060151-02 Sample No: MH0062 Sample Date: 06/03/2019 17:41:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	3910	23.7	4.3	mg/kg	*		
Antimony	7440-36-0	667	7.1	0.19	mg/kg	*		
Arsenic	7440-38-2	581	5.9	1.2	mg/kg	D*		
Calcium	7440-70-2	112000	2960	23.1	mg/kg	D*		
Copper	7440-50-8	848	3.0	0.11	mg/kg	*		
Iron	7439-89-6	18100	11.8	1.3	mg/kg	*		
Lead	7439-92-1	9590	5.9	0.83	mg/kg	D*		
Magnesium	7439-95-4	61300	2960	14.2	mg/kg	D*		
Manganese	7439-96-5	3590	8.9	0.43	mg/kg	D*		
Potassium	7440-09-7	1260	592	4.4	mg/kg	*		
Silver	7440-22-4	164	5.9	0.29	mg/kg	D*		
Sodium	7440-23-5	63.9	592	3.6	mg/kg	J*	J	
Zinc	7440-66-6	21300	71.1	0.85	mg/kg	D*		

Lab Sample Name: 9060151-03 Sample No: MH0063 Sample Date: 06/03/2019 17:22:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	6600	27.9	5.0	mg/kg	*		
Antimony	7440-36-0	440	8.4	0.22	mg/kg	*		
Arsenic	7440-38-2	291	1.4	0.29	mg/kg	*		
Calcium	7440-70-2	27500	698	5.4	mg/kg	*		
Copper	7440-50-8	857	3.5	0.13	mg/kg	*		
Iron	7439-89-6	16200	14.0	1.5	mg/kg	*		
Lead	7439-92-1	10300	7.0	0.98	mg/kg	D*		
Magnesium	7439-95-4	17400	698	3.4	mg/kg	*		
Manganese	7439-96-5	818	2.1	0.10	mg/kg	*		
Potassium	7440-09-7	1160	698	5.2	mg/kg	*		
Silver	7440-22-4	146	7.0	0.34	mg/kg	D*		
Sodium	7440-23-5	1940	698	4.2	mg/kg	*		
Zinc	7440-66-6	19300	41.9	0.50	mg/kg	D*		

Analysis Method ICP_AES

Lab Sample Name: 9060151-04 Sample No: MH0064 Sample Date: 06/03/2019 16:42:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	7700	25.6	4.6	mg/kg	*		
Antimony	7440-36-0	485	7.7	0.20	mg/kg	*		
Arsenic	7440-38-2	453	1.3	0.27	mg/kg	*		
Calcium	7440-70-2	29400	640	5.0	mg/kg	*		
Copper	7440-50-8	1460	32.0	1.2	mg/kg	D*		
Iron	7439-89-6	21800	12.8	1.4	mg/kg	*		
Lead	7439-92-1	15400	12.8	1.8	mg/kg	D*		
Magnesium	7439-95-4	21600	640	3.1	mg/kg	*		
Manganese	7439-96-5	1220	1.9	0.092	mg/kg	*		
Potassium	7440-09-7	840	640	4.7	mg/kg	*		
Silver	7440-22-4	198	12.8	0.63	mg/kg	D*		
Sodium	7440-23-5	2550	640	3.8	mg/kg	*		
Zinc	7440-66-6	37500	76.9	0.92	mg/kg	D*		

Lab Sample Name: 9060151-05 Sample No: MH0065 Sample Date: 06/03/2019 15:08:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	1020	22.0	4.0	mg/kg	*		
Antimony	7440-36-0	188	6.6	0.18	mg/kg	*		
Arsenic	7440-38-2	173	1.1	0.23	mg/kg	*		
Calcium	7440-70-2	134000	2750	21.5	mg/kg	D*		
Copper	7440-50-8	240	2.8	0.10	mg/kg	*		
Iron	7439-89-6	7630	11.0	1.2	mg/kg	*		
Lead	7439-92-1	2440	1.1	0.15	mg/kg	*		
Magnesium	7439-95-4	75400	2750	13.2	mg/kg	D*		
Manganese	7439-96-5	1660	1.7	0.079	mg/kg	*		
Potassium	7440-09-7	350	551	4.1	mg/kg	J*	J	
Silver	7440-22-4	55.4	1.1	0.054	mg/kg	*		
Sodium	7440-23-5	26.8	551	3.3	mg/kg	J*	J	
Zinc	7440-66-6	10700	33.0	0.40	mg/kg	D*		

Lab Sample Name: 9060151-06 Sample No: MH0066 Sample Date: 06/03/2019 15:15:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	1510	23.5	4.2	mg/kg	*		
Antimony	7440-36-0	273	7.0	0.19	mg/kg	*		
Arsenic	7440-38-2	230	1.2	0.25	mg/kg	*		
Calcium	7440-70-2	125000	2940	22.9	mg/kg	D*		

Analysis Method ICP_AES

Copper	7440-50-8	331	2.9	0.11	mg/kg	*	
Iron	7439-89-6	9170	11.7	1.3	mg/kg	*	
Lead	7439-92-1	4140	5.9	0.82	mg/kg	D*	
Magnesium	7439-95-4	69000	2940	14.1	mg/kg	D*	
Manganese	7439-96-5	1800	1.8	0.085	mg/kg	*	
Potassium	7440-09-7	502	587	4.3	mg/kg	J*	J
Silver	7440-22-4	113	1.2	0.058	mg/kg	*	
Sodium	7440-23-5	17.2	587	3.5	mg/kg	J*	J
Zinc	7440-66-6	12100	35.2	0.42	mg/kg	D*	

Lab Sample Name: 9060151-07

Sample No: MH0085

Sample Date: 06/04/2019 10:22:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	12200	24.1	4.3	mg/kg	*	J	E, A
Antimony	7440-36-0	1.1	7.2	0.19	mg/kg	J*	J	E, Q, A
Arsenic	7440-38-2	9.3	1.2	0.25	mg/kg	*	J	E, A
Calcium	7440-70-2	4290	602	4.7	mg/kg	*	J	E, A
Copper	7440-50-8	17.4	3.0	0.11	mg/kg	*	J	E, Q, A
Iron	7439-89-6	17100	12.0	1.3	mg/kg	*	J	E, A
Lead	7439-92-1	28.3	1.2	0.17	mg/kg	*	J	E, A
Magnesium	7439-95-4	3710	602	2.9	mg/kg	*	J	A
Manganese	7439-96-5	715	1.8	0.087	mg/kg	*	J	E, A
Potassium	7440-09-7	2970	602	4.5	mg/kg	*	J	E, A
Silver	7440-22-4	0.15	1.2	0.059	mg/kg	J*	J-	B, E, Q
Sodium	7440-23-5	245	602	3.6	mg/kg	J*	J	A
Zinc	7440-66-6	127	7.2	0.087	mg/kg	*	J	E, A

Lab Sample Name: 9060151-08

Sample No: MH0086

Sample Date: 06/04/2019 10:33:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	9930	21.4	3.9	mg/kg	*	J	E, A
Antimony	7440-36-0	1.9	6.4	0.17	mg/kg	J*	J	E, Q, A
Arsenic	7440-38-2	9.2	1.1	0.22	mg/kg	*	J	E, A
Calcium	7440-70-2	2710	535	4.2	mg/kg	*	J	E, A
Copper	7440-50-8	16.7	2.7	0.099	mg/kg	*	J	E, Q, A
Iron	7439-89-6	17500	10.7	1.2	mg/kg	*	J	E, A
Lead	7439-92-1	40.3	1.1	0.15	mg/kg	*	J	E, A
Magnesium	7439-95-4	2820	535	2.6	mg/kg	*	J	A
Manganese	7439-96-5	504	1.6	0.077	mg/kg	*	J	E, A
Potassium	7440-09-7	1890	535	4.0	mg/kg	*	J	E, A
Silver	7440-22-4	0.40	1.1	0.052	mg/kg	J*	J-	E, Q
Sodium	7440-23-5	106	535	3.2	mg/kg	J*	J	A

Analysis Method ICP_AES

Zinc	7440-66-6	147	6.4	0.077	mg/kg	*	J	E, A
Lab Sample Name:	9060151-09	Sample No:	MH0087	Sample Date: 06/04/2019 10:04:00				
Matrix Type:	Soil							

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	22200	23.6	4.2	mg/kg	*	J	E, A
Antimony	7440-36-0	16.5	7.1	0.19	mg/kg	*	J	E, Q, A
Arsenic	7440-38-2	149	1.2	0.25	mg/kg	*	J	E, A
Calcium	7440-70-2	15500	590	4.6	mg/kg	*	J	E, A
Copper	7440-50-8	74.7	2.9	0.11	mg/kg	*	J	E, Q, A
Iron	7439-89-6	35100	11.8	1.3	mg/kg	*	J	E, A
Lead	7439-92-1	564	1.2	0.17	mg/kg	*	J	E, A
Magnesium	7439-95-4	13600	590	2.8	mg/kg	*	J	A
Manganese	7439-96-5	1290	1.8	0.085	mg/kg	*	J	E, A
Potassium	7440-09-7	4990	590	4.4	mg/kg	*	J	E, A
Silver	7440-22-4	10.7	1.2	0.058	mg/kg	*	J-	E, Q
Sodium	7440-23-5	251	590	3.5	mg/kg	J*	J	A
Zinc	7440-66-6	1910	7.1	0.085	mg/kg	*	J	E, A

Lab Sample Name: 9060151-10 Sample No: MH0088 Sample Date: 06/04/2019 10:11:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	13300	21.4	3.9	mg/kg	*	J	E, A
Antimony	7440-36-0	3.1	6.4	0.17	mg/kg	J*	J	E, Q, A
Arsenic	7440-38-2	260	1.1	0.22	mg/kg	*	J	E, A
Calcium	7440-70-2	3010	535	4.2	mg/kg	*	J	E, A
Copper	7440-50-8	21.6	2.7	0.098	mg/kg	*	J	E, Q, A
Iron	7439-89-6	25000	10.7	1.2	mg/kg	*	J	E, A
Lead	7439-92-1	66.1	1.1	0.15	mg/kg	*	J	E, A
Magnesium	7439-95-4	3560	535	2.6	mg/kg	*	J	A
Manganese	7439-96-5	652	1.6	0.077	mg/kg	*	J	E, A
Potassium	7440-09-7	2420	535	4.0	mg/kg	*	J	E, A
Silver	7440-22-4	0.62	1.1	0.052	mg/kg	J*	J-	E, Q
Sodium	7440-23-5	167	535	3.2	mg/kg	J*	J	A
Zinc	7440-66-6	219	6.4	0.077	mg/kg	*	J	E, A

Analysis Method ICP_MS

Lab Sample Name: 9060151-01 Sample No: MH0061 Sample Date: 06/03/2019 17:36:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	24.5	5.5	0.056	mg/kg			

Analysis Method ICP_MS

Beryllium	7440-41-7	0.14	0.55	0.039	mg/kg	J	J	
Cadmium	7440-43-9	178	0.55	0.065	mg/kg	*		
Chromium	7440-47-3	2.4	1.1	0.034	mg/kg	*		
Cobalt	7440-48-4	2.8	0.55	0.028	mg/kg	*		
Nickel	7440-02-0	6.8	0.55	0.025	mg/kg	*		
Selenium	7782-49-2	2.8	2.8	0.20	mg/kg	J	U	B
Thallium	7440-28-0	0.55	0.55	0.020	mg/kg	J	U	B
Vanadium	7440-62-2	18.5	2.8	0.022	mg/kg	*		

Lab Sample Name: 9060151-02 **Sample No:** MH0062 **Sample Date:** 06/03/2019 17:41:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	37.7	5.5	0.056	mg/kg			
Beryllium	7440-41-7	0.22	0.55	0.038	mg/kg	J	J	
Cadmium	7440-43-9	231	0.55	0.065	mg/kg	*		
Chromium	7440-47-3	3.5	1.1	0.034	mg/kg	*		
Cobalt	7440-48-4	3.8	0.55	0.027	mg/kg	*		
Nickel	7440-02-0	9.4	0.55	0.025	mg/kg	*		
Selenium	7782-49-2	2.7	2.7	0.20	mg/kg	J	U	B
Thallium	7440-28-0	0.55	0.55	0.020	mg/kg	J	U	B
Vanadium	7440-62-2	28.6	2.7	0.022	mg/kg	*		

Lab Sample Name: 9060151-03 **Sample No:** MH0063 **Sample Date:** 06/03/2019 17:22:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	32.0	6.7	0.068	mg/kg			
Beryllium	7440-41-7	0.26	0.67	0.047	mg/kg	J	J	
Cadmium	7440-43-9	72.9	0.67	0.079	mg/kg	*		
Chromium	7440-47-3	4.8	1.3	0.041	mg/kg	*		
Cobalt	7440-48-4	2.3	0.67	0.033	mg/kg	*		
Nickel	7440-02-0	4.8	0.67	0.031	mg/kg	*		
Selenium	7782-49-2	3.3	3.3	0.24	mg/kg	J	U	B
Thallium	7440-28-0	0.67	0.67	0.024	mg/kg	J	U	B
Vanadium	7440-62-2	14.3	3.3	0.027	mg/kg	*		

Lab Sample Name: 9060151-04 **Sample No:** MH0064 **Sample Date:** 06/03/2019 16:42:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	39.1	6.2	0.063	mg/kg			
Beryllium	7440-41-7	0.22	0.62	0.043	mg/kg	J	J	
Cadmium	7440-43-9	132	0.62	0.073	mg/kg	*		
Chromium	7440-47-3	4.7	1.2	0.038	mg/kg	*		

Analysis Method ICP_MS

Cobalt	7440-48-4	2.0	0.62	0.031	mg/kg	*		
Nickel	7440-02-0	4.4	0.62	0.028	mg/kg	*		
Selenium	7782-49-2	3.1	3.1	0.22	mg/kg	J	U	B
Thallium	7440-28-0	0.62	0.62	0.022	mg/kg	J	U	B
Vanadium	7440-62-2	15.3	3.1	0.025	mg/kg	*		

Lab Sample Name: 9060151-05

Sample No: MH0065

Sample Date: 06/03/2019 15:08:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	13.6	5.3	0.054	mg/kg			
Beryllium	7440-41-7	0.087	0.53	0.037	mg/kg	J	J	
Cadmium	7440-43-9	114	0.53	0.062	mg/kg	*		
Chromium	7440-47-3	1.2	1.1	0.033	mg/kg	*		
Cobalt	7440-48-4	1.6	0.53	0.026	mg/kg	*		
Nickel	7440-02-0	3.8	0.53	0.024	mg/kg	*		
Selenium	7782-49-2	2.6	2.6	0.19	mg/kg	J	U	B
Thallium	7440-28-0	0.53	0.53	0.019	mg/kg	J	U	B
Vanadium	7440-62-2	7.6	2.6	0.021	mg/kg	*		

Lab Sample Name: 9060151-06

Sample No: MH0066

Sample Date: 06/03/2019 15:15:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	10.1	5.8	0.059	mg/kg			
Beryllium	7440-41-7	0.094	0.58	0.041	mg/kg	J	J	
Cadmium	7440-43-9	115	0.58	0.069	mg/kg	*		
Chromium	7440-47-3	1.4	1.2	0.036	mg/kg	*		
Cobalt	7440-48-4	1.5	0.58	0.029	mg/kg	*		
Nickel	7440-02-0	3.8	0.58	0.027	mg/kg	*		
Selenium	7782-49-2	2.9	2.9	0.21	mg/kg	J	U	B
Thallium	7440-28-0	0.58	0.58	0.021	mg/kg	J	U	B
Vanadium	7440-62-2	7.8	2.9	0.023	mg/kg	*		

Lab Sample Name: 9060151-07

Sample No: MH0085

Sample Date: 06/04/2019 10:22:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	165	6.0	0.061	mg/kg			
Beryllium	7440-41-7	0.38	0.60	0.042	mg/kg	J	J	
Cadmium	7440-43-9	1.3	0.60	0.071	mg/kg	*	J	Q, A
Chromium	7440-47-3	15.9	1.2	0.037	mg/kg	*	J	A
Cobalt	7440-48-4	6.3	0.60	0.030	mg/kg	*	J	A
Nickel	7440-02-0	10.2	0.60	0.028	mg/kg	*	J	A
Selenium	7782-49-2	3.0	3.0	0.22	mg/kg	J	U	B

Analysis Method ICP_MS

Thallium	7440-28-0	0.60	0.60	0.022	mg/kg	J	U	B
Vanadium	7440-62-2	30.7	3.0	0.024	mg/kg	*	J	A

Lab Sample Name: 9060151-08 Sample No: MH0086 Sample Date: 06/04/2019 10:33:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	137	5.4	0.055	mg/kg			
Beryllium	7440-41-7	0.39	0.54	0.038	mg/kg	J	J	
Cadmium	7440-43-9	1.7	0.54	0.064	mg/kg	*	J	Q, A
Chromium	7440-47-3	28.5	2.2	0.067	mg/kg	D*	J	A
Cobalt	7440-48-4	6.4	0.54	0.027	mg/kg	*	J	A
Nickel	7440-02-0	9.4	0.54	0.025	mg/kg	*	J	A
Selenium	7782-49-2	5.4	5.4	0.39	mg/kg	JD	U	B
Thallium	7440-28-0	0.54	0.54	0.019	mg/kg	J	U	B
Vanadium	7440-62-2	57.7	5.4	0.043	mg/kg	D*	J	A

Lab Sample Name: 9060151-09 Sample No: MH0087 Sample Date: 06/04/2019 10:04:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	143	5.6	0.057	mg/kg			
Beryllium	7440-41-7	0.44	0.56	0.039	mg/kg	J	J	
Cadmium	7440-43-9	8.7	0.56	0.066	mg/kg	*	J	Q, A
Chromium	7440-47-3	14.7	1.1	0.035	mg/kg	*	J	A
Cobalt	7440-48-4	7.4	0.56	0.028	mg/kg	*	J	A
Nickel	7440-02-0	9.8	0.56	0.026	mg/kg	*	J	A
Selenium	7782-49-2	2.8	2.8	0.20	mg/kg	J	U	B
Thallium	7440-28-0	0.56	0.56	0.020	mg/kg	J	U	B
Vanadium	7440-62-2	31.5	2.8	0.022	mg/kg	*	J	A

Lab Sample Name: 9060151-10 Sample No: MH0088 Sample Date: 06/04/2019 10:11:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	140	5.5	0.056	mg/kg			
Beryllium	7440-41-7	0.47	1.1	0.076	mg/kg	JD	J	
Cadmium	7440-43-9	2.2	0.55	0.064	mg/kg	*	J	Q, A
Chromium	7440-47-3	13.0	2.2	0.068	mg/kg	D*	J	A
Cobalt	7440-48-4	8.8	1.1	0.055	mg/kg	D*	J	A
Nickel	7440-02-0	9.7	1.1	0.050	mg/kg	D*	J	A
Selenium	7782-49-2	5.5	5.5	0.39	mg/kg	JD	U	B
Thallium	7440-28-0	0.55	0.55	0.020	mg/kg	J	U	B
Vanadium	7440-62-2	32.6	5.5	0.044	mg/kg	D*	J	A



DATA VALIDATION REPORT

Elkhorn Mining Site Inspection

SAMPLE DELIVERY GROUP: MH0071

Prepared by

MEC^x
12269 East Vassar Drive
Aurora, CO 80014

I. INTRODUCTION

Task Order Title: Elkhorn Mining Site Inspection
 Contract Task Order: 20408.012.004.0621.00
 Sample Delivery Group: MH0071
 Weston Project Manager: Natalie Quiet
 EPA Project Manager: Joseph Chisholm
 TDD No.: 0004/1807-06
 Case No.: 48289
 Matrix: Soils/Solids
 QC Level: Stage 2B
 No. of Samples: 8
 No. of Reanalyses/Dilutions: 0
 Laboratory: Bonner Analytical Testing Co.

Table 1. Sample Identification

<i>Sample No.</i>	<i>Lab Sample Name</i>	<i>Matrix Type</i>	<i>Collection Date</i>	<i>Method</i>
MH0071	9060158-01	Waste Material	06/03/2019 10:17:00	Hg, ICP-AES, ICP-MS
MH0072	9060158-02	Waste Material	06/03/2019 10:41:00	Hg, ICP-AES, ICP-MS
MH0073	9060158-03	Tailing	06/03/2019 12:48:00	Hg, ICP-AES, ICP-MS
MH0094	9060158-04	Waste Material	06/05/2019 13:56:00	Hg, ICP-AES, ICP-MS
MH0095	9060158-05	Waste Material	06/05/2019 13:57:00	Hg, ICP-AES, ICP-MS
MH0096	9060158-06	Waste Material	06/05/2019 13:45:00	Hg, ICP-AES, ICP-MS
MH0097	9060158-07	Waste Material	06/05/2019 13:47:00	Hg, ICP-AES, ICP-MS
MH0A10	9060158-08	Tailings	06/05/2019 09:40:00	Hg, ICP-AES, ICP-MS



II. Sample Management

Anomalies with sample management are noted below. According to the Sample Receipt Forms the samples were received intact and properly preserved. All coolers were received at 0°C; however, as no sample was noted to be broken, no qualifications were applied. The chains of custody (COC) were signed and dated by field and/or laboratory personnel. Custody seals were present and intact.

The following issue was noted:

- Sample MH00A10, as listed on the COC, was logged as MH0A10 per client authorization.

Data Qualifier Reference Table

Qualifier	Organics	Inorganics
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit. The associated value is the quantitation limit or the estimated detection limit for dioxins or PCB congeners.	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit. The associated value is the sample detection limit or the quantitation limit for perchlorate only.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J+	Not applicable	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, and may have a potential positive bias.
J-	Not applicable	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, and may have a potential negative bias.
UJ	The analyte was not deemed above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.	The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."	Not applicable.



Qualifier	Organics	Inorganics
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.	Not applicable.
R	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet quality control criteria. The presence or absence of the analyte cannot be verified.

Qualification Code Reference Table

Qualifier	Organics	Inorganics
H	Holding times were exceeded.	Holding times were exceeded.
S	Surrogate recovery was outside QC limits.	The sequence or number of standards used for the calibration was incorrect
C	Calibration %RSD or %D was noncompliant.	Correlation coefficient is <0.995 or calibration was noncompliant.
R	Calibration RRF was <0.05.	%R for calibration is not within control limits.
B	Presumed contamination as indicated by the preparation (method) blank results.	Presumed contamination as indicated by the preparation (method) or calibration blank results.
L	Laboratory Blank Spike/Blank Spike Duplicate %R was not within control limits.	Laboratory Control Sample %R was not within control limits.
L1	LCS/LCSD RPD was outside control limits.	LCS/LCSD RPD was outside control limits.
Q	MS/MSD recovery was poor.	MS recovery was poor.
Q1	MS/MSD RPD was outside control limits.	MS/MSD RPD was outside control limits.
E	Not applicable.	Duplicates showed poor agreement.
I	Internal standard performance was unsatisfactory.	ICP ICS results were unsatisfactory.
A	Not applicable.	ICP Serial Dilution %D were not within control limits.
M	Tuning (BFB or DFTPP) was noncompliant.	ICPMS tune was not compliant.
T	Presumed contamination as indicated by the trip blank results.	Not applicable.
+	False positive – reported compound was not present.	Not applicable.
-	False negative – compound was present but not reported.	Not applicable.
F	Presumed contamination as indicated by the FB or ER results.	Presumed contamination as indicated by the FB or ER results.
F1	Field duplicate results were outside the control limit.	Field duplicate results were outside the control limit.
\$	Reported result or other information was incorrect.	Reported result or other information was incorrect.
?	TIC identity or reported retention time has been changed.	Not applicable.



Qualifier	Organics	Inorganics
D	The analysis with this flag should not be used because another more technically sound analysis is available.	The analysis with this flag should not be used because another more technically sound analysis is available.
P	Instrument performance for pesticides was poor.	Post Digestion Spike recovery was not within control limits.
*II, *III	Unusual problems found with the data that have been described in Section II, "Sample Management," or Section III, "Method Analyses." The number following the asterisk (*) will indicate the report section where a description of the problem can be found.	Unusual problems found with the data that have been described in Section II, "Sample Management," or Section III, "Method Analyses." The number following the asterisk (*) will indicate the report section where a description of the problem can be found.

III. Method Analyses

A. **Methods 200.7, 200.8 and 245.1—Metals and Mercury**

Reviewed By: M. Hilchey

Date Reviewed: July 30, 2019

The samples listed in Table 1 for these analyses were validated based on the guidelines outlined in the *Quality Assurance Project Plan for U. S. EPA Region 8 CERCLA Site Assessment* (Rev. 2015), *United States Environmental Protection Agency Methods 200.7, 200.8 and 245.1* and the *National Functional Guidelines for Inorganic Superfund Methods Data Review* (January 2017).

- Holding Times: The analytical holding times, 28 days for mercury and six months for the remaining metals, were met
- Instrument tune: ICP-MS instrument tuning requirements were met.
- Calibration:
 - Initial calibration: According to the calibration summaries, correlation coefficients and %Ds met National Functional Guideline (NFG) acceptance requirements.
 - Initial (ICV) and continuing calibration (CCV) verification: ICV and CCV frequency requirements were met. ICV and CCV recoveries were within 90-110% for ICP-MS and ICP-AES, and 85-115% for mercury.
- Method Blanks: No target analytes were reported in the method blanks (MB) or calibration blanks (ICB/CCB) of sufficient concentration to qualify site sample results except as noted in the table below. Associated detected sample results that were below the reporting limit (RL) were qualified as nondetect (U) at the RL. Associated detected sample results that were below the RL and >10× the blank concentration were not qualified, based on professional judgment.

Analyte	Blank concentration	Qualified Samples
sodium	31.8 µg/L (CCB)	MH0073, MH0096, MH0097
thallium	0.055 mg/Kg (MB)	MH0094, MH0095

- Interference Check Samples (ICSA/B): ICSA/B data are not reviewed at a Stage 2B validation.
- Laboratory Control Samples (LCS): The LCS recoveries were within 80-120% for ICP-MS and ICP-AES.
- Laboratory Duplicates: Laboratory duplicate analyses were performed on sample MH0095 for all methods. RPDs met the control limits of ≤20% for sample results >5× RL and ±RL for sample results <5× RL for all target analytes except antimony (44%), arsenic (53%), iron (35%), zinc (24%), barium (85%), cadmium (122%), cobalt (71%), nickel (25%), selenium (38%) and vanadium (49%). Associated results for all site samples of similar matrix (waste material) were qualified as estimated (J for detects, UJ for nondetects).

- **Matrix Spike:** Matrix spike (MS) analysis was performed on sample MH0095 for all methods. It should be noted that MS results were not reported for ICP-AES analytes aluminum, calcium, iron, magnesium, sodium and potassium. MS recoveries were not assessed when the parent sample concentrations were more than 4× the spike amount. Recoveries met control limits of 75-125% for all target analytes except chromium (163%), nickel (135%) and vanadium (196%). Associated results for all site samples of similar matrix (waste material) were qualified as estimated with high potential bias (J+).
- **Post Digestion Spike:** Post digestion spike (PDS) analysis was performed on sample MH0095 for cadmium, nickel and vanadium. The PDS recoveries were within 75-125% for all applicable analytes except cadmium (133%). Cadmium results for all site samples of similar matrix (waste material) were qualified as estimated (J). Bias was not assigned to cadmium results due to acceptable matrix spike recovery. Bias was removed from the matrix spike qualifiers (see above) for nickel and vanadium due to acceptable PDS recoveries.
- **Serial Dilution:** Serial dilution analysis was performed on sample MH0095 for ICP-AES and ICP-MS. Results were not assessed unless the parent sample concentration was >50× the MDL. The control limit of ≤10% difference (%D) of the original sample results was met for all target analytes except barium (15%), cadmium (20%) and vanadium (49%). Associated results for all samples of similar matrix (waste material) were qualified as estimated (J).
- **Internal Standards:** Several ICP-MS sample internal standard intensities failed to meet the control limits of 60-125% of the calibration blank. These samples were diluted 2× and analyzed for affected analytes. In the samples as noted below, the internal standard intensities for the diluted analyses were not acceptable and the results were reported from the undiluted analyses. The affected sample results were qualified as estimated (J).

Sample ID	analyte
MH0071	cadmium
MH0073	
MH0A10	
MH0072	cadmium, chromium, cobalt, nickel, vanadium

- **Sample Result Verification:** Sample results are not verified at a Stage 2B validation. Detects below the reporting limit were qualified as estimated (J). Nondetects are valid to the reporting limit.

Several samples were diluted for various target analytes due to high analyte concentration and for poor internal standard performance. All reporting limits were adjusted appropriately. Detected results for dilutions were flagged with “D” by the laboratory.



- Field QC Samples: MEC^x evaluated field QC samples, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. MEC^x used the remaining detects to evaluate the associated site samples. Findings associated with field QC samples are summarized below.
 - o Field Blanks and Equipment Blanks: Field blanks and equipment blanks were not identified for this SDG
 - o Field Duplicates: Field Duplicates: Field duplicate samples were not identified for this SDG.

Validated Sample Result Forms MH0071

Analysis Method Hg

Lab Sample Name: 9060158-01

Sample No: MH0071

Sample Date: 06/03/2019 10:17:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Mercury	7439-97-6	1.0	0.11	0.017	mg/kg	*		

Lab Sample Name: 9060158-02

Sample No: MH0072

Sample Date: 06/03/2019 10:41:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.14 0.10 0.017 mg/kg *

Lab Sample Name: 9060158-03

Sample No: MH0073

Sample Date: 06/03/2019 12:48:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 0.075 0.094 0.015 mg/kg J*

Lab Sample Name: 9060158-04

Sample No: MH0094

Sample Date: 06/05/2019 13:56:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 1.7 0.42 0.067 mg/kg D*

Lab Sample Name: 9060158-05

Sample No: MH0095

Sample Date: 06/05/2019 13:57:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 2.7 0.40 0.065 mg/kg D*

Lab Sample Name: 9060158-06

Sample No: MH0096

Sample Date: 06/05/2019 13:45:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 1.3 0.41 0.066 mg/kg D*

Lab Sample Name: 9060158-07

Sample No: MH0097

Sample Date: 06/05/2019 13:47:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
---------	--------	--------------	----------------------	---------------------	--------------	---------------	----------------------	------------------

Mercury 7439-97-6 1.5 0.36 0.057 mg/kg D*

Analysis Method Hg

Lab Sample Name: 9060158-08

Sample No: MH0A10

Sample Date: 06/05/2019 09:40:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Mercury	7439-97-6	0.98	0.12	0.019	mg/kg	*		

Analysis Method ICP_AES

Lab Sample Name: 9060158-01

Sample No: MH0071

Sample Date: 06/03/2019 10:17:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	4830	103	18.5	mg/kg	D		
Antimony	7440-36-0	37.6	30.8	0.82	mg/kg	D*	J	E
Arsenic	7440-38-2	26700	76.9	16.1	mg/kg	D*	J	E
Calcium	7440-70-2	19900	2560	20.0	mg/kg	D		
Copper	7440-50-8	75.0	12.8	0.47	mg/kg	D		
Iron	7439-89-6	91400	51.3	5.6	mg/kg	D*	J	E
Lead	7439-92-1	34100	76.9	10.8	mg/kg	D*		
Magnesium	7439-95-4	14100	2560	12.3	mg/kg	D		
Manganese	7439-96-5	732	7.7	0.37	mg/kg	D		
Potassium	7440-09-7	1930	2560	19.0	mg/kg	JD	J	
Silver	7440-22-4	160	5.1	0.25	mg/kg	D		
Sodium	7440-23-5	45.7	2560	15.4	mg/kg	JD	J	
Zinc	7440-66-6	13000	30.8	0.37	mg/kg	D*	J	E

Lab Sample Name: 9060158-02

Sample No: MH0072

Sample Date: 06/03/2019 10:41:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	4170	102	18.4	mg/kg	D		
Antimony	7440-36-0	19.0	30.7	0.82	mg/kg	JD*	J	E
Arsenic	7440-38-2	4790	25.6	5.4	mg/kg	D*	J	E
Calcium	7440-70-2	29800	2560	19.9	mg/kg	D		
Copper	7440-50-8	69.1	12.8	0.47	mg/kg	D		
Iron	7439-89-6	48500	51.1	5.6	mg/kg	D*	J	E
Lead	7439-92-1	25500	25.6	3.6	mg/kg	D*		
Magnesium	7439-95-4	15000	2560	12.3	mg/kg	D		
Manganese	7439-96-5	683	7.7	0.37	mg/kg	D		
Potassium	7440-09-7	2060	2560	18.9	mg/kg	JD	J	
Silver	7440-22-4	133	5.1	0.25	mg/kg	D		
Sodium	7440-23-5	40.0	2560	15.3	mg/kg	JD	J	
Zinc	7440-66-6	8290	30.7	0.37	mg/kg	D*	J	E

Analysis Method ICP_AES

Lab Sample Name: 9060158-03

Sample No: MH0073

Sample Date: 06/03/2019 12:48:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	7030	106	19.0	mg/kg	D		
Antimony	7440-36-0	10.7	31.7	0.85	mg/kg	JD*	J	E
Arsenic	7440-38-2	1780	5.3	1.1	mg/kg	D*		
Calcium	7440-70-2	7910	2640	20.6	mg/kg	D		
Copper	7440-50-8	40.7	13.2	0.49	mg/kg	D		
Iron	7439-89-6	41000	52.8	5.8	mg/kg	D*		
Lead	7439-92-1	2450	5.3	0.74	mg/kg	D*		
Magnesium	7439-95-4	6660	2640	12.7	mg/kg	D		
Manganese	7439-96-5	396	7.9	0.38	mg/kg	D		
Potassium	7440-09-7	2390	2640	19.5	mg/kg	JD	J	
Silver	7440-22-4	11.3	5.3	0.26	mg/kg	D		
Sodium	7440-23-5	2640	2640	15.9	mg/kg	JD	U	B
Zinc	7440-66-6	5640	31.7	0.38	mg/kg	D*		

Lab Sample Name: 9060158-04

Sample No: MH0094

Sample Date: 06/05/2019 13:56:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	1310	98.2	17.7	mg/kg	D		
Antimony	7440-36-0	284	29.5	0.79	mg/kg	D*	J	E
Arsenic	7440-38-2	256	4.9	1.0	mg/kg	D*	J	E
Calcium	7440-70-2	12200	2460	19.2	mg/kg	D		
Copper	7440-50-8	907	12.3	0.45	mg/kg	D		
Iron	7439-89-6	22400	49.1	5.4	mg/kg	D*	J	E
Lead	7439-92-1	10000	4.9	0.69	mg/kg	D*		
Magnesium	7439-95-4	1050	2460	11.8	mg/kg	JD	J	
Manganese	7439-96-5	713	7.4	0.35	mg/kg	D		
Potassium	7440-09-7	616	2460	18.2	mg/kg	JD	J	
Silver	7440-22-4	249	4.9	0.24	mg/kg	D		
Sodium	7440-23-5	2460	2460	14.7	mg/kg	UD	U	
Zinc	7440-66-6	15700	58.9	0.71	mg/kg	D*	J	E

Lab Sample Name: 9060158-05

Sample No: MH0095

Sample Date: 06/05/2019 13:57:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	1250	107	19.3	mg/kg	D		
Antimony	7440-36-0	328	32.2	0.86	mg/kg	D*	J	E
Arsenic	7440-38-2	205	5.4	1.1	mg/kg	D*	J	E
Calcium	7440-70-2	9000	2680	20.9	mg/kg	D		

Analysis Method ICP_AES

Copper	7440-50-8	1020	13.4	0.49	mg/kg	D		
Iron	7439-89-6	18000	53.6	5.9	mg/kg	D*	J	E
Lead	7439-92-1	15800	10.7	1.5	mg/kg	D*		
Magnesium	7439-95-4	1210	2680	12.9	mg/kg	JD	J	
Manganese	7439-96-5	463	8.0	0.39	mg/kg	D		
Potassium	7440-09-7	508	2680	19.8	mg/kg	JD	J	
Silver	7440-22-4	223	5.4	0.26	mg/kg	D		
Sodium	7440-23-5	2680	2680	16.1	mg/kg	UD	U	
Zinc	7440-66-6	8700	32.2	0.39	mg/kg	D*	J	E

Lab Sample Name: 9060158-06 Sample No: MH0096 Sample Date: 06/05/2019 13:45:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	5570	106	19.0	mg/kg	D		
Antimony	7440-36-0	330	31.7	0.85	mg/kg	D*	J	E
Arsenic	7440-38-2	645	5.3	1.1	mg/kg	D*	J	E
Calcium	7440-70-2	1060	2640	20.6	mg/kg	JD	J	
Copper	7440-50-8	696	13.2	0.49	mg/kg	D		
Iron	7439-89-6	34200	52.8	5.8	mg/kg	D*	J	E
Lead	7439-92-1	38700	26.4	3.7	mg/kg	D*		
Magnesium	7439-95-4	1360	2640	12.7	mg/kg	JD	J	
Manganese	7439-96-5	2480	7.9	0.38	mg/kg	D		
Potassium	7440-09-7	1010	2640	19.5	mg/kg	JD	J	
Silver	7440-22-4	200	5.3	0.26	mg/kg	D		
Sodium	7440-23-5	2640	2640	15.8	mg/kg	JD	U	B
Zinc	7440-66-6	7140	31.7	0.38	mg/kg	D*	J	E

Lab Sample Name: 9060158-07 Sample No: MH0097 Sample Date: 06/05/2019 13:47:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Aluminum	7429-90-5	4820	94.9	17.1	mg/kg	D		
Antimony	7440-36-0	346	28.5	0.76	mg/kg	D*	J	E
Arsenic	7440-38-2	468	4.7	1.0	mg/kg	D*	J	E
Calcium	7440-70-2	976	2370	18.5	mg/kg	JD	J	
Copper	7440-50-8	582	11.9	0.44	mg/kg	D		
Iron	7439-89-6	27200	47.4	5.2	mg/kg	D*	J	E
Lead	7439-92-1	15500	9.5	1.3	mg/kg	D*		
Magnesium	7439-95-4	1090	2370	11.4	mg/kg	JD	J	
Manganese	7439-96-5	3790	7.1	0.34	mg/kg	D		
Potassium	7440-09-7	800	2370	17.5	mg/kg	JD	J	
Silver	7440-22-4	102	4.7	0.23	mg/kg	D		
Sodium	7440-23-5	2370	2370	14.2	mg/kg	JD	U	B

Analysis Method ICP_AES

Zinc	7440-66-6	5580	28.5	0.34	mg/kg	D*	J	E	
Lab Sample Name:	9060158-08	Sample No:	MH0A10	Sample Date:					06/05/2019 09:40:00
Matrix Type: Soil									
Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes	
Aluminum	7429-90-5	8680	116	20.8	mg/kg	D			
Antimony	7440-36-0	315	34.7	0.92	mg/kg	D*			
Arsenic	7440-38-2	43600	145	30.3	mg/kg	D*			
Calcium	7440-70-2	38000	2890	22.5	mg/kg	D			
Copper	7440-50-8	4000	14.5	0.53	mg/kg	D			
Iron	7439-89-6	294000	1450	159	mg/kg	D*			
Lead	7439-92-1	3880	5.8	0.81	mg/kg	D*			
Magnesium	7439-95-4	4150	2890	13.9	mg/kg	D			
Manganese	7439-96-5	2310	8.7	0.42	mg/kg	D			
Potassium	7440-09-7	477	2890	21.4	mg/kg	JD	J		
Silver	7440-22-4	32.2	5.8	0.28	mg/kg	D			
Sodium	7440-23-5	89.0	2890	17.3	mg/kg	JD	J		
Zinc	7440-66-6	3280	34.7	0.42	mg/kg	D*			

Analysis Method ICP_MS

Lab Sample Name:		9060158-01	Sample No:		MH0071	Sample Date:		06/03/2019 10:17:00	
Matrix Type: Soil									
Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes	
Barium	7440-39-3	9.6	5.1	0.052	mg/kg	*	J	E, A	
Beryllium	7440-41-7	0.59	0.51	0.036	mg/kg				
Cadmium	7440-43-9	129	0.51	0.060	mg/kg	*	J	E, P, A, *III	
Chromium	7440-47-3	2.8	2.1	0.064	mg/kg	D*	J+	Q	
Cobalt	7440-48-4	11.6	0.51	0.026	mg/kg	*	J	E	
Nickel	7440-02-0	22.0	0.51	0.024	mg/kg	*	J	E, Q	
Selenium	7782-49-2	4.4	2.6	0.18	mg/kg	*	J	E	
Thallium	7440-28-0	0.55	0.51	0.018	mg/kg				
Vanadium	7440-62-2	5.0	5.1	0.041	mg/kg	JD*	J	E, Q, A	
Lab Sample Name:		9060158-02	Sample No:		MH0072	Sample Date:		06/03/2019 10:41:00	
Matrix Type: Soil									
Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes	
Barium	7440-39-3	16.5	4.7	0.048	mg/kg	*	J	E, A	
Beryllium	7440-41-7	0.70	0.47	0.033	mg/kg				
Cadmium	7440-43-9	89.4	0.47	0.056	mg/kg	*	J	E, P, A, *III	
Chromium	7440-47-3	1.8	0.95	0.029	mg/kg	*	J+	Q, *III	
Cobalt	7440-48-4	8.3	0.47	0.024	mg/kg	*	J	E, *III	

Analysis Method ICP_MS

Nickel	7440-02-0	26.4	0.47	0.022	mg/kg	*	J	E, Q, *III
Selenium	7782-49-2	2.7	2.4	0.17	mg/kg	*	J	E
Thallium	7440-28-0	0.48	0.47	0.017	mg/kg			
Vanadium	7440-62-2	3.6	2.4	0.019	mg/kg	*	J	E, Q, A, *III

Lab Sample Name: 9060158-03

Sample No: MH0073

Sample Date: 06/03/2019 12:48:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	29.8	4.6	0.047	mg/kg	*		
Beryllium	7440-41-7	0.71	0.46	0.032	mg/kg			
Cadmium	7440-43-9	108	0.46	0.055	mg/kg	*	J	*III
Chromium	7440-47-3	3.6	1.9	0.058	mg/kg	D*		
Cobalt	7440-48-4	8.3	0.93	0.046	mg/kg	D*		
Nickel	7440-02-0	21.3	0.93	0.043	mg/kg	D*		
Selenium	7782-49-2	2.7	2.3	0.17	mg/kg	*		
Thallium	7440-28-0	0.71	0.46	0.017	mg/kg			
Vanadium	7440-62-2	4.3	4.6	0.037	mg/kg	JD*	J	

Lab Sample Name: 9060158-04

Sample No: MH0094

Sample Date: 06/05/2019 13:56:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	4.6	4.7	0.048	mg/kg	J*	J	E, A
Beryllium	7440-41-7	0.15	0.47	0.033	mg/kg	J	J	
Cadmium	7440-43-9	112	0.47	0.056	mg/kg	*	J	E, P, A
Chromium	7440-47-3	1.1	1.9	0.059	mg/kg	JD*	J+	Q
Cobalt	7440-48-4	7.9	0.47	0.024	mg/kg	*	J	E
Nickel	7440-02-0	223	0.47	0.022	mg/kg	*	J	E, Q
Selenium	7782-49-2	18.9	2.4	0.17	mg/kg	*	J	E
Thallium	7440-28-0	0.47	0.47	0.017	mg/kg	J	U	B
Vanadium	7440-62-2	12.9	4.7	0.038	mg/kg	D*	J	E, Q, A

Lab Sample Name: 9060158-05

Sample No: MH0095

Sample Date: 06/05/2019 13:57:00

Matrix Type: Soil

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	3.9	5.3	0.054	mg/kg	J*	J	E, A
Beryllium	7440-41-7	0.10	0.53	0.037	mg/kg	J	J	
Cadmium	7440-43-9	252	1.1	0.13	mg/kg	D*	J	E, P, A
Chromium	7440-47-3	0.91	2.1	0.066	mg/kg	JD*	J+	Q
Cobalt	7440-48-4	5.3	0.53	0.027	mg/kg	*	J	E
Nickel	7440-02-0	146	0.53	0.024	mg/kg	*	J	E, Q
Selenium	7782-49-2	15.5	2.7	0.19	mg/kg	*	J	E
Thallium	7440-28-0	0.53	0.53	0.019	mg/kg	J	U	B

Analysis Method ICP_MS

Vanadium	7440-62-2	8.6	5.3	0.042	mg/kg	D*	J	E, Q, A
Lab Sample Name:	9060158-06	Sample No:	MH0096	Sample Date:	06/05/2019 13:45:00			
Matrix Type:	Soil							

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	28.3	5.3	0.054	mg/kg	*	J	E, A
Beryllium	7440-41-7	0.52	0.53	0.037	mg/kg	J	J	
Cadmium	7440-43-9	125	0.53	0.062	mg/kg	*	J	E, P, A
Chromium	7440-47-3	9.9	2.1	0.066	mg/kg	D*	J+	Q
Cobalt	7440-48-4	57.9	0.53	0.026	mg/kg	*	J	E
Nickel	7440-02-0	209	0.53	0.024	mg/kg	*	J	E, Q
Selenium	7782-49-2	13.0	2.6	0.19	mg/kg	*	J	E
Thallium	7440-28-0	0.60	0.53	0.019	mg/kg			
Vanadium	7440-62-2	54.8	5.3	0.042	mg/kg	D*	J	E, Q, A

Lab Sample Name:	9060158-07	Sample No:	MH0097	Sample Date:	06/05/2019 13:47:00
Matrix Type:	Soil				

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	130	4.8	0.049	mg/kg	*	J	E, A
Beryllium	7440-41-7	3.0	0.48	0.033	mg/kg			
Cadmium	7440-43-9	33.2	0.48	0.056	mg/kg	*	J	E, P, A
Chromium	7440-47-3	22.9	1.9	0.059	mg/kg	D*	J+	Q
Cobalt	7440-48-4	3.6	0.48	0.024	mg/kg	*	J	E
Nickel	7440-02-0	29.0	0.48	0.022	mg/kg	*	J	E, Q
Selenium	7782-49-2	0.80	2.4	0.17	mg/kg	J*	J	E
Thallium	7440-28-0	0.71	0.48	0.017	mg/kg			
Vanadium	7440-62-2	934	4.8	0.038	mg/kg	D*	J	E, Q, A

Lab Sample Name:	9060158-08	Sample No:	MH0A10	Sample Date:	06/05/2019 09:40:00
Matrix Type:	Soil				

Analyte	CAS No	Result Value	Sample Adjusted CRQL	Sample Adjusted MDL	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Barium	7440-39-3	190	5.8	0.059	mg/kg	*		
Beryllium	7440-41-7	4.5	0.58	0.040	mg/kg			
Cadmium	7440-43-9	45.2	0.58	0.068	mg/kg	*	J	*III
Chromium	7440-47-3	26.8	2.3	0.072	mg/kg	D*		
Cobalt	7440-48-4	4.5	0.58	0.029	mg/kg	*		
Nickel	7440-02-0	39.9	0.58	0.027	mg/kg	*		
Selenium	7782-49-2	0.98	2.9	0.21	mg/kg	J*	J	
Thallium	7440-28-0	0.99	0.58	0.021	mg/kg			
Vanadium	7440-62-2	1090	5.8	0.046	mg/kg	D*		

APPENDIX C
Sampling Activities Report

**SAMPLING ACTIVITIES REPORT
FOR
C&D MINE
ELKHORN CREEK TAILINGS
UNION ELKHORN MINE
TRUMLEY HEAP LEACH
SKYLINE MINE
BOULAWAY MINE
ELKHORN QUEEN MINE
JEFFERSON COUNTY, MONTANA**

Prepared for
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 8

Prepared by
WESTON SOLUTIONS, INC.
Region 8 Superfund Technical Assessment and Response Team

Date Prepared	January 2020
CERCLA ID/Site Spill Identifier No.:	MTN0008/A8V9
TDD No.	0004/1807-06
Document Control No.	W0621.1A.02086
Contract No.	EP-S8-13-01
U.S. EPA Site Assessment Manager	Joseph Chisholm

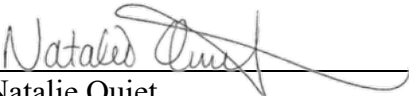
**SAMPLING ACTIVITIES REPORT
FOR
C&D MINE
ELKHORN CREEK TAILINGS
UNION ELKHORN MINE
TRUMLEY HEAP LEACH
SKYLINE MINE
BOULAWAY MINE
ELKHORN QUEEN MINE
JEFFERSON COUNTY, MONTANA**

Prepared for
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 8

Prepared by
WESTON SOLUTIONS, INC.
Region 8 Superfund Technical Assessment and Response Team

January 2020

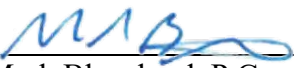
Prepared by:



Natalie Quiet
WESTON START Project Manager

Date: 1/17/2020

Reviewed and Approved by:



Mark Blanchard, P.G.
WESTON START Program Manager

Date: 1/17/2020

TABLE OF CONTENTS

1.0	INTRODUCTION.....	1
1.1	Project Objectives	1
1.2	Project Scope	1
2.0	SITE BACKGROUND	2
2.1	Location	2
2.2	Site Description.....	4
2.3	Current Site Conditions.....	4
3.0	CURRENT INVESTIGATION	6
3.1	Sample and Measurement Locations and Methodologies	6
3.1.1	Sample Identification	7
3.2	Sample Collection	7
3.2.1	Surface Water Sampling	8
3.2.2	Sediment Sampling	8
3.2.3	Waste Material Sampling.....	9
3.2.4	Soil Sampling.....	10
3.3	Quality Control	10
3.3.1	Field Instrument Calibration	10
3.3.2	Decontamination Methods	11
3.3.3	Field Duplicates	11
3.3.4	Matrix Spike (MS)/Matrix Spike Duplicates (MSD).....	11
3.3.5	Equipment Blanks	11
3.3.6	Field Blanks	11
3.3.7	Trip Blanks.....	11
3.3.8	Data Validation	12
4.0	DEVIATIONS FROM THE SAMPLING PLAN	13
5.0	FIELD OBSERVATIONS.....	16
6.0	REFERENCES.....	17

TDD 0004/1805-06

LIST OF TABLES

Table 1	Sample Location, Description, and Information
---------	---

LIST OF FIGURES

Figure 1	Investigation Area Location Map
Figure 2	Investigation Area Vicinity Map
Figure 3	C & D Mine Sample Location Map
Figure 4	Elkhorn Creek Tailings Sample Location Map
Figure 5	Union Elkhorn Mine Sample Location Map
Figure 6	Greyback Gulch Sample Location Map
Figure 7	Trumley Heap Leach Sample Location Map
Figure 8	Skyline Mine Sample Location Map
Figure 9	Boulaway Mine Sample Location Map
Figure 10	Elkhorn Queen Mine Sample Location Map

LIST OF APPENDICES

Appendix A	Photograph Log
Appendix B	Field Documentation

LIST OF ACRONYMS

ATV	all-terrain vehicle
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Contaminants of Concern
DEQ	Department of Environmental Quality
DO	dissolved oxygen
EPA	U.S. Environmental Protection Agency
FR	Forest Road
ft	feet
GPS	global positioning system
HRS	Hazard Ranking System Scoring
MS	matrix spike
MSD	matrix spike duplicate
MSL	Montana State Library
MT	Montana
ORP	oxygen reduction potential
QAPP	Quality Assurance Project Plan
SAM	Site Assessment Manager
SAP	Sampling and Analysis Plan
SAR	Sampling Activities Report
SI	Site Inspection
SOP	Standard Operating Procedure
SQL	Sample Quantitation Limit
START	Superfund Technical Assessment and Response Team
TAL	Target Analyte List
TDD	Technical Direction Document
USFS	U.S. Department of Agriculture, Forest Service
WESTON	Weston Solutions, Inc.
XRF	X-ray fluorescence

TDD 0004/1805-06

1.0 INTRODUCTION

This Sampling Activities Report (SAR) for the Elkhorn Mining Site Inspection (SI) sites (seven mine and mill sites and Greyback Gulch) located in the Beaverhead-Deerlodge National Forest, Jefferson County, Montana (MT) (Figure 1) has been prepared to partially satisfy the requirements of Technical Direction Document (TDD) No. 1807-06 issued to Weston Solutions, Inc. (WESTON) under the U.S. Environmental Protection Agency (EPA) Region 8 Superfund Technical Assessment and Response Team (START) Contract No. EP-S8-13-01.

This SI is being conducted at the C&D Mine, Elkhorn Creek Tailings, Union Elkhorn Mine, Trumley Heap Leach, Skyline Mine, Boulaway Mine, Elkhorn Queen Mine sites, Greyback Gulch and surrounding vicinity to provide a comprehensive assessment of the area to determine whether mining related sources pose a threat to human health and the environment, and if further investigation under CERCLA is warranted. This report has been prepared in accordance with the EPA “Guidance for Performing Site Inspections under CERCLA,” Interim Final, September 1992, and the “Region 8 Supplement to Guidance for Performing Site Inspections under CERCLA” (EPA, 1992; EPA, 1993). This report addresses field sampling activities conducted from June 3 through June 5, 2019 and from September 9, 2019 through September 12, 2019 in the Elkhorn Creek watershed. Field activities followed the Site Inspection format, applicable START Standard Operating Procedures (SOPs), the approved Elkhorn Mining District Sampling and Analysis Plan (SAP), and the Quality Assurance Project Plan (QAPP) (WESTON, 2019a; WESTON, 2019b).

1.1 PROJECT OBJECTIVES

The purpose of this SI is to:

- Assess current conditions in surface water, sediment and waste material for comparison against background, and health-based and aquatic life benchmarks and standards.
- Collect samples and associated analytical data to identify if there is a potential threat of a release of a hazardous substance to the environment.
- Identify if sufficient data exists to support U.S. EPA decision making as determined by project managers.

1.2 PROJECT SCOPE

The assessment included reviewing readily available site information. The supplemental sampling included field screening of water quality parameters in surface waters, X-ray fluorescence screening of waste material, photo documentation, and sampling activities at the sites. Surface water, sediment, soil, and waste material samples were submitted for laboratory analysis to verify the nature and extent of potential contamination and COCs.

2.0 SITE BACKGROUND

2.1 LOCATION

The sites are located in the Elkhorn Creek watershed within the Elkhorn Mining District and in the Elkhorn Mountains of the Beaverhead-Deerlodge National Forest (See Figures 1 and 2). The district is situated in the center of Jefferson County. The geographical coordinates of Elkhorn, MT and the approximate center of the watershed are 46.275097 N latitude and 111.946030 W longitude. The closest permanent residences are located in Elkhorn, approximately 30 feet from Elkhorn Creek with the town of Boulder, MT located 18.5 miles to the southwest.

Locations, ownership, and site access information for each individual mine and mill site is presented in Table 2-1 by drainage.

Table 2-1 Site Summary

Site Name	Latitude/Longitude	Ownership	Access Directions
Elkhorn Creek			
C&D Mine	46.2893° North / 111.9348° West	Private	Travel east from Boulder via Highway 69, to White Bridge Road. Turn north on White Bridge Road, then east on Lower Valley Road for 2 miles to the town of Elkhorn. Travel north from Elkhorn via Diego Town Road for 0.85 miles, then east on an unnamed high-clearance dirt road for 0.3 miles.
Elkhorn Creek Tailings	46.2657° North / 111.95646 ° West	Private/ U.S. Department of Agriculture, Forest Service (USFS)	Travel east from Boulder via Highway 69, to White Bridge Road. Turn north on White Bridge Road, then east on Lower Valley Road for 2 miles. Turn east on Elkhorn Road (USFS Road 258) for approximately 8 miles.
Slaughterhouse Gulch			
Union Elkhorn Mine	46.291241° North / 111.942602° West	USFS	Travel east from Boulder via Highway 69, to White Bridge Road. Turn north on White Bridge Road, then east on Lower Valley Road for 2 miles to the town of Elkhorn. Travel north from Elkhorn via Diego Town Road for 0.95 mile, then head northwest on an unnamed high-clearance dirt road for 0.3 miles.
Greyback Gulch			
Sourdough and Golden Curry Mines*	46.284477° North / 111.960427° West	Private	Travel east from Boulder via Highway 69, to White Bridge Road. Turn north on White Bridge Road, then east on Lower Valley Road for 2 miles to the town of Elkhorn.

TDD 0004/1805-06

Site Name	Latitude/Longitude	Ownership	Access Directions
			Travel northwest from Elkhorn via Slaughter House Road for 1.65 miles.
Mill (unnamed)	46.279650° North / 111.967631° West	USFS	Travel east from Boulder via Highway 69, to White Bridge Road. Turn north on White Bridge Road, then east on Lower Valley Road for 2 miles. Turn east on Elkhorn Road (USFS Road 258) for 7.6 miles, then north-northwest on high -clearance Tramway Road (USFS Road 9365) for approximately 0.9 mile. Take a right, crossing Turnley Creek, on an unnamed road, and follow approximately 170 ft to cattle fencing with an unlocked gate. Continue through gate and follow the road north-northwest approximately 0.9 mile to the vicinity of the site. The site is located approximately 500 ft upslope and east of the road
Turnley Creek			
Trumley Heap Leach	46.2703° North / 111.971° West	USFS	Travel east from Boulder via Highway 69 to White Bridge Road. Turn north on White Bridge Road, then east on Lower Valley Road for 2 miles. Turn east on Elkhorn Road (USFS Road 258) for 7.6 miles, then north-northwest on high clearance Tramway Road (USFS Road 9365) for 1 mile
Queen Gulch			
Skyline Mine	46.290311° North / 111.889213° West	USFS	Travel east from Boulder via Highway 69, to White Bridge Road. Turn north on White Bridge Road, then east on Lower Valley Road for 2 miles. Turn east on Elkhorn Road (USFS Road 258) for 7.1 miles, then northeast for 2.3 miles on Queen Gulch Road (USFS Road 8546) to the intersection with Tramway Road and the Queen Gulch Road trailhead (USFS Road 8578). Follow the road on foot for 1.23 miles to the Leslie Lake trailhead (Trail 7075) and travel north for 1.35 miles.
Boulaway Mine	46.260219° North / 111.948131° West	USFS	Travel east from Boulder via Highway 69 to White Bridge Road, then north on White Bridge Road, then east on Lower Valley Road for 2 miles. Turn east on Elkhorn Road (USFS Road 258) for 7.1 miles, then

TDD 0004/1805-06

Site Name	Latitude/Longitude	Ownership	Access Directions
			northeast on Queen Gulch Road (USFS Road 8578) for 1.07 miles.
South Fork Queen Gulch			
Elkhorn Queen Mine	46.291241° North / 111.942602° West	Private	Travel east from Boulder via Highway 69, to White Bridge Road. Turn north on White Bridge Road, then east on Lower Valley Road for 2 miles. Turn east on Elkhorn Road (USFS Road 258) for 7.1 miles, then northeast for ½-mile on Queen Gulch Road (USFS Road 8578), then southeast on an unnamed dirt road for 1.06 miles, then head west on an unnamed high-clearance dirt road for 0.36 miles.

2.2 SITE DESCRIPTION

The Elkhorn Mining District contains numerous abandoned mines with adits, shafts, prospect pits, waste rock and tailings piles, and historic mining structures. For the purposes of this investigation, the approximate boundaries are the Elkhorn Creek subwatershed (hydrologic unit code 100200060503) which is approximately 22,658.33 acres (Figure 2). The northern and northeastern edges of the Elkhorn subwatershed are bordered by the Helena National Forest. The south and west sides of the watershed are bordered by private property. Regionally, Elkhorn watershed is bounded to the south and west by the Boulder River and Boulder Valley, and to the north and northeast by the Continental Divide.

The properties within and surrounding the District are comprised of a mix of private and USFS managed lands. The majority of residences are located near the center of the District in Elkhorn, MT. Recreational use in the District includes hunting, fishing, sightseeing, hiking, biking, snowmobiling, four-wheeling and other recreational driving, and cross country skiing. Elkhorn State Park is located in the center of Elkhorn and Elkhorn is a historic mining town that attracts tourists and sightseers.

According to the Bureau of Land Management's (BLM) Land & Mineral System Reports database, the Golden Curry, Sourdough and Skyline mines are the only sites with active mining claims associated with the sites sampled in this SI. The Golden Curry and Sourdough claims are located within Township 6 North, Range 3 West, Section 10 on private lands. There are 4 active lode claims within this section identified as Sourdough Fraction, South Sourdough, South Golden Curry, and South Golden Curry#2. The Skyline mine is associated with the Elkhorn Skyline lode claim, which is located within Township 6 North, Range 2 West, Section 8, and is on USFS-administered land (BLM, 2020; Montana State Library [MSL], 2019).

2.3 CURRENT SITE CONDITIONS

Current site conditions are based on observations made during the June 3-5, 2019 and September 9-12, 2019 sampling events. Mining operations are not currently active at the sites; however,

TDD 0004/1805-06

observations were made during this investigation from public roads, USFS property, and private lands in which access was permissible, which included waste source piles, draining adits, and a former leach pad. The sites and observed potential source areas are shown in photographs presented in Appendix A and are identified on Figures 3-10. The Skyline Mine and Greyback Gulch areas were not observed during the June 2019 sampling event due to access issues as described in Section 4.0.

TDD 0004/1805-06

3.0 CURRENT INVESTIGATION

The current investigation included sample collection to provide information to 1) document if a contaminant release has occurred, 2) evaluate through the Hazard Ranking System Scoring (HRS) scoring if the site is eligible for the National Priorities List (NPL) as a result of historical mining activities at the site, 3) assess the relative risk to human health and the environment, and 4) determine the need for additional investigation or action.

Field sampling activities were conducted from June 3, 2019 through June 5, 2019 by START personnel (WESTON). START personnel conducted a reconnaissance of the site features and took photographs documenting general conditions. An EPA representative was present for oversight and to ensure that access was obtained and granted for each sampling point. A USFS and a U.S. Fish and Wildlife Service representative were also present for oversight. Field sampling activities conducted from September 9, 2019 through September 12, 2019 were by START personnel only. The following data were noted in the field log book at each of the sample locations:

- Water quality screening readings (temperature, pH, conductivity, dissolved oxygen [DO], and oxygen reduction potential [ORP])
- General features and/or conditions including observations regarding areas of stressed vegetation, debris, or any access issues (e.g., road/trail condition and width, etc.).

Sample locations were determined in the field based on field observations. Sample locations were documented using a Survey123 application on an Apple iPad 2. Global positioning systems (GPS) data were collected using a combination of an external GPS unit (Garmin GLO) and/or the internal GPS on the Apple iPad or Apple iPhone GPS. Horizontal accuracy of the GPSs were determined to be between 5 and 10 meters. All GPS data was recorded in UTM WGS84, Zone 12N datum.

All surface water quality screening readings were collected using YSI 556 MPS or Horiba U-53 meters. In-situ XRF field screening readings were collected using an Olympus Delta.

Photographs of field activities and Site features were collected using Apple iPad or Apple iPhone digital cameras and are included in the Photograph Log in Appendix A. Media evaluated include surface water, sediment, soil, and waste material. Table 1 outlines the sample locations, descriptions, geographic coordinates and information for each media collected during the sampling efforts. The Skyline Mine and Greyback Gulch areas were only observed during the September 2019 sampling event due to access issues as described in Section 4.0.

3.1 SAMPLE AND MEASUREMENT LOCATIONS AND METHODOLOGIES

Environmental samples were collected in surface water, sediment, waste material, and soil locations in areas intended to characterize background and site conditions (Figures 3-10). GPS coordinates and a description of each sample location are presented in Table 1.

In general, the planned sample locations were biased towards areas where historic mining activities occurred (e.g., adit, waste material piles), areas that appeared more likely to have an impact due to the nature or size of the feature (e.g., potential land disturbance area or streambed), areas located immediately upstream and downstream of the mine sites. Any variations in sample collection

TDD 0004/1805-06

procedures identified in the project SAP are outlined in Section 3.2. A sample summary is included in Table 1 and presents the samples that were planned for collection versus the samples that were actually collected. A description of the sample collection methodologies for each feature and matrix is provided in the following sections.

3.1.1 Sample Identification

Samples were identified using a site-specific alpha-numeric identification scheme. As outlined in the SAP, the sample identification system is as follows (WESTON, 2019a):

[_]
1
[_]
2
[_]
3

Component 1 – Defines the investigation area Identification:

CD = C&D	ECT= Elkhorn Creek Tailings
UE = Union Elkhorn	GG = Greyback Gulch
THL = Trumley Heap Leach	SM = Elkhorn Skyline
BM = Boulaway	EQ = Elkhorn Queen

Component 2 – Defines sample type:

SW = Surface Water Sample
SD = Sediment Sample
WR = Waste Material Sample
SO = Soil Sample
BK = Background Sample
OP = Opportunity Sample

Component 3 – Indicates the sample number (two digits)

01 = The first sample collected

Duplicate samples were identified with unique alpha-numeric identification and noted in the field log book and Survey123. Any variations in sample nomenclature identified in the project SAP are outlined in Section 3.3.

3.2 SAMPLE COLLECTION

START conducted sample collection activities of surface water, sediment, waste material, and soil June 3- 5, 2019 and September 9-12, 2019 at the selected sites (Appendix B). Sample collection activities were conducted in modified Level D personal protective equipment in accordance with the approved project SAP (WESTON, 2019a). Any variations in sample collection activities are outlined in Section 3.2 and documented in the field logbooks in Appendix B.

Co-located grab surface water and sediment samples (including duplicates), 5-, 15, and 30-point composite soil and waste material samples (including duplicates), and background grab and 5-point composite soil samples (Table 1) were collected as described below (Figures 3-10 and Appendix B).

Surface water samples were submitted for laboratory analysis of total and dissolved Target Analyte List (TAL) metals (aluminum, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, sodium, thallium,

TDD 0004/1805-06

vanadium, and zinc), mercury, and cyanide (Trumley Heap Leach and Elkhorn Creek Tailings sites only) using EPA Method ISM02.4. All surface water samples were preserved with nitric acid. Acid was added incrementally to each sample and the pH measured with litmus paper until a sample pH ≤ 2 was reached. The sediment and composite samples were submitted to the laboratory for analysis of TAL metals and mercury using EPA Method ISM02.4. All samples were immediately stored in coolers on ice. All samples were shipped on ice accompanied by chain-of-custody to the CLP designated laboratory, Bonner Analytical Testing Company, in Hattiesburg, Missouri.

3.2.1 Surface Water Sampling

Prior to sample collection activities, surface water samples were field screened with a YSI 556 MPS or Horiba U-53 multi-parameter water quality meter to determine water quality parameters and results recorded in the field logbook and Survey123 for temperature, pH, conductivity, DO and ORP. The water quality meter probe was placed in the water body downstream of or far enough away from the sample collection point so as not to agitate sediments and allowed to sit until the readings stabilized. The readings were then recorded in the field logbook. Surface water quality measurement procedures followed the SOPs presented in the approved SAP (WESTON, 2019a).

Surface water samples were co-located with sediment samples and were collected from a total of 25 locations (six [6] from Elkhorn Creek, two [2] from Slaughterhouse Gulch, one [1] from the adit drainage at Union Elkhorn mine, two [2] from Greyback Gulch, four [4] from Turnley Creek, one [1] from adit drainage at Skyline mine, and nine [9] from Queen Gulch) as shown in Figures 3-10 and Appendix A. Sample collection began at the farthest downstream mine sites with one team starting at Elkhorn Creek Tailings and the second team starting at Elkhorn Queen mine and working upstream by drainage through the watershed. A total of six (6) source area-specific background surface water samples (ECT-SW-BK01, THL-SW-BK01, BM-SW-BK01, CD-SW-BK01, UE-SW-BK01, and SM-SW-BK01) were collected from the sites (Figures 3-8 and Appendix A).

Collection of surface water samples was accomplished by collecting a grab sample directly from the water body using the sample collection container and preserved as described above in Section 3.2. The dissolved samples were collected in certified clean containers and filtered directly into the sample bottle and preserved as described above in Section 3.2. Surface water samples were collected from 0-12 in. below the water surface. Surface water sampling procedures followed the SOPs presented in the approved SAP (WESTON, 2019a). All sampling equipment used for surface water sampling was disposable and/or single use and therefore no decontamination was required as described in the approved SAP (WESTON, 2019a).

3.2.2 Sediment Sampling

Discrete sediment samples were co-located with the surface water samples and were collected from a total of 24 locations (six [6] from Elkhorn Creek, two [2] from Slaughterhouse Gulch, two [2] from Greyback Gulch, four [4] from Turnley Creek, one [1] from adit drainage at Skyline mine, and eight [8] from Queen Gulch) as shown in Figures 3-10 and Appendix A. Sample collection began at the farthest downstream mine sites with one team starting at Elkhorn Creek Tailings and the second team starting at Elkhorn Queen mine and working upstream by drainage through the

TDD 0004/1805-06

watershed. A total of five (5) source area-specific sediment samples (ECT-SD-BK01, THL-SD-BK01, BM-SD-BK01, CD-SD-BK01, and UE-SD-BK01) were collected from the sites (Figures 3-8 and Appendix A).

Collection of the sediment samples was accomplished by collecting a discrete sample directly from the sediment using a disposable plastic scoop and placing the sediment into the sample container. Sediment samples were collected from 0-6 in. below the ground surface. Sediment sampling procedures followed the SOPs presented in the approved SAP (WESTON, 2019a). All sampling equipment used for sediment sampling was disposable and/or single use and therefore no decontamination was required as described in the approved SAP (WESTON, 2019a).

3.2.3 Waste Material Sampling

A three-step process was used to collect composite and discrete grab waste/soil samples to be submitted for laboratory analyses including:

1. In-situ XRF field screening - XRF field screening was conducted to assist in identifying ranges of key metals concentrations (e.g., arsenic and lead) for use in selecting representative areas of the waste pile with the highest reading(s) for grab sample collection. Field screening was conducted by placing the XRF instrument directly on the surface and recording the reading on the instrument. All metals results were recorded in the XRF instrument and/or log books and downloaded from the XRF post field activities.
2. Establishing Sample Aliquot Locations – 5-point composite samples were collected for small piles using a 5-on-dice composite pattern. For larger piles, linear transects were generated within the representative waste pile area and equally-spaced aliquot sample locations identified along each transect for a total of 15 (piles $\frac{1}{2}$ -acre or less) or 30 aliquots (piles greater than $\frac{1}{2}$ -acre). Locations were selected to characterize the entire pile.
3. Sample Collection – Waste material samples were collected from a total of 59 locations (14 from C & D mine, seven [7] from Elkhorn Creek Tailings, eight [8] from Union Elkhorn mine, two [2] from Trumley Heap Leach, eight [8] from Skyline mine, 12 from Boulaway mine, and eight [8] from Elkhorn Queen mine) as shown in Figures 3-10 and Appendix A. Waste composite samples were collected from 0-6 inches below the ground surface, which were homogenized into composite samples and submitted for laboratory analysis. Collection of the waste samples was accomplished by collecting aliquots directly from the waste pile using a disposable plastic scoop and placing the waste material into a 1-gallon zip-top plastic bag. Efforts to collect the same size aliquot at each location were made. The aliquots were homogenized in the bag and a plastic scoop was used to obtain a subsample from the bag, which was placed directly into the sample container. Discrete grab samples were collected by placing the sample directly into the sample container. Samples collected are shown in Figures 3-10 and Appendix A, Photos 3-6, 9-15, 20-30, 33, 34, 40, 41, 46-49, 52, 53, 55, 56, 60-78.

TDD 0004/1805-06

In addition, one (1) 5-point composite (BM-WR-OP-01) and one (1) discrete (BM-WR-OP-02) waste rock opportunity samples were collected from a waste pile at Boulaway mine that was visually different blue rock material than the piles adjacent to it (locations BM-WR-13/14 and BM-WR-17/18) (Figure 9 and Appendix A, Photo 47). The samples were collected as described above.

XRF field screening procedures and waste/soil sampling procedures followed the SOPs for the instrument and #2012 as presented in the approved SAP (WESTON, 2019a). All sampling equipment used for sediment sampling was disposable and/or single use and therefore no decontamination was required as described in the approved SAP (WESTON, 2019a).

3.2.4 Soil Sampling

5-point composite and discrete background soil samples were collected in a geologically similar area representative of the waste pile area, but outside the influence of mining activities (Figures 3-8 and Appendix A, Photos 13, 14, 21, 22, 29, 30, 52, 53, 62, 63, and 78).

In addition, one (1) discrete (ECT-SO-OP-01) soil opportunity sample was collected from the east side of Elkhorn Road (USFS Road 258) from the tailings impoundment (location ECT-WR-03/04) at Elkhorn Creek Tailings that was visually different than the piles adjacent to it (Figure 7 and Appendix A, Photo 35). The samples were collected as described above.

3.3 QUALITY CONTROL

Quality Control methods and samples used during this sampling event are discussed in the following sections and include field instrument calibration, equipment decontamination, and sample collection.

Field quality control samples were submitted to the laboratory for analysis of TAL metals, mercury, and cyanide using EPA Method ISM02.4. All samples were immediately stored in coolers on ice. All samples were shipped on ice, accompanied by chain-of-custody (Appendix C), overnight via FedEx to the CLP designated laboratory, Bonner Analytical Testing Company, in Hattiesburg, Missouri. Field quality control samples submitted for laboratory analysis for each media are discussed in the following sections.

3.3.1 Field Instrument Calibration

Field instrument calibration occurred at the beginning of each sampling day (YSI or Horiba water quality meters) or prior to sample collection activities (XRF) and procedures followed the SOPs presented in the approved SAP (WESTON, 2019a). All calibration results were recorded in the field logbook (Appendix B).

3.3.2 Decontamination Methods

All sampling equipment used for surface water, sediment, and waste material sampling was new, certified pre-cleaned, disposable and/or single use and therefore, no decontamination was required as described in the approved SAP (WESTON, 2019a).

3.3.3 Field Duplicates

A total of three (3) co-located surface water/sediment (ECT-SW/SD-05 [duplicate of ECT-SW/SD-03], UE-SW/SD-03 [duplicate of UE-SW/SD-01], and THL-SW/SD-04 [duplicate of THL-SW/SD-01] duplicate samples were collected during each sampling event on one (1) co-located surface water/sediment sample was collected from adit drainage at Skyline mine (SM-SW/SD-05 (duplicate of SM-SW/SD-02) during the September 2019 sampling event. Surface water, sediment, and waste material field duplicates were collected and submitted for analysis of total and dissolved (surface water only) TAL metals, mercury, and cyanide (Elkhorn Creek Tailings and Trumley Heap Leach sites only). Field duplicate samples are used to assess field precision.

3.3.4 Matrix Spike (MS)/Matrix Spike Duplicates (MSD)

Two (2) surface water (ECT-SW-04 and THL-SW-03), one (1) sediment (UE-SD-01), six (6) waste material (CD-WR-11, CD-WR-12, THL-WR-01, UE-WR-02, SM-WR-07, and SM-WR-08), and four (4) soil (CD-SO-BK-01, CD-SO-BK02, SM-SO-BK01 and SM-SO-BK02) samples were collected and analyzed for MS/MSD analysis of total and dissolved (surface water only) TAL metals, mercury, and cyanide (Elkhorn Creek Tailings and Trumley Heap Leach sites only). The recoveries of the spiked analytes are used to assess accuracy within a given matrix. Comparison of the MS to the MSD is used to assess precision within a given matrix.

3.3.5 Equipment Blanks

Equipment blanks were not collected as part of this investigation. Only disposable/one time use sampling equipment was used and therefore, equipment blanks were not required to be collected.

3.3.6 Field Blanks

Five (5) field blanks (FB-01 through FB-04) were collected and submitted for analysis of total and dissolved TAL metals and mercury. Field blank samples are used to identify errors or contamination in sample handling, collection, and analysis.

3.3.7 Trip Blanks

Trip blanks were not collected as part of this investigation. They are used to identify errors or contamination in sample handling, collection, and analysis of volatile organic compounds; no samples were collected for volatile organic compound analysis as part of this investigation.

TDD 0004/1805-06

3.3.8 Data Validation

All laboratory data packages were verified and validated using a Stage 2b validation, as described in the: Quality Assurance Project Plan (QAPP) for Region 8 Comprehensive Environmental Response, CERCLA Site Assessment in Colorado, Utah, Wyoming, Montana, North Dakota, and South Dakota (September 2015); EPA Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use (February 2009) (QAPP, Appendix N); Sampling and Analysis Plan for C&D Mine, Elkhorn Creek Tailings, Union Elkhorn Mine, Trumley Heap Leach, Skyline Mine, Boulaway Mine, Elkhorn Queen Mine, Jefferson County, Montana (May 2019); EPA CLP Statement of Work for Inorganic Superfund Methods, ISM02.4 (October 2016); National Functional Guidelines for Inorganic Superfund Data Review (January 2017). Laboratory analytical and data validation reports are provided in Appendix C.

TDD 0004/1805-06

4.0 DEVIATIONS FROM THE SAMPLING PLAN

During the June 2019 field effort, the following deviations were made from the original SAP:

1. The co-located surface water and sediment samples (ECT-SW/SD-02) planned to be collected from Elkhorn Creek at the Elkhorn Creek Tailings site were not collected due to the location of samples ECT-SW/SD-03 being representative of the most downstream probable point of entry and within the wetland area.
2. The co-located surface water and sediment samples (UE-SW/SD-02) planned to be collected from Slaughterhouse Gulch at the Union Elkhorn mine were not collected due to access issues. START attempted to access the sample location from the east side of the mountain, but was unable to due to steep terrain.
3. The surface water MS/MSD sample (UE-SW-01) planned to be collected from Slaughterhouse Gulch at the Union Elkhorn mine were inadvertently not collected.
4. The co-located surface water and sediment samples (GG-SW/SD-01 and GG-SW/SD-01) planned to be collected from Greyback Gulch were not collected during the June 2019 sampling event due to access issues.
5. The 5-point composite soil samples (THL-SO-01/02 and duplicates THL-SO-03/04) planned to be collected from Trumley Heap Leach were not collected due no observable material difference or definable area designated for sample collection present per the EPA SAM. The surface soil in the area proposed was collected and included as part of the 30-point composite waste material sample (THL-WR-01).
6. The waste material samples (BM-WR-01 through BM-WR-08 and BM-WR-11/12) planned to be collected from Boulaway mine were not collected due to low XRF readings for lead and/or metals per the direction of the EPA liaison.
7. The waste material samples (BM-WR-09/10) planned to be collected from Boulaway mine were not collected due to the absence of a waste material pile. Pile was observed to be road cut overburden and not mining waste.
8. The proposed 5-point composite sample (BM-WR-17 and duplicate BM-WR-19) to be collected from the waste rock pile (location BM-WR-17/18) at Boulaway mine was changed to a 15-point composite sample due to a larger pile size than anticipated.
9. The background co-located surface water and sediment samples (EQ-SW/SD-BK01) planned to be collected from South Fork Queen Gulch near the Elkhorn Queen mine were not collected due to no observable creek bed, surface water or sediment present.
10. The co-located surface water and sediment samples (EQ-SW/SD-02) planned to be collected from South Fork Queen Gulch near the Elkhorn Queen mine were not collected due to no observable creek bed, surface water or sediment present.
11. The proposed 15-point composite sample (EQ-WR-05) to be collected from the waste rock pile (location EQ-WR-05/06) at Elkhorn Queen mine was changed to a 5-point composite sample per the EPA SAM due to a smaller pile size than anticipated.
12. The samples planned to be collected from Skyline mine were not collected due to snowpack that would prevent sample collection activities and accessibility during the June 2019

TDD 0004/1805-06

sampling event. This decision was made prior to mobilization by the EPA SAM in correspondence with the MT DEQ and USFS.

13. The duplicate soil samples (THL-SO-03 and THL-SO-04) planned to be collected from the Trumley Heap Leach site were not collected due the parent samples not being collected per the EPA SAM. Alternate duplicate soil samples were inadvertently not collected.
14. Proposed duplicate and MS/MSD samples to be collected at Skyline Mine during the June 2019 sampling event were reassigned to other sites due to inaccessibility. The following changes were made:
 - Waste material MS/MSDs were assigned to CD-WR-11/12.
 - Soil MS/MSDs were assigned to CD-SO-BK01/02.
 - Co-located surface water and sediment MS/MSDs were assigned to ECT-SW/SD-04. The laboratory did not conduct MS/MSD analysis on ECT-SD-04.
 - Co-located surface water and sediment duplicate samples (THL-SW/SD-04) were collected at sample location THL-SW/SD-01.
 - Surface water MS/MSDs were assigned to THL-SW-03.
 - Co-located surface water and sediment MS/MSDs were assigned to UE-SW/SD-01. The surface water MS/MSD was inadvertently not collected.
 - Waste material duplicate samples were collected at sample location UE-WR-05/06.

During the September 2019 field effort, the following deviations were made from the original SAP:

1. Co-located surface water/sediment sample GG-SW/SD-01 was moved downstream to a location just upstream of the mill site due to access issues for the mine complex.
2. Co-located surface water/sediment sample GG-SW/SD-02 was moved to an unnamed creek just above the confluence with Greyback Gulch to assess any contributions to Greyback Gulch.
3. Co-located surface water/sediment sample GG-SW/SD-03 was moved in Greyback Gulch to below the confluence with the unnamed creek and downstream of the most downstream probably point of entry for the mill site.
4. Surface water samples CD-SW-BK01 and CD-SW-01 were not collected during the September 2019 sampling event due to the absence of water in Elkhorn Creek at those locations.
5. Sample UE-SW-04 was not collected from the adit during the September 2019 sampling event due to an absence of draining water from the pipe or adit.
6. The background sediment sample (SM-SD-BK01) planned to be collected from the headwaters of Queen Gulch was not collected due to the surface water location being a spring that daylights from a rock face.
7. The surface water MS/MSD samples planned for SM-SW-03 were inadvertently not collected.

TDD 0004/1805-06

8. The waste material samples (SM-WR-01/02) planned to be collected from Skyline mine were not collected due to the material being the same as that collected for samples SM-WR-03/04.
9. Duplicate samples SM-WR-09/10 were inadvertently switched: SM-WR-09 is a duplicate of SM-WR-06 and SM-WR-10 is a duplicate of SM-WR-05.

TDD 0004/1805-06

5.0 FIELD OBSERVATIONS

The following observations were made during the field sampling activities and reconnaissance of the areas surrounding the sites.

- The sites in general are accessible to any persons and some are heavily recreated. Vehicle access to the sites generally requires high-clearance four-wheel drive vehicles to navigate the muddy, rutted tracks and large rocks on the forest roads. Elkhorn Creek Tailings, Trumley Heap Leach, and Boulaway mine are easily accessible with a standard clearance vehicle. Access is made increasingly difficult with precipitation events. No evidence of stressed vegetation was observed at any of the sites or any locations visited downstream of the sites.
- Evidence of heavy recreational use (UTVs, camping, fishing, hunting, etc.), especially at Elkhorn Creek Tailings, was observed throughout the most of the investigation area with decreasing use observed as elevation increased. Campfire rings were observed on the waste piles at Boulaway (Appendix A, Photo 48) and Union Elkhorn mines, children's footprints were observed in the tailings pile at Elkhorn Creek Tailings, shooting targets and firing points were observed at Trumley Heap Leach (Appendix A, Photo 27), and hunters were encountered at the cabin at Skyline mine.
- A mining claim marker was observed near the background soil sample location for CD-SO-BK01/02 at the C&D mine. Claim number was illegible (Appendix A, Photo 57).
- Evidence of wildlife (scat) including large game animals such as deer were observed at numerous locations throughout the subwatershed during sampling activities. During the September 2019 sampling activities, a black bear (at Elkhorn Queen), a moose (off the side of USFS Road 8578 to the Skyline Mine), deer, and cattle were observed onsite by START.
- In general, all streambeds sampled exhibited a gravelly, rocky streambed with sediment-filled depositional zones and clear water. South Fork Queen Gulch was observed to have potentially intermittent or seasonal flow, as it was dry and no obvious streambed was observed during sampling activities (Appendix A, Photos 2, 7, 8, 16-19, 31, 32, 35-39, 42-45, 50, 51, 54, 58, 59, 79-82). Stream banks at all locations were observed to be thickly vegetated with grasses and shrubs characteristic of the Rocky Mountains with small non-vegetated areas at Elkhorn Creek Tailings due to recreational use (Appendix A, Photo 25).
- The sample collected from the pipe exiting the adit at the Union Elkhorn mine was observed to be clear and the flow was low (<1 gallon per minute) (Appendix A, Photo 1). The drainage absorbed into the waste rock pile within a few feet of discharge from the pipe.
- The mine complex did not appear to be operating during either 2019 sampling events.

TDD 0004/1805-06

6.0 REFERENCES

Bureau of Land Management (BLM), 2020. LR200 Public Reports. Reporting Application. Accessed January 13 and 14, 2020. 6 pages.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
BLM, 2020	Database	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

EPA, 1993. *Region 8 Supplement to Guidance for Performing Site Inspections under CERCLA*. OSWER. February 1993.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
EPA, 1993	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

EPA, 1992. *Guidance for Performing Site Inspections Under CERCLA, Interim Final*. OSWER. Directive 9345.1-05. EPA540-R-92-021. September 1992.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
EPA, 1992	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

Weston Solutions, Inc. (WESTON), 2019. *Sampling and Analysis Plan for C&D Mine, Elkhorn Creek Tailings, Union Elkhorn Mine, Trumley Heap Leach, Skyline Mine, Boulaway Mine, Elkhorn Queen Mine, Jefferson County, Montana*. May 2019.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
WESTON, 2019a	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

WESTON, 2019. *Quality Assurance Project Plan for U.S. EPA Region 8 CERCLA Site Assessment, Revision 2*. May 2019.

Citation	Reference Type	Assessment Factor				
		Soundness	Applicability and Utility	Clarity and Completeness	Uncertainty and Variability	Evaluation and Review
WESTON, 2019b	Document	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

TDD 0004/1805-06

TABLES

Sample Location, Description, and Information
Site Inspection
Elkhorn Mining District

Table 1

Sample ID	Geographical Coordinates UTM		Location Description	Matrix	Depth	Sample Type	Measurements/ Analyses
	Zone 12 (WGS 84)						
	Latitude	Longitude					
C&D Mine							
CD-SW-BK01	46.278616	-111.939645	Elkhorn Creek above confluence with the overland flow probable point of entry	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
CD-SD-BK01				Sediment	0-6 in.	Grab	
CD-SW-01	46.277302	-111.940962	Elkhorn Creek below confluence with the overland flow probable point of entry	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
CD-SD-01				Sediment	0-6 in.	Grab	
CD-SO-BK01	46.290125	-111.933542	Background soil	Surface Soil	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
CD-SO-BK02	46.290044	-111.933925	Background soil	Surface Soil	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
CD-WR-01	46.288632	-111.934086	Waste material pile	Tailings	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
CD-WR-02	46.288618	-111.933975	Waste material pile	Tailings	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
CD-WR-03	46.28856829	-111.9342211	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
CD-WR-04	46.288563	-111.93428	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
CD-WR-05	46.288527	-111.934102	Waste material pile	Tailings	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
CD-WR-06	46.28854448	-111.9340351	Waste material pile	Tailings	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
CD-WR-07	46.2885602	-111.9345337	Waste material pile	Tailings	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
CD-WR-08	46.288491	-111.93461	Waste material pile	Tailings	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
CD-WR-09	46.288408	-111.934194	Waste material pile	Tailings	0-6 in.	15-Point Composite	XRF field screening, TAL Metals and Mercury
CD-WR-10	46.28840952	-111.9341937	Waste material pile	Tailings	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
CD-WR-11	46.289162	-111.934497	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
CD-WR-12	46.28906	-111.934503	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
CD-WR-13	46.289162	-111.934497	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
CD-WR-14	46.28906	-111.934503	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
Elkhorn Creek Tailings							
ECT-SW-BK01	46.27018	-111.953128	Source area-specific background location in Elkhorn Creek	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, Mercury, and Cyanide
ECT-SD-BK01	46.270189	-111.953175		Sediment	0-6 in.		
ECT-SW-01	46.268601	-111.955016	Elkhorn Creek at most downstream probable point of entry of waste pile	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, Mercury, and Cyanide
ECT-SD-01	46.268727	-111.954819		Sediment	0-6 in.		
ECT-SW-02	46.264029	-111.956291	Elkhorn Creek at most downstream probable point of entry of waste pile	Surface Water	0-12 in.	Grab	Removed from Sampling
ECT-SD-02				Sediment	0-6 in.		
ECT-SW-03	46.263794	-111.956482	Elkhorn Creek at most downstream point within the wetland area	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, Mercury, and Cyanide
ECT-SD-03				Sediment	0-6 in.		
ECT-SW-04	46.261148	-111.957131	Elkhorn Creek at 1/10-mile inside of the wetland area	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, Mercury, and Cyanide
ECT-SD-04				Sediment	0-6 in.		
ECT-SW-05	46.263794	-111.956482	Elkhorn Creek at most downstream point within the wetland area	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, Mercury, and Cyanide
ECT-SD-05				Sediment	0-6 in.		
ECT-SO-BK01	46.267664	-111.95572	Background soil	Surface Soil	0-6 in.	5-Point Composite	XRF field screening, TAL Metals, Mercury and Cyanide
ECT-SO-OP-01	46.266639	-111.955519	East side of Elkhorn Creek Road across from Elkhorn Creek Tailings impoundment	Surface Soil	0-6 in.	Grab	XRF field screening, TAL Metals, Mercury and Cyanide
ECT-WR-01	46.269144	-111.954139	Waste material pile	Tailings	0-6 in.	30-Point Composite	XRF field screening, TAL Metals, Mercury and Cyanide
ECT-WR-02	46.269144	-111.954139	Waste material pile	Tailings	0-6 in.	Grab	XRF field screening, TAL Metals, Mercury and Cyanide
ECT-WR-03	46.266474	-111.957065	Waste material pile	Tailings	0-6 in.	30-Point Composite	XRF field screening, TAL Metals, Mercury and Cyanide
ECT-WR-04	46.266474	-111.957065	Waste material pile	Tailings	0-6 in.	Grab	XRF field screening, TAL Metals, Mercury and Cyanide
ECT-WR-05	46.264529	-111.957177	Waste material pile	Tailings	0-6 in.	30-Point Composite	XRF field screening, TAL Metals, Mercury and Cyanide
ECT-WR-06	46.264529	-111.957177	Waste material pile	Tailings	0-6 in.	Grab	XRF field screening, TAL Metals, Mercury and Cyanide
Union Elkhorn Mine							
UE-SW-BK01	46.29157	-111.942324	Source area-specific background location in Slaughterhouse Gulch	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
UE-SD-BK01				Sediment	0-6 in.		
UE-SW-01	46.290928	-111.942629	Slaughterhouse Gulch at most downstream probable point of entry of waste pile	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
UE-SD-01				Sediment	0-6 in.		
UE-SW-02	46.284274	-111.946033	Slaughterhouse Gulch at 1/10-mile inside of the wetland area	Surface Water	0-12 in.	Grab	Not Collected
UE-SD-02				Sediment	0-6 in.		
UE-SW-03	46.290928	-111.942629	Slaughterhouse Gulch at most downstream probable point of entry of waste pile	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
UE-SD-03				Sediment	0-6 in.		
UE-SW-04	46.291487	-111.942844	Drainage from pipe exiting adit	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
UE-SD-04				Sediment	0-6 in.		
UE-SO-BK01	46.291388	-111.942589	Background soil	Surface Soil	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
UE-WR-01	46.291488	-111.943259	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
UE-WR-02	46.291488	-111.943259	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury

Sample Location, Description, and Information
Site Inspection
Elkhorn Mining District

Table 1

Sample ID	Geographical Coordinates UTM Zone 12 (WGS 84)		Location Description	Matrix	Depth	Sample Type	Measurements/ Analyses
	Latitude	Longitude					
UE-WR-03	46.291424	-111.943204	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
UE-WR-04	46.291424	-111.943204	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
UE-WR-05	46.291188	-111.942509	Waste material pile	Waste Material	0-6 in.	15-Point Composite	XRF field screening, TAL Metals and Mercury
UE-WR-06	46.291379	-111.942789	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
UE-WR-07	46.291188	-111.942509	Waste material pile	Waste Material	0-6 in.	15-Point Composite	XRF field screening, TAL Metals and Mercury
UE-WR-08	46.291379	-111.942789	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
Greyback Gulch							
GG-SW-01	46.280903	-111.9688143	Source area-specific background location in Greyback Gulch	Surface Water	0-12 in.	Grab	TAL Metals and Mercury
GG-SD-01				Sediment	0-6 in.		TAL Metals and Mercury
GG-SW-02	46.2806055	-111.9700887	Unnamed creek just above confluence with Greyback Gulch	Surface Water	0-12 in.	Grab	TAL Metals and Mercury
GG-SD-02				Sediment	0-6 in.		TAL Metals and Mercury
GG-SW-03	46.2795906	-111.9716078	Greyback Gulch downstream of mill site and confluence with unnamed creek	Surface Water	0-12 in.	Grab	TAL Metals and Mercury
GG-SD-03				Sediment	0-6 in.		TAL Metals and Mercury
Trumley Heap							
THL-SW-BK01	46.27137	-111.973545	Source area-specific background location in Turnley Creek	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, Mercury, and Cyanide
THL-SD-BK01	46.271488	-111.97363		Sediment	0-6 in.		
THL-SW-01	46.270399	-111.970333	Turnley Creek at most downstream probable point of entry of the site	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, Mercury, and Cyanide
THL-SD-01	46.270399	-111.970333		Sediment	0-6 in.		
THL-SW-02	46.268929	-111.96869	Turnley Creek at 1/10-mile downstream of the most probably point of entry	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, Mercury, and Cyanide
THL-SD-02	46.269006	-111.968522		Sediment	0-6 in.		
THL-SW-03	46.258049	-111.962853	Turnley Creek just above the confluence with Elkhorn Creek	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, Mercury, and Cyanide
THL-SD-03	46.258049	-111.962853		Sediment	0-6 in.		
THL-SW-04	46.270399	-111.970333	Turnley Creek at most downstream probable point of entry of the site	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, Mercury, and Cyanide
THL-SD-04	46.270399	-111.970333		Sediment	0-6 in.		
THL-SO-BK01	46.268575	-111.973816	Background soil	Surface Soil	0-6 in.	Grab	XRF field screening, TAL Metals, Mercury and Cyanide
THL-SO-BK02	46.268592	-111.973825	Background soil	Surface Soil	0-6 in.	5-Point Composite	XRF field screening, TAL Metals, Mercury and Cyanide
THL-WR-01	46.269852	-111.971261	Waste material pile	Surface Soil	0-6 in.	30-Point Composite	XRF field screening, TAL Metals, Mercury and Cyanide
THL-WR-02	46.268966	-111.972193	Waste material pile	Surface Soil	0-6 in.	Grab	XRF field screening, TAL Metals, Mercury and Cyanide
Skyline Mine							
SM-SW-BK01	46.290586	-111.889397	Background location in headwaters of Queen Gulch	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
SM-SD-BK01				Sediment	0-6 in.		Not Collected
SM-SW-01	46.289477	-111.889447	Queen Gulch just above confluence with adit drainage	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
SM-SD-01				Sediment	0-6 in.		
SM-SW-02	46.2894854	-111.8893747	Adit drainage	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
SM-SD-02				Sediment	0-6 in.		
SM-SW-03	46.288662	-111.8892271	Queen Gulch at most downstream probable point of entry of adit drainage and waste pile	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
SM-SD-03				Sediment	0-6 in.		
SM-SW-04	46.2863275	-11.8846364	Leslie Lake at inlet	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
SM-SD-04				Sediment	0-6 in.		
SM-SW-05	46.2894854	-111.8893747	Adit drainage	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
SM-SD-05				Sediment	0-6 in.		
SM-SO-BK01	46.290419	-111.888679	Background soil	Surface Soil	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
SM-SO-BK02			Background soil	Surface Soil	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
SM-WR-01	46.290535	-111.889015	Waste material pile	Waste Material	0-6 in.	5-Point Composite	Not Collected
SM-WR-02						Grab	
SM-WR-03	46.290077	-111.889259	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
SM-WR-04	46.29012	-111.889259	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
SM-WR-05	46.29022497	-111.8890222	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
SM-WR-06	46.290109	-111.889094	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
SM-WR-07	46.289639	-111.889332	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
SM-WR-08	46.289559	-111.889258	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
SM-WR-09	46.290109	-111.889094	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
SM-WR-10	46.29022497	-111.8890222	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
Boulaway Mine							
BM-SW-BK01	46.260806	-111.945669	Source area-specific background location in Queen Gulch	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
BM-SD-BK01	46.260806	-111.945669		Sediment	0-6 in.		
BM-SW-01	46.259454	-111.948565	Queen Gulch at most downstream probable point of entry of waste pile	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
BM-SD-01	46.259454	-111.948565		Sediment	0-6 in.		

Sample Location, Description, and Information
Site Inspection
Elkhorn Mining District

Table 1

Sample ID	Geographical Coordinates UTM Zone 12 (WGS 84)		Location Description	Matrix	Depth	Sample Type	Measurements/ Analyses
	Latitude	Longitude					
BM-SW-02	46.257224	-111.950699	Queen Gulch at 1/10-mile inside of the wetland area	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
BM-SD-02	46.257224	-111.950699		Sediment	0-6 in.		
BM-SO-BK01	46.260861	-111.944363	Background soil	Surface Soil	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
BM-SO-BK02	46.260876	-111.944387	Background soil	Surface Soil	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
BM-WR-01	46.261832	-111.949063	Waste material pile	Waste Material	0-6 in.	5-Point Composite	Not Collected
BM-WR-02			Waste material pile	Waste Material	0-6 in.	Grab	
BM-WR-03	46.261349	-111.94858	Waste material pile	Waste Material	0-6 in.	5-Point Composite	Not Collected
BM-WR-04			Waste material pile	Waste Material	0-6 in.	Grab	
BM-WR-05	46.260953	-111.948634	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
BM-WR-06	46.260953	-111.948678	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
BM-WR-07	46.260518	-111.948306	Waste material pile	Waste Material	0-6 in.	15-Point Composite	Not Collected
BM-WR-08			Waste material pile	Waste Material	0-6 in.	Grab	
BM-WR-09	46.259071	-111.949294	Waste material pile	Waste Material	0-6 in.	15-Point Composite	Not Collected
BM-WR-10			Waste material pile	Waste Material	0-6 in.	Grab	
BM-WR-11	46.259702	-111.948839	Waste material pile	Waste Material	0-6 in.	5-Point Composite	Not Collected
BM-WR-12			Waste material pile	Waste Material	0-6 in.	Grab	
BM-WR-13	46.260072	-111.948323	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
BM-WR-14	46.260074	-111.948269	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
BM-WR-15	46.260152	-111.948072	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
BM-WR-16	46.260152	-111.948072	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
BM-WR-17	46.259786	-111.948286	Waste material pile	Waste Material	0-6 in.	15-Point Composite	XRF field screening, TAL Metals and Mercury
BM-WR-18	46.259786	-111.948286	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
BM-WR-19	46.259786	-111.948286	Waste material pile	Waste Material	0-6 in.	15-Point Composite	XRF field screening, TAL Metals and Mercury
BM-WR-20	46.259786	-111.948286	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
BM-WR-OP-01	46.25994	-111.948351	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
BM-WR-OP-02	46.25993973	-111.9483509	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
Elkhorn Queen							
EQ-SW-BK01	46.24503	-111.939022	Source area-specific background location in South Fork Queen Gulch	Surface Water	0-12 in.	Grab	Not Collected
EQ-SD-BK01				Sediment	0-6 in.		
EQ-SW-01	46.253542	-111.955422	Queen Gulch just above confluence with South Fork Queen Gulch	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
EQ-SD-01	46.253748	-111.955078		Sediment	0-6 in.		
EQ-SW-02	46.252679	-111.956012	South Fork Queen Gulch just above confluence with Queen Gulch	Surface Water	0-12 in.	Grab	Not Collected
EQ-SD-02				Sediment	0-6 in.		
EQ-SW-03	46.252735	-111.956748	Queen Gulch just below confluence with South Fork Queen Gulch	Surface Water	0-12 in.	Grab	Field parameters ¹ , water quality ² , TAL Metals, and Mercury
EQ-SD-03	46.252721	-111.956727		Sediment	0-6 in.		
EQ-SO-BK01	46.246018	-111.946096	Background soil	Surface Soil	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
EQ-SO-BK02	46.245992	-111.946026	Background soil	Surface Soil	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
EQ-WR-01	46.272764	-111.949761	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
EQ-WR-02	46.246642	-111.946299	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
EQ-WR-03	46.246476	-111.946628	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
EQ-WR-04	46.246574	-111.946646	Waste material pile	Tailings	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
EQ-WR-05	46.246801	-111.946472	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
EQ-WR-06	46.246767	-111.946411	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury
EQ-WR-07	46.247809	-111.946841	Waste material pile	Waste Material	0-6 in.	5-Point Composite	XRF field screening, TAL Metals and Mercury
EQ-WR-08	46.247829	-111.946799	Waste material pile	Waste Material	0-6 in.	Grab	XRF field screening, TAL Metals and Mercury

ID - Identification

in. - inches

TAL - Target Analyte List

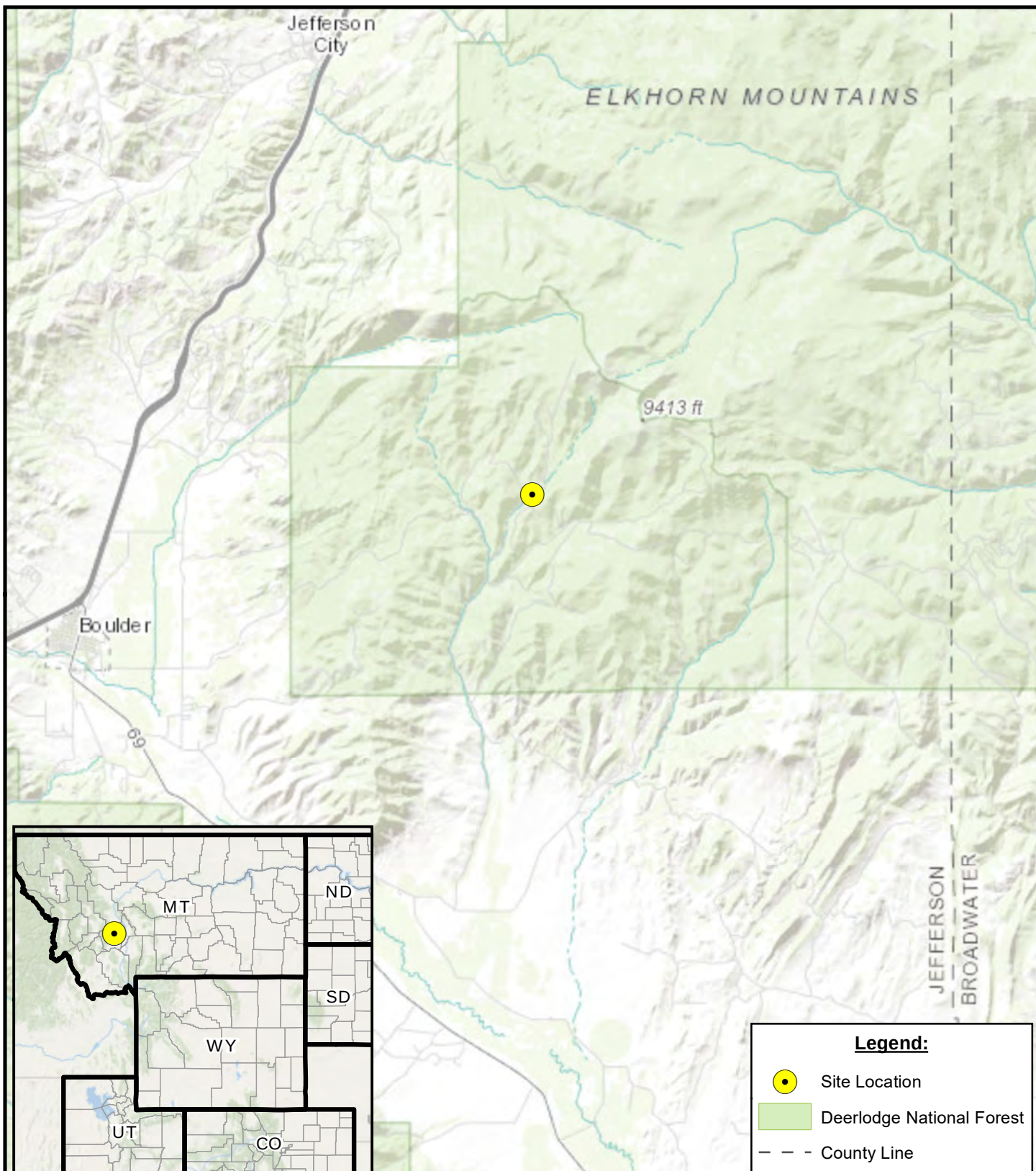
UTM - Universal Transverse Mercator coordinate system

WGS - World Geodetic System

¹ Field Parameters: temperature, conductivity, pH, dissolved oxygen, oxygen reduction potential

² Water Quality – total and dissolved metals

FIGURES



Legend:

- Site Location
- Deerlodge National Forest
- - - County Line

Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
 Projection: Mercator Auxiliary Sphere
 Datum: WGS 1984

Source:
 Background: ESRI USA Topo Maps (2017)

0 2 4 8 Miles



Prepared for:
 U.S. EPA - Region 8



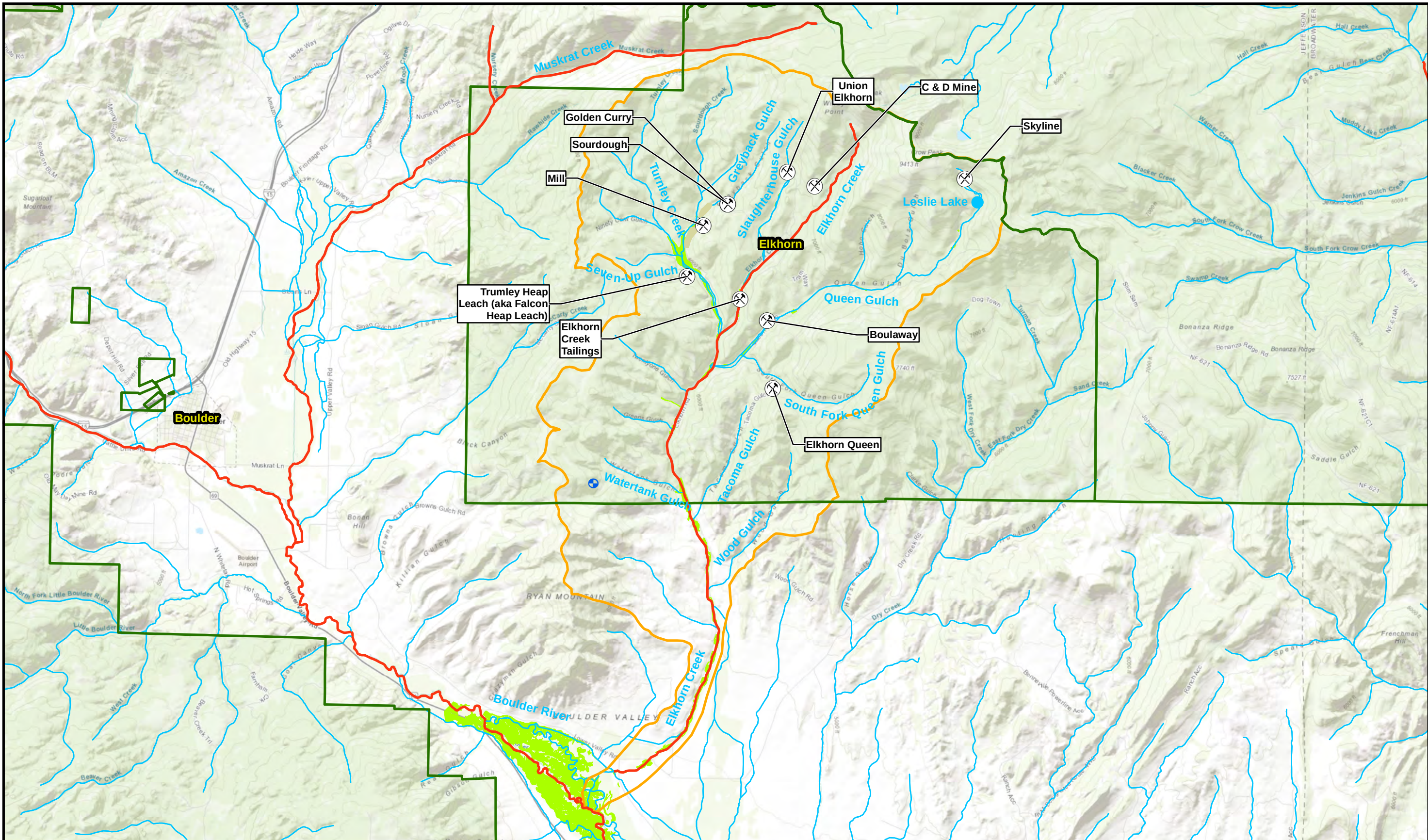
Contract: EP-S8-13-01
 TO/TDD: 0004/1807-06

Prepared By:
 Weston Solutions, Inc.
 START IV
 Suite 100
 1435 Garrison St.
 Lakewood, CO



FIGURE 1
INVESTIGATION AREA LOCATION MAP
ELKHORN MINING DISTRICT
SITE INSPECTION
JEFFERSON COUNTY, MONTANA

Date: 2/11/2020

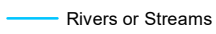
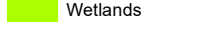


Coordinate System: NAD 1983 UTM Zone 12N
Projection: Transverse Mercator
Datum: North American 1983
Source:
303(d) Listed Impaired Waters: EPA ATTAINS (2010)
Public Water Supply: GWIC (2017)
Rivers, Site Boundary: USGS NHD (2019)
National Forest Boundary: HSIP (2015)
Wetlands: US NWI Wetlands (2020)
Background: ESRI World Topographic Map (2019)
Mine Sites: Weston GPS (2017) *Access to Sourdough, Mill and Golden Curry mines were not accessible but the surface waters above and below these sites were evaluated to assess for potential impacts

0 0.75 1.5 3 Miles

N

Legend

-  Mine Sites
-  Waterbody
-  Public Supply Well
-  303(d) Listed Impaired Waters
-  National Forest Boundary
-  Elkhorn Creek Subwatershed Boundary
-  Rivers or Streams
-  Wetlands

Prepared for:
U.S. EPA - Region 8

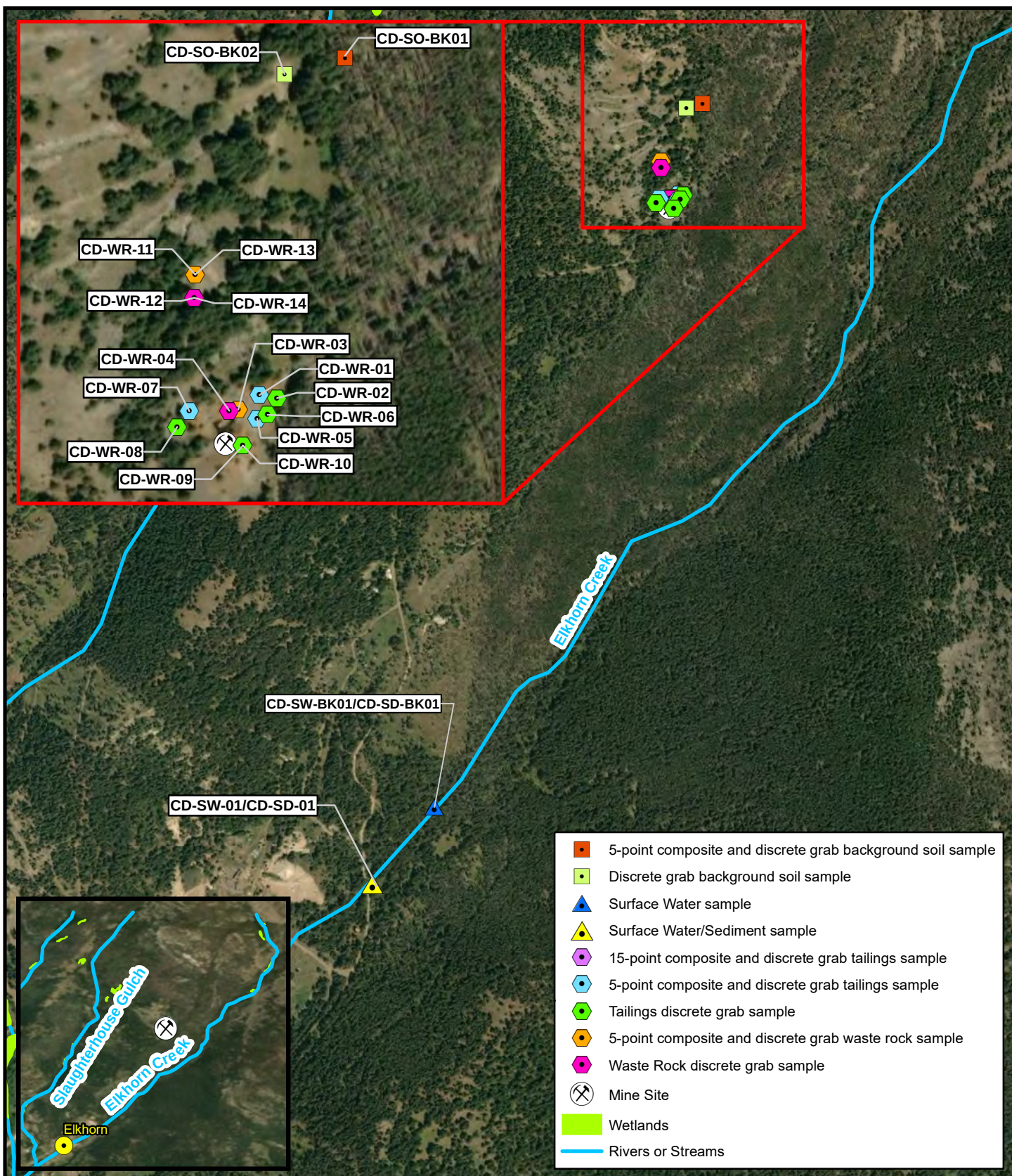
Contract: EP-S8-13-01
TO/TDD: 0004/1807-06

Prepared By:
Weston Solutions, Inc.
START IV
Suite 100
1435 Garrison St.
Lakewood, CO



FIGURE 2
INVESTIGATION AREA VICINITY
ELKHORN MINING DISTRICT SITE INSPECTION
JEFFERSON COUNTY, MONTANA

Date: 6/4/2020



Coordinate System: NAD 1983 UTM Zone 12N
 Projection: Transverse Mercator
 Datum: North American 1983
 Units: Meter

Source:

Mine Sites: Weston GPS (2019)
 Rivers, Site Boundary: USGS NHD (2019)
 Wetlands: US NWI Wetlands (2020)
 Background: ESRI World Imagery (2019)

0 360 720 1,440 Feet



Prepared for:
 U.S. EPA - Region 8

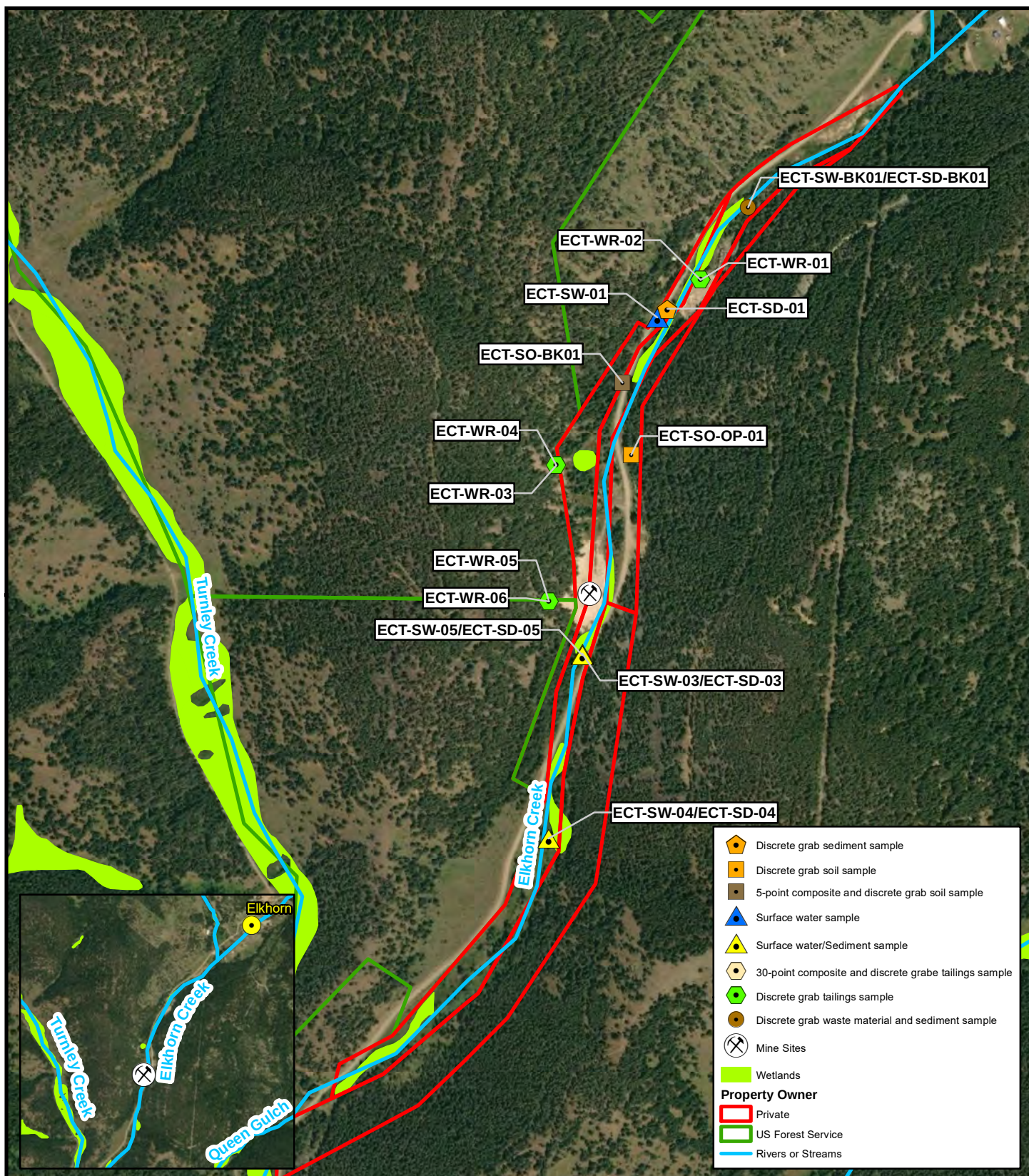
Contract: EP-S8-13-01
 TO/TDD: 0004/1807-06

Prepared By:
 Weston Solutions, Inc.
 START IV
 Suite 100
 1435 Garrison St.
 Lakewood, CO



FIGURE 3
C & D MINE
SAMPLE LOCATIONS MAP
ELKHORN MINING DISTRICT
SITE INSPECTION
JEFFERSON COUNTY, MONTANA

Date: 5/1/2020



Coordinate System: NAD 1983 UTM Zone 12N
 Projection: Transverse Mercator
 Datum: North American 1983
 Units: Meter

Source:
 Mine Sites: Weston GPS (2019)
 Rivers, Site Boundary: USGS NHD (2019)
 Wetlands: US NWI Wetlands (2020)
 Background: ESRI World Imagery (2019)

0 360 720 1,440 Feet



Prepared for:
 U.S. EPA - Region 8

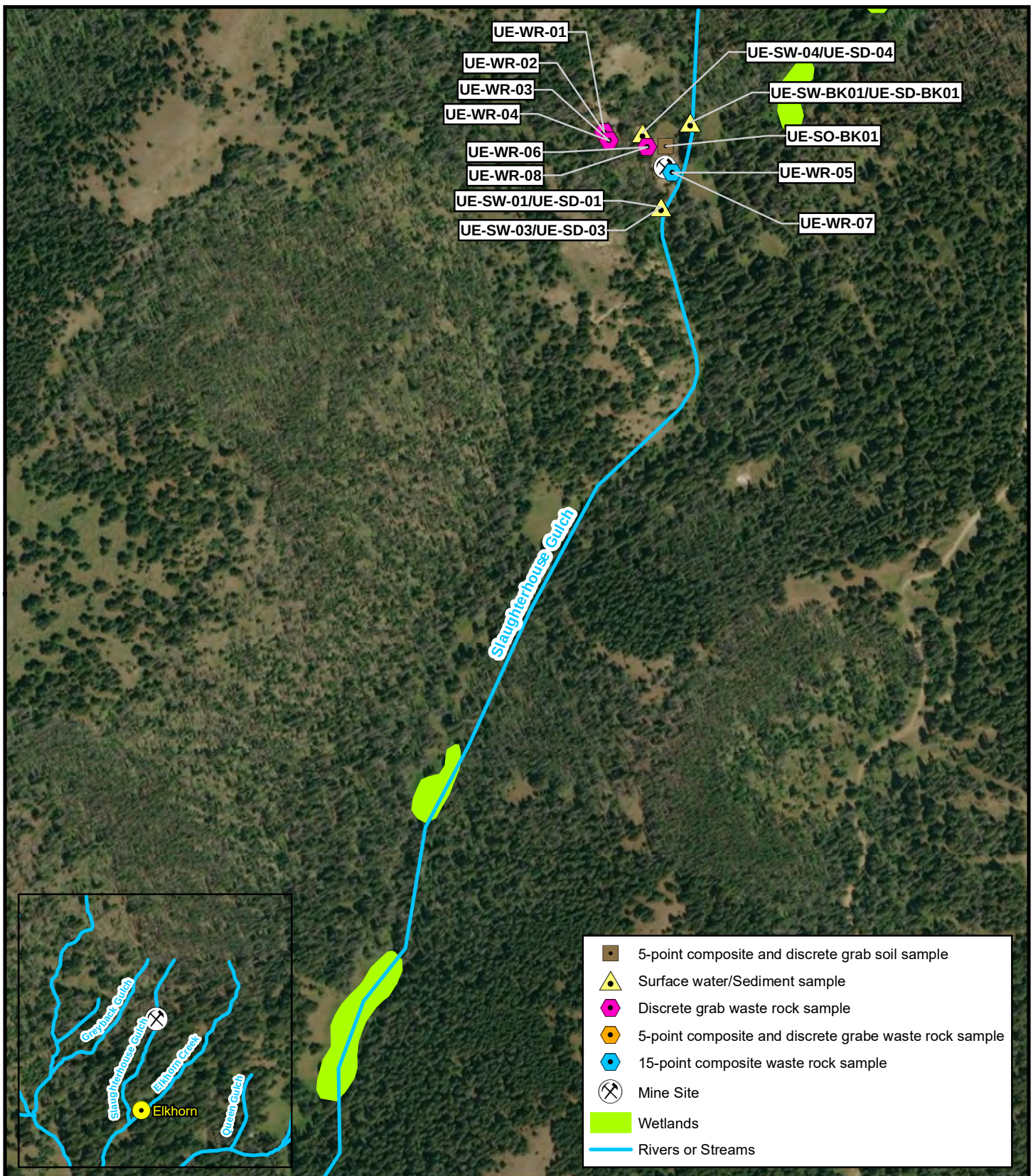
Contract: EP-S8-13-01
 TO/TDD: 0004/1807-06

Prepared By:
 Weston Solutions, Inc.
 START IV
 Suite 100
 1435 Garrison St.
 Lakewood, CO

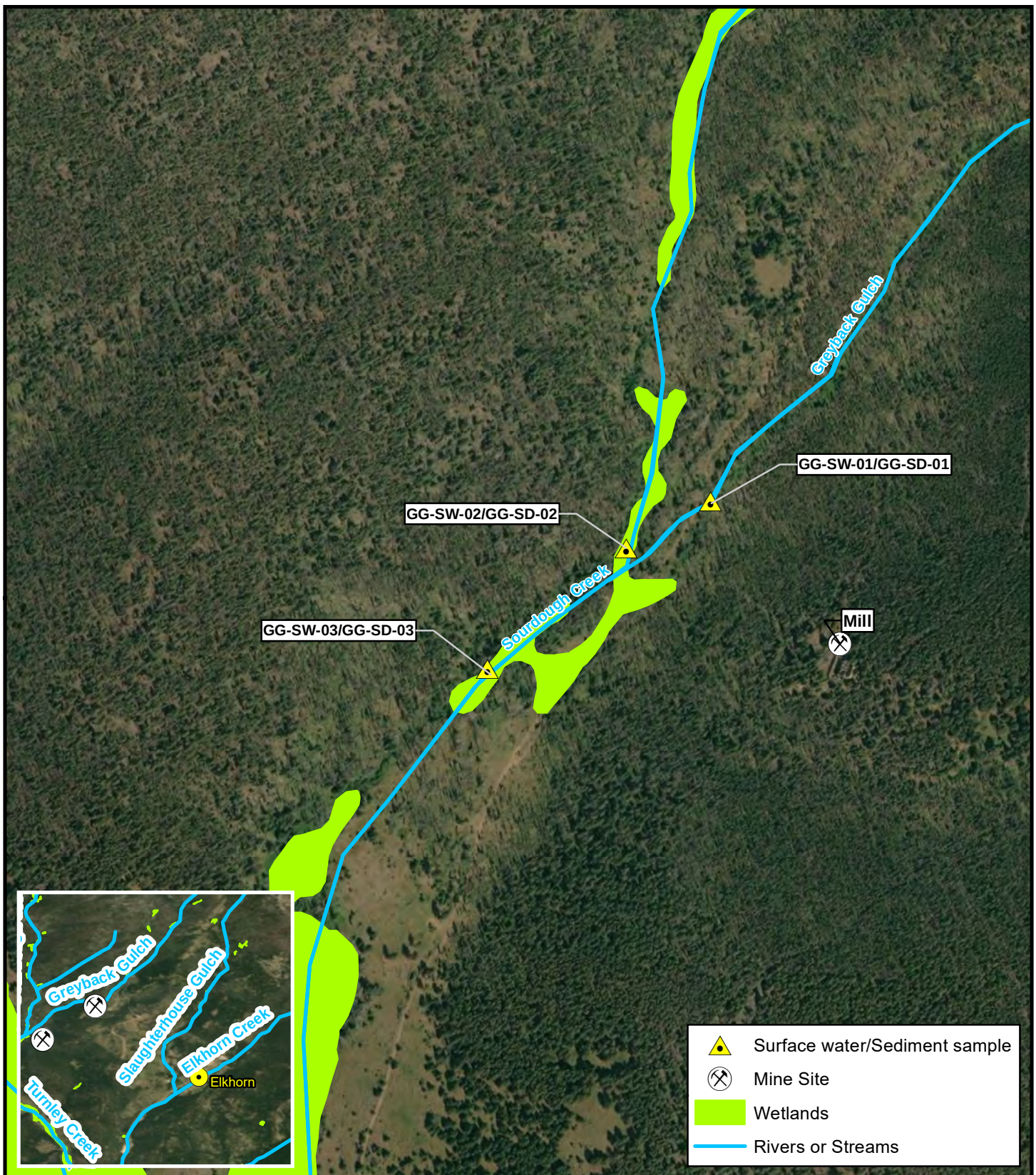


FIGURE 4
ELKHORN CREEK TAILINGS
SAMPLE LOCATIONS MAP
ELKHORN MINING DISTRICT
SITE INSPECTION
JEFFERSON COUNTY, MONTANA

Date: 4/27/2020



Coordinate System: NAD 1983 UTM Zone 12N Projection: Transverse Mercator Datum: North American 1983 Units: Meter Source: Mine Sites: Weston GPS (2019) Rivers, Site Boundary: USGS NHD (2019) Wetlands: US NWI Wetlands (2020) Background: ESRI World Imagery (2019) 0 175 350 700 Feet	Prepared for: U.S. EPA - Region 8 Contract: EP-S8-13-01 TO/TDD: 0004/1807-06 Prepared By: Weston Solutions, Inc. START IV Suite 100 1435 Garrison St. Lakewood, CO	FIGURE 5 UNION ELKHORN MINE SAMPLE LOCATIONS MAP ELKHORN MINING DISTRICT SITE INSPECTION JEFFERSON COUNTY, MONTANA Date: 5/1/2020
---	---	---



Coordinate System: NAD 1983 UTM Zone 12N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter

Source:
Rivers, Site Boundary: USGS NHD (2019)
Wetlands: US NWI Wetlands (2020)
Background: ESRI World Imagery (2019)
Mine Sites: Weston GPS (2018) *Access to Sourdough, Mill and Golden Curry mines were not accessible but the surface waters above and below these sites were evaluated to assess for potential impacts

0 200 400 800 Feet

N

Prepared for:
U.S. EPA - Region 8

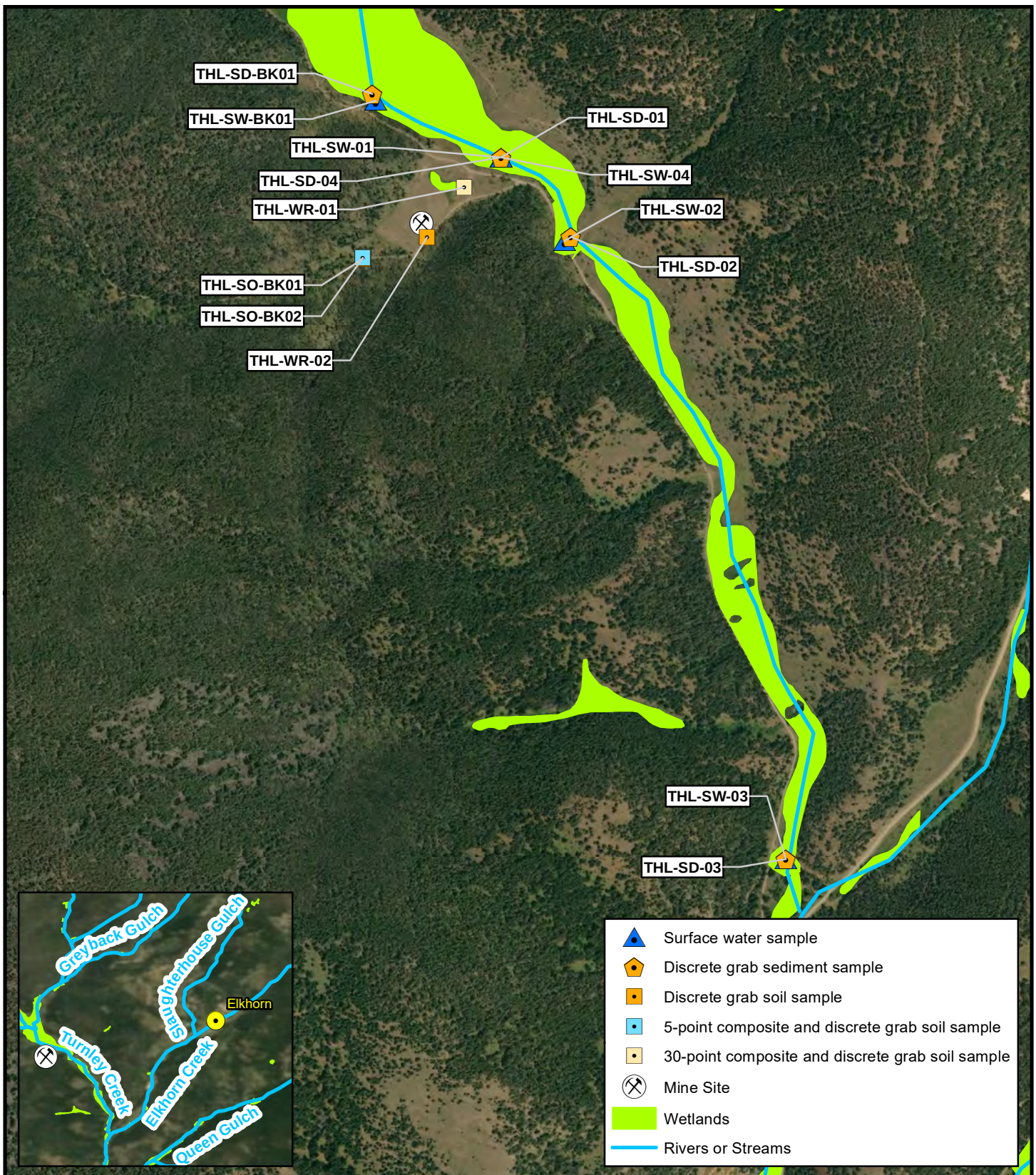
Contract: EP-S8-13-01
TO/TDD: 0004/1807-06

Prepared By:
Weston Solutions, Inc.
START IV
Suite 100
1435 Garrison St.
Lakewood, CO



FIGURE 6
GREYBACK GULCH
SAMPLE LOCATIONS MAP
ELKHORN MINING DISTRICT
SITE INSPECTION
JEFFERSON COUNTY, MONTANA

Date: 5/1/2020



- Surface water sample
- Discrete grab sediment sample
- Discrete grab soil sample
- 5-point composite and discrete grab soil sample
- 30-point composite and discrete grab soil sample
- Mine Site
- Wetlands
- Rivers or Streams

Coordinate System: NAD 1983 UTM Zone 12N
 Projection: Transverse Mercator
 Datum: North American 1983
 Units: Meter

Source:
 Mine Sites: Weston GPS (2019)
 Rivers, Site Boundary: USGS NHD (2019)
 Wetlands: US NWI Wetlands (2020)
 Background: ESRI World Imagery (2019)

0 410 820 1,640 Feet



Prepared for:
 U.S. EPA - Region 8

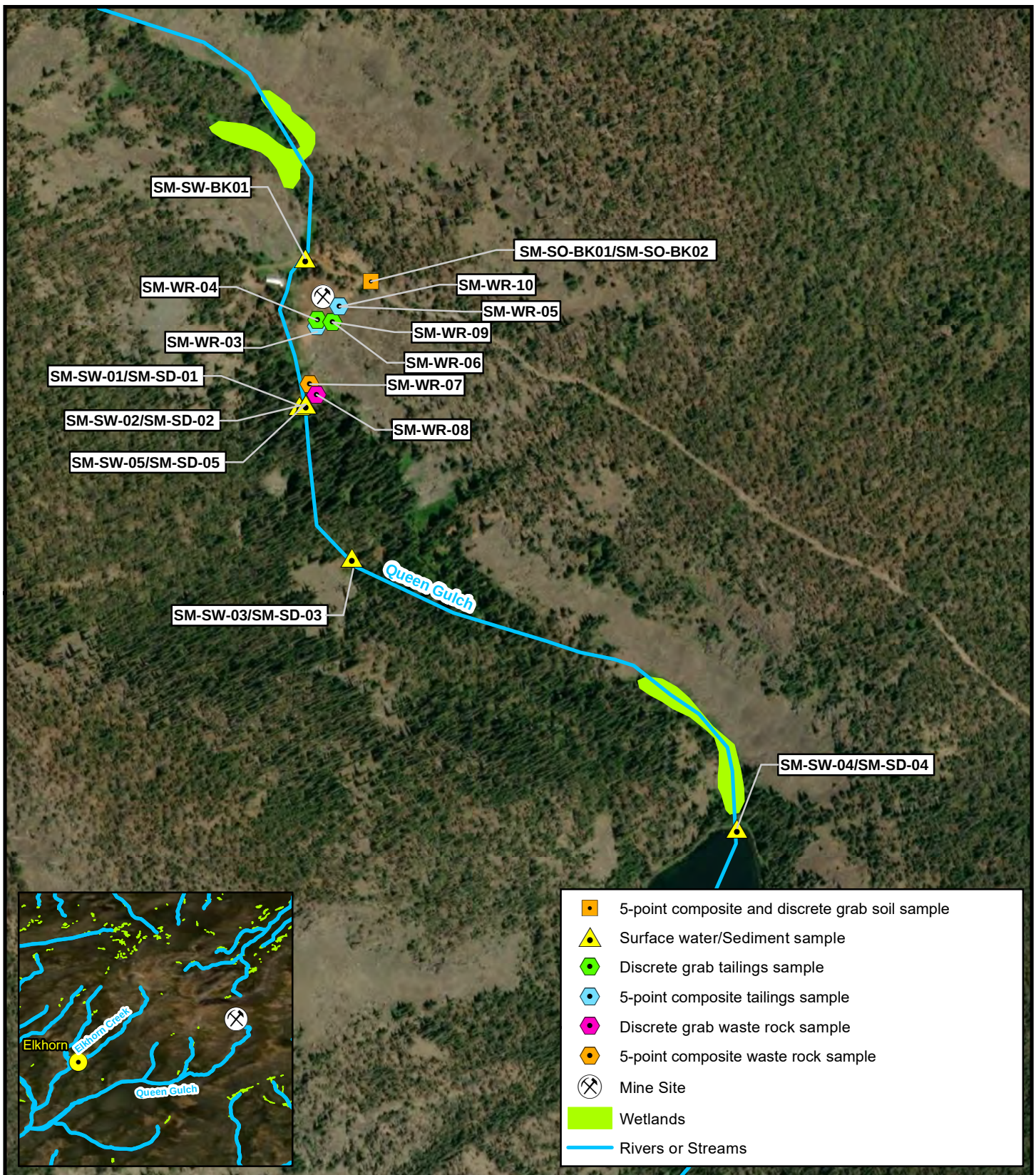
Contract: EP-S8-13-01
 TO/TDD: 0004/1807-06

Prepared By:
 Weston Solutions, Inc.
 START IV
 Suite 100
 1435 Garrison St.
 Lakewood, CO



FIGURE 7
TRUMLEY HEAP LEACH
SAMPLE LOCATION MAP
ELKHORN MINING DISTRICT
SITE INSPECTION
JEFFERSON COUNTY, MONTANA

Date: 5/1/2020



Coordinate System: NAD 1983 UTM Zone 12N
 Projection: Transverse Mercator
 Datum: North American 1983
 Units: Meter
Source:
 Mine Sites: Weston GPS (2017)
 Rivers, Site Boundary: USGS NHD (2015)
 Wetlands: US NWI Wetlands (2017)
 Background: ESRI World Imagery (2017)

0 175 350 700 Feet



Prepared for:
 U.S. EPA - Region 8

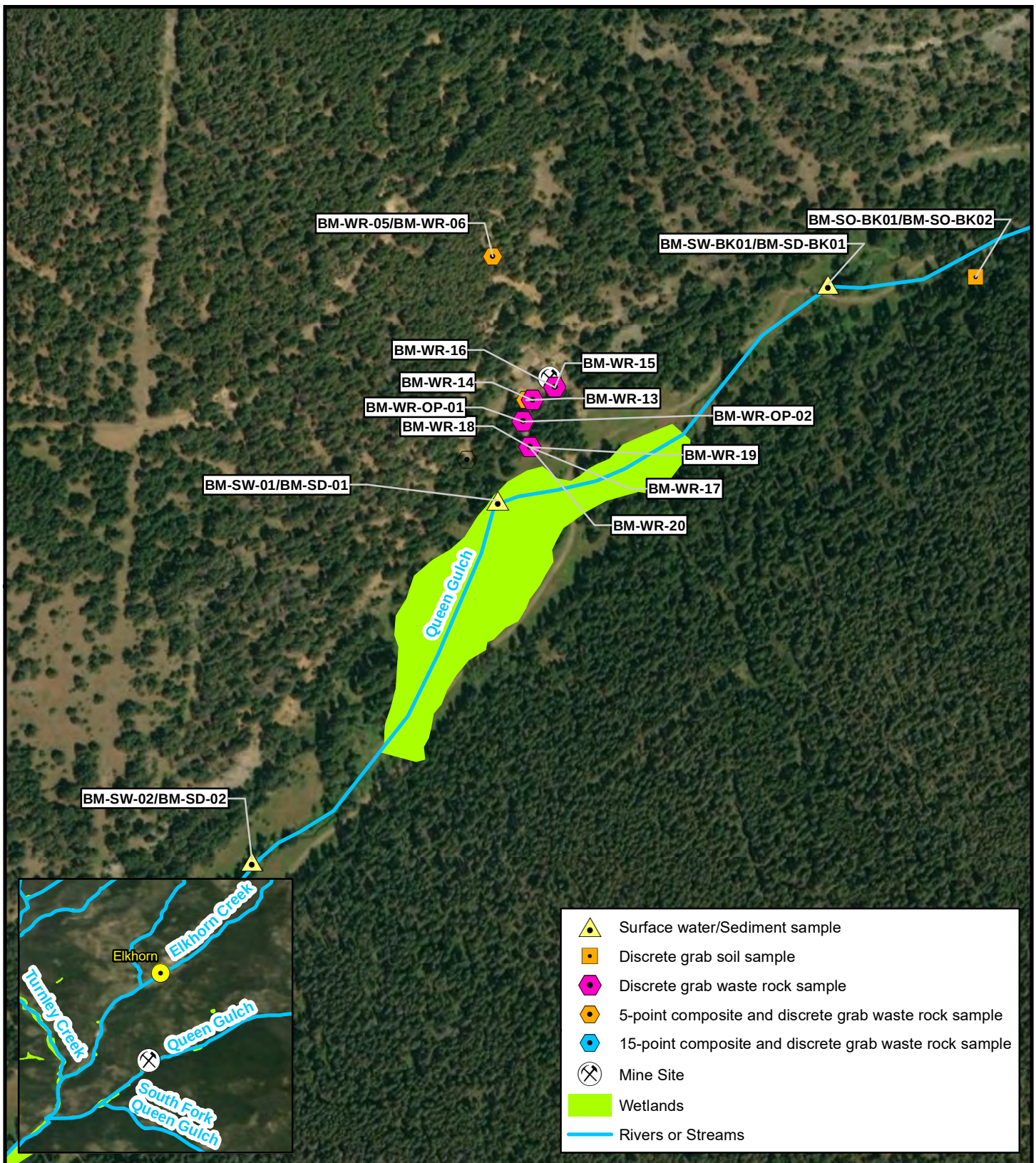
Contract: EP-S8-13-01
 TO/TDD: 0004/1807-06

Prepared By:
 Weston Solutions, Inc.
 START IV
 Suite 100
 1435 Garrison St.
 Lakewood, CO



FIGURE 8
SKYLINE MINE
SAMPLE LOCATION
ELKHORN MINING DISTRICT
SITE INSPECTION
JEFFERSON COUNTY, MONTANA

Date: 6/4/2020



Coordinate System: NAD 1983 UTM Zone 12N
 Projection: Transverse Mercator
 Datum: North American 1983
 Units: Meter

Source:

Mine Sites: Weston GPS (2019)
 Rivers, Site Boundary: USGS NHD (2019)
 Wetlands: US NWI Wetlands (2020)
 Background: ESRI World Imagery (2019)

0 140 280 560 Feet



Prepared for:
 U.S. EPA - Region 8



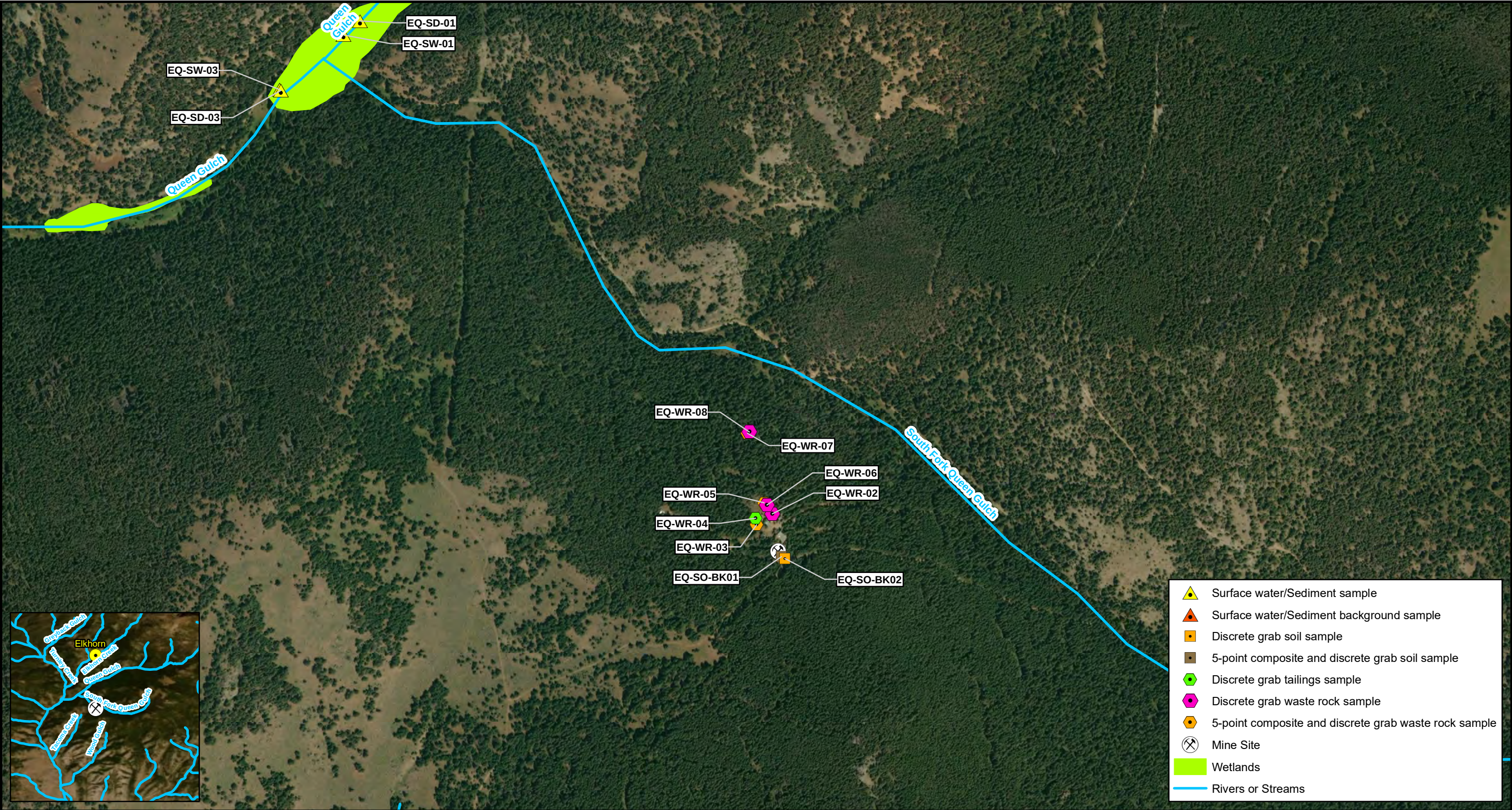
Contract: EP-S8-13-01
 TO/TDD: 0004/1807-06

Prepared By:
 Weston Solutions, Inc.
 START IV
 Suite 100
 1435 Garrison St.
 Lakewood, CO



**FIGURE 9
 BOULAWAY MINE
 SAMPLE LOCATIONS MAP
 ELKHORN MINING DISTRICT
 SITE INSPECTION
 JEFFERSON COUNTY, MONTANA**

Date: 5/1/2020



Coordinate System: NAD 1983 UTM Zone 12N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter

Source:
Mine Sites: Weston GPS (2019)
Rivers, Site Boundary: USGS NHD (2019)
Wetlands: US NWI Wetlands (2020)
Background: ESRI World Imagery (2019)

0 500 1,000 2,000 Feet



Prepared for:
U.S. EPA - Region 8



Contract: EP-S8-13-01
TO/TDD: 0004/1807-06

Prepared By:
Weston Solutions, Inc.
START IV
Suite 100
1435 Garrison St.
Lakewood, CO



FIGURE 10
ELKHORN QUEEN MINE
SAMPLE LOCATIONS MAP
ELKHORN MINING DISTRICT SITE INSPECTION
JEFFERSON COUNTY, MONTANA

Date: 5/1/2020

APPENDIX A
Photograph Log

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 1</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.2786</td></tr> <tr> <td>Long</td><td>-111.939697</td></tr> <tr> <td colspan="2">Direction Photo Taken: 6.52655792555416</td></tr> <tr> <td colspan="2">Description: Location of sample CD-SW/SW-BK01</td></tr> </table>	Photo No. 1	Date: 06/05/2019	Photo Coordinates		Lat	46.2786	Long	-111.939697	Direction Photo Taken: 6.52655792555416		Description: Location of sample CD-SW/SW-BK01		
Photo No. 1	Date: 06/05/2019												
Photo Coordinates													
Lat	46.2786												
Long	-111.939697												
Direction Photo Taken: 6.52655792555416													
Description: Location of sample CD-SW/SW-BK01													
<table> <tr> <td>Photo No. 2</td><td>Date: 09/10/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.278917</td></tr> <tr> <td>Long</td><td>-111.939614</td></tr> <tr> <td colspan="2">Direction Photo Taken: 42.45266723116</td></tr> <tr> <td colspan="2">Description: Location of sample CD-SD-BK01</td></tr> </table>	Photo No. 2	Date: 09/10/2019	Photo Coordinates		Lat	46.278917	Long	-111.939614	Direction Photo Taken: 42.45266723116		Description: Location of sample CD-SD-BK01		
Photo No. 2	Date: 09/10/2019												
Photo Coordinates													
Lat	46.278917												
Long	-111.939614												
Direction Photo Taken: 42.45266723116													
Description: Location of sample CD-SD-BK01													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 3</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.277458</td></tr> <tr> <td>Long</td><td>-111.941108</td></tr> <tr> <td colspan="2">Direction Photo Taken: 13.2999114932356</td></tr> <tr> <td colspan="2">Description: Location of sample CD-SW/SD-01</td></tr> </table>	Photo No. 3	Date: 06/05/2019	Photo Coordinates		Lat	46.277458	Long	-111.941108	Direction Photo Taken: 13.2999114932356		Description: Location of sample CD-SW/SD-01		
Photo No. 3	Date: 06/05/2019												
Photo Coordinates													
Lat	46.277458												
Long	-111.941108												
Direction Photo Taken: 13.2999114932356													
Description: Location of sample CD-SW/SD-01													
<table> <tr> <td>Photo No. 4</td><td>Date: 09/10/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.277642</td></tr> <tr> <td>Long</td><td>-111.941008</td></tr> <tr> <td colspan="2">Direction Photo Taken: 338.838913148957</td></tr> <tr> <td colspan="2">Description: Location of sample CD-SD-01 –Note the dry creek bed</td></tr> </table>	Photo No. 4	Date: 09/10/2019	Photo Coordinates		Lat	46.277642	Long	-111.941008	Direction Photo Taken: 338.838913148957		Description: Location of sample CD-SD-01 –Note the dry creek bed		
Photo No. 4	Date: 09/10/2019												
Photo Coordinates													
Lat	46.277642												
Long	-111.941008												
Direction Photo Taken: 338.838913148957													
Description: Location of sample CD-SD-01 –Note the dry creek bed													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 5</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.290124</td></tr> <tr> <td>Long</td><td>-111.933673</td></tr> <tr> <td colspan="2">Direction Photo Taken: 161.3</td></tr> <tr> <td colspan="2"> Description: Screening for background location sample CD-SO-BK01 </td></tr> </table>	Photo No. 5	Date: 06/04/2019	Photo Coordinates		Lat	46.290124	Long	-111.933673	Direction Photo Taken: 161.3		Description: Screening for background location sample CD-SO-BK01		
Photo No. 5	Date: 06/04/2019												
Photo Coordinates													
Lat	46.290124												
Long	-111.933673												
Direction Photo Taken: 161.3													
Description: Screening for background location sample CD-SO-BK01													
<table> <tr> <td>Photo No. 6</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.290124</td></tr> <tr> <td>Long</td><td>-111.933673</td></tr> <tr> <td colspan="2">Direction Photo Taken: 127.3</td></tr> <tr> <td colspan="2"> Description: Collection of sample CD-SO-BK02 </td></tr> </table>	Photo No. 6	Date: 06/04/2019	Photo Coordinates		Lat	46.290124	Long	-111.933673	Direction Photo Taken: 127.3		Description: Collection of sample CD-SO-BK02		
Photo No. 6	Date: 06/04/2019												
Photo Coordinates													
Lat	46.290124												
Long	-111.933673												
Direction Photo Taken: 127.3													
Description: Collection of sample CD-SO-BK02													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 7</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.288625</td></tr> <tr> <td>Long</td><td>-111.933929</td></tr> <tr> <td colspan="2">Direction Photo Taken: 243.72</td></tr> <tr> <td colspan="2">Description: Showing 5-point composite locations for sample CD-WR-01</td></tr> </table>	Photo No. 7	Date: 06/04/2019	Photo Coordinates		Lat	46.288625	Long	-111.933929	Direction Photo Taken: 243.72		Description: Showing 5-point composite locations for sample CD-WR-01		
Photo No. 7	Date: 06/04/2019												
Photo Coordinates													
Lat	46.288625												
Long	-111.933929												
Direction Photo Taken: 243.72													
Description: Showing 5-point composite locations for sample CD-WR-01													
<table> <tr> <td>Photo No. 8</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.288618</td></tr> <tr> <td>Long</td><td>-111.933975</td></tr> <tr> <td colspan="2">Direction Photo Taken: 210.56</td></tr> <tr> <td colspan="2">Description: Location of sample CD-WR-02</td></tr> </table>	Photo No. 8	Date: 06/04/2019	Photo Coordinates		Lat	46.288618	Long	-111.933975	Direction Photo Taken: 210.56		Description: Location of sample CD-WR-02		
Photo No. 8	Date: 06/04/2019												
Photo Coordinates													
Lat	46.288618												
Long	-111.933975												
Direction Photo Taken: 210.56													
Description: Location of sample CD-WR-02													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 9</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.288669</td></tr> <tr> <td>Long</td><td>-111.934364</td></tr> <tr> <td colspan="2">Direction Photo Taken: 153.148139946856</td></tr> <tr> <td colspan="2"> Description: Showing 5-point composite locations for sample CD-WR-03 </td></tr> </table>	Photo No. 9	Date: 06/05/2019	Photo Coordinates		Lat	46.288669	Long	-111.934364	Direction Photo Taken: 153.148139946856		Description: Showing 5-point composite locations for sample CD-WR-03		
Photo No. 9	Date: 06/05/2019												
Photo Coordinates													
Lat	46.288669												
Long	-111.934364												
Direction Photo Taken: 153.148139946856													
Description: Showing 5-point composite locations for sample CD-WR-03													
<table> <tr> <td>Photo No. 10</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.288588</td></tr> <tr> <td>Long</td><td>-111.934292</td></tr> <tr> <td colspan="2">Direction Photo Taken: 103.23</td></tr> <tr> <td colspan="2"> Description: Location of sample CD-WR-04 </td></tr> </table>	Photo No. 10	Date: 06/05/2019	Photo Coordinates		Lat	46.288588	Long	-111.934292	Direction Photo Taken: 103.23		Description: Location of sample CD-WR-04		
Photo No. 10	Date: 06/05/2019												
Photo Coordinates													
Lat	46.288588												
Long	-111.934292												
Direction Photo Taken: 103.23													
Description: Location of sample CD-WR-04													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 11</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.288558</td></tr> <tr> <td>Long</td><td>-111.934128</td></tr> <tr> <td colspan="2">Direction Photo Taken: 115.256141763995</td></tr> <tr> <td colspan="2">Description: Showing 5-point composite locations for sample CD-WR-05</td></tr> </table>	Photo No. 11	Date: 06/05/2019	Photo Coordinates		Lat	46.288558	Long	-111.934128	Direction Photo Taken: 115.256141763995		Description: Showing 5-point composite locations for sample CD-WR-05		
Photo No. 11	Date: 06/05/2019												
Photo Coordinates													
Lat	46.288558												
Long	-111.934128												
Direction Photo Taken: 115.256141763995													
Description: Showing 5-point composite locations for sample CD-WR-05													
<table> <tr> <td>Photo No. 12</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.288517</td></tr> <tr> <td>Long</td><td>-111.93399</td></tr> <tr> <td colspan="2">Direction Photo Taken: 170.37</td></tr> <tr> <td colspan="2">Description: Location of sample CD-WR-06</td></tr> </table>	Photo No. 12	Date: 06/05/2019	Photo Coordinates		Lat	46.288517	Long	-111.93399	Direction Photo Taken: 170.37		Description: Location of sample CD-WR-06		
Photo No. 12	Date: 06/05/2019												
Photo Coordinates													
Lat	46.288517												
Long	-111.93399												
Direction Photo Taken: 170.37													
Description: Location of sample CD-WR-06													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 13</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.288536</td></tr> <tr> <td>Long</td><td>-111.934578</td></tr> <tr> <td colspan="2">Direction Photo Taken: 107.636213311286</td></tr> <tr> <td colspan="2"> Description: Showing 5-point composite locations for sample CD-WR-07 </td></tr> </table>	Photo No. 13	Date: 06/05/2019	Photo Coordinates		Lat	46.288536	Long	-111.934578	Direction Photo Taken: 107.636213311286		Description: Showing 5-point composite locations for sample CD-WR-07		
Photo No. 13	Date: 06/05/2019												
Photo Coordinates													
Lat	46.288536												
Long	-111.934578												
Direction Photo Taken: 107.636213311286													
Description: Showing 5-point composite locations for sample CD-WR-07													
<table> <tr> <td>Photo No. 14</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.288482</td></tr> <tr> <td>Long</td><td>-111.934593</td></tr> <tr> <td colspan="2">Direction Photo Taken: 96.45</td></tr> <tr> <td colspan="2"> Description: Location of sample CD-WR-08 </td></tr> </table>	Photo No. 14	Date: 06/05/2019	Photo Coordinates		Lat	46.288482	Long	-111.934593	Direction Photo Taken: 96.45		Description: Location of sample CD-WR-08		
Photo No. 14	Date: 06/05/2019												
Photo Coordinates													
Lat	46.288482												
Long	-111.934593												
Direction Photo Taken: 96.45													
Description: Location of sample CD-WR-08													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 15		Date: 06/05/2019	
Photo Coordinates			
Lat	46.288351		
Long	-111.934343		
Direction Photo Taken: 165.01			
Description: Screening of 5-point composite locations for sample CD-WR-09			

Photo No. 16		Date: 06/05/2019	
Photo Coordinates			
Lat	46.288422		
Long	-111.934255		
Direction Photo Taken: 129.79			
Description: Location of sample CD-WR-10			

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 17</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.289161</td></tr> <tr> <td>Long</td><td>-111.934494</td></tr> <tr> <td colspan="2">Direction Photo Taken: 107.900749208311</td></tr> <tr> <td colspan="2"> Description: Screening of 5-point composite locations for sample CD-WR-11 and duplicate sample CD-WR-13 </td></tr> </table>	Photo No. 17	Date: 06/04/2019	Photo Coordinates		Lat	46.289161	Long	-111.934494	Direction Photo Taken: 107.900749208311		Description: Screening of 5-point composite locations for sample CD-WR-11 and duplicate sample CD-WR-13		
Photo No. 17	Date: 06/04/2019												
Photo Coordinates													
Lat	46.289161												
Long	-111.934494												
Direction Photo Taken: 107.900749208311													
Description: Screening of 5-point composite locations for sample CD-WR-11 and duplicate sample CD-WR-13													
<table> <tr> <td>Photo No. 18</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.289122</td></tr> <tr> <td>Long</td><td>-111.934486</td></tr> <tr> <td colspan="2">Direction Photo Taken: 236.791580400276</td></tr> <tr> <td colspan="2"> Description: Location of grab sample CD-WR-12 and duplicate sample CD-WR-14 </td></tr> </table>	Photo No. 18	Date: 06/04/2019	Photo Coordinates		Lat	46.289122	Long	-111.934486	Direction Photo Taken: 236.791580400276		Description: Location of grab sample CD-WR-12 and duplicate sample CD-WR-14		
Photo No. 18	Date: 06/04/2019												
Photo Coordinates													
Lat	46.289122												
Long	-111.934486												
Direction Photo Taken: 236.791580400276													
Description: Location of grab sample CD-WR-12 and duplicate sample CD-WR-14													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 19	Date: 06/04/2019
Photo Coordinates	
Lat	46.290131
Long	-111.9336
Direction Photo Taken: 23.2333526626075	
Description: Mining claim near background soil samples CD-WR-BK01/02	



Photo No. 20	Date: 06/03/2019
Photo Coordinates	
Lat	46.264344
Long	-111.956008
Direction Photo Taken: 333.66383744856	
Description: Probable point of entry from Elkhorn Creek Tailings site	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 21	Date: 09/10/2019
Photo Coordinates	
Lat	46.2688
Long	-111.954644
Direction Photo Taken: 58.9137268599371	
Description: Elkhorn Creek Tailings pile	



Photo No. 22	Date: 09/10/2019
Photo Coordinates	
Lat	46.2688
Long	-111.954644
Direction Photo Taken: 46.525146484375	
Description: Elkhorn Creek Tailings pile near the creek	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 23</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.270182</td></tr> <tr> <td>Long</td><td>-111.953176</td></tr> <tr> <td colspan="2">Direction Photo Taken: 94.58</td></tr> <tr> <td colspan="2">Description: Location of sample ECT-SD-BK01</td></tr> </table>	Photo No. 23	Date: 06/03/2019	Photo Coordinates		Lat	46.270182	Long	-111.953176	Direction Photo Taken: 94.58		Description: Location of sample ECT-SD-BK01		
Photo No. 23	Date: 06/03/2019												
Photo Coordinates													
Lat	46.270182												
Long	-111.953176												
Direction Photo Taken: 94.58													
Description: Location of sample ECT-SD-BK01													
<table> <tr> <td>Photo No. 24</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.270186</td></tr> <tr> <td>Long</td><td>-111.95313</td></tr> <tr> <td colspan="2">Direction Photo Taken: 203.93</td></tr> <tr> <td colspan="2">Description: Location of sample ECT-SW-BK01</td></tr> </table>	Photo No. 24	Date: 06/03/2019	Photo Coordinates		Lat	46.270186	Long	-111.95313	Direction Photo Taken: 203.93		Description: Location of sample ECT-SW-BK01		
Photo No. 24	Date: 06/03/2019												
Photo Coordinates													
Lat	46.270186												
Long	-111.95313												
Direction Photo Taken: 203.93													
Description: Location of sample ECT-SW-BK01													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 25	Date: 09/10/2019
Photo Coordinates	
Lat	46.270061
Long	-111.953514
Direction Photo Taken: 130.385257806826	
Description: Location of sample ECT-SW/SD-BK01	



Photo No. 26	Date: 06/03/2019
Photo Coordinates	
Lat	46.268692
Long	-111.954755
Direction Photo Taken: 314.35	
Description: Location of sample ECT-SW-01	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 27</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.268684</td></tr> <tr> <td>Long</td><td>-111.954787</td></tr> <tr> <td colspan="2">Direction Photo Taken: 221.72</td></tr> <tr> <td colspan="2">Description: Location of sample ECT-SD-01</td></tr> </table>	Photo No. 27	Date: 06/03/2019	Photo Coordinates		Lat	46.268684	Long	-111.954787	Direction Photo Taken: 221.72		Description: Location of sample ECT-SD-01		
Photo No. 27	Date: 06/03/2019												
Photo Coordinates													
Lat	46.268684												
Long	-111.954787												
Direction Photo Taken: 221.72													
Description: Location of sample ECT-SD-01													
<table> <tr> <td>Photo No. 28</td><td>Date: 09/10/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.268569</td></tr> <tr> <td>Long</td><td>-111.954619</td></tr> <tr> <td colspan="2">Direction Photo Taken: 330.997268692386</td></tr> <tr> <td colspan="2">Description: Location of sample ECT-SW/SD-01</td></tr> </table>	Photo No. 28	Date: 09/10/2019	Photo Coordinates		Lat	46.268569	Long	-111.954619	Direction Photo Taken: 330.997268692386		Description: Location of sample ECT-SW/SD-01		
Photo No. 28	Date: 09/10/2019												
Photo Coordinates													
Lat	46.268569												
Long	-111.954619												
Direction Photo Taken: 330.997268692386													
Description: Location of sample ECT-SW/SD-01													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 29	Date: 06/03/2019
Photo Coordinates	
Lat	46.263669
Long	-111.956519
Direction Photo Taken: 356.836807320793	
Description: Location of sample ECT-SW/SD-03 in wetland below tailings pile and most downstream probably point of entry	



Photo No. 30	Date: 06/03/2019
Photo Coordinates	
Lat	46.263814
Long	-111.956519
Direction Photo Taken: 187.640868974881	
Description: Collecting sample ECT-SW/SD-03; downstream of tailings pile in wetland	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 31	Date: 09/10/2019
Photo Coordinates	
Lat	46.263775
Long	-111.956725
Direction Photo Taken: 351.075591985428	
Description: Location of ECT-SW/SD-03 and ECT-SW/SD-05 (duplicate sample)	



Photo No. 32	Date: 06/03/2019
Photo Coordinates	
Lat	46.260958
Long	-111.957314
Direction Photo Taken: 9.2065734910152	
Description: Location of sample ECT-SW/SD-04	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 33	Date: 09/10/2019
Photo Coordinates	
Lat	46.273728
Long	-111.975931
Direction Photo Taken: 35.720703125	
Description: Location of sample ECT-SW/SD-04	



Photo No. 34	Date: 06/03/2019
Photo Coordinates	
Lat	46.266372
Long	-111.956847
Direction Photo Taken: 228.247497725205	
Description: Location of background grab sample ECT-SO-BK02	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 35	Date: 06/04/2019
Photo Coordinates	
Lat	46.266664
Long	-111.955458
Direction Photo Taken: 272.106527093596	
Description: Location of opportunity grab sample ECT-SO-OP-01; photo taken standing on bank of Elkhorn Creek	



Photo No. 36	Date: 06/03/2019
Photo Coordinates	
Lat	46.269008
Long	-111.953925
Direction Photo Taken: 284.803973192915	
Description: Collecting aliquots for 30-point composite sample ECT-WR-01	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table border="1"> <tr> <td>Photo No. 37</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.269174</td></tr> <tr> <td>Long</td><td>-111.954446</td></tr> <tr> <td colspan="2">Direction Photo Taken: 18.62</td></tr> <tr> <td colspan="2"> Description: Showing 30-point composite locations for sample ECT-WR-01 </td></tr> </table>	Photo No. 37	Date: 06/03/2019	Photo Coordinates		Lat	46.269174	Long	-111.954446	Direction Photo Taken: 18.62		Description: Showing 30-point composite locations for sample ECT-WR-01		
Photo No. 37	Date: 06/03/2019												
Photo Coordinates													
Lat	46.269174												
Long	-111.954446												
Direction Photo Taken: 18.62													
Description: Showing 30-point composite locations for sample ECT-WR-01													
<table border="1"> <tr> <td>Photo No. 38</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.266369</td></tr> <tr> <td>Long</td><td>-111.956069</td></tr> <tr> <td colspan="2">Direction Photo Taken: 332.837658017299</td></tr> <tr> <td colspan="2"> Description: Location of sample ECT-WR-04 in the Elkhorn Creek Tailings impoundment </td></tr> </table>	Photo No. 38	Date: 06/03/2019	Photo Coordinates		Lat	46.266369	Long	-111.956069	Direction Photo Taken: 332.837658017299		Description: Location of sample ECT-WR-04 in the Elkhorn Creek Tailings impoundment		
Photo No. 38	Date: 06/03/2019												
Photo Coordinates													
Lat	46.266369												
Long	-111.956069												
Direction Photo Taken: 332.837658017299													
Description: Location of sample ECT-WR-04 in the Elkhorn Creek Tailings impoundment													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 39</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.264622</td></tr> <tr> <td>Long</td><td>-111.956628</td></tr> <tr> <td colspan="2">Direction Photo Taken: 353.141891476679</td></tr> <tr> <td colspan="2"> Description: Screening of 30-point composite location for sample ECT-WR-05 </td></tr> </table>	Photo No. 39	Date: 06/03/2019	Photo Coordinates		Lat	46.264622	Long	-111.956628	Direction Photo Taken: 353.141891476679		Description: Screening of 30-point composite location for sample ECT-WR-05		
Photo No. 39	Date: 06/03/2019												
Photo Coordinates													
Lat	46.264622												
Long	-111.956628												
Direction Photo Taken: 353.141891476679													
Description: Screening of 30-point composite location for sample ECT-WR-05													
<table> <tr> <td>Photo No. 40</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.29152</td></tr> <tr> <td>Long</td><td>-111.942376</td></tr> <tr> <td colspan="2">Direction Photo Taken: 329</td></tr> <tr> <td colspan="2"> Description: Location of UE-SW/SD-BK01; upstream of creek-road crossing </td></tr> </table>	Photo No. 40	Date: 06/05/2019	Photo Coordinates		Lat	46.29152	Long	-111.942376	Direction Photo Taken: 329		Description: Location of UE-SW/SD-BK01; upstream of creek-road crossing		
Photo No. 40	Date: 06/05/2019												
Photo Coordinates													
Lat	46.29152												
Long	-111.942376												
Direction Photo Taken: 329													
Description: Location of UE-SW/SD-BK01; upstream of creek-road crossing													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 41	Date: 09/10/2019
Photo Coordinates	
Lat	46.291436
Long	-111.942361
Direction Photo Taken: 47.6089171974522	
Description: Location of UE-SW/SD-BK01; upstream of creek-road crossing	



Photo No. 42	Date: 06/05/2019
Photo Coordinates	
Lat	46.290928
Long	-111.942629
Direction Photo Taken: 334.47	
Description: Location of sample UE-SW/SD-01	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 43	Date: 09/10/2019
Photo Coordinates	
Lat	46.290803
Long	-111.942514
Direction Photo Taken: 22.2747802734375	
Description: Location of sample UE-SW/SD-01	



Photo No. 44	Date: 09/10/2019
Photo Coordinates	
Lat	46.283333
Long	-111.944228
Direction Photo Taken: 330.779723991507	
Description: Top of steep terrain prior to the cliff for location UE-SW/SD-02	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table border="1"> <tr> <td>Photo No. 45</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.29145</td></tr> <tr> <td>Long</td><td>-111.942694</td></tr> <tr> <td colspan="2">Direction Photo Taken: 253.614593535749</td></tr> <tr> <td colspan="2"> Description: Collecting sample UE-SW-04 from the drain pipe exiting the adit. </td></tr> </table>	Photo No. 45	Date: 06/05/2019	Photo Coordinates		Lat	46.29145	Long	-111.942694	Direction Photo Taken: 253.614593535749		Description: Collecting sample UE-SW-04 from the drain pipe exiting the adit.		
Photo No. 45	Date: 06/05/2019												
Photo Coordinates													
Lat	46.29145												
Long	-111.942694												
Direction Photo Taken: 253.614593535749													
Description: Collecting sample UE-SW-04 from the drain pipe exiting the adit.													
<table border="1"> <tr> <td>Photo No. 46</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.291671</td></tr> <tr> <td>Long</td><td>-111.942393</td></tr> <tr> <td colspan="2">Direction Photo Taken: 277.33</td></tr> <tr> <td colspan="2"> Description: Screening 5-point background composite locations for sample UE-SO-BK01 </td></tr> </table>	Photo No. 46	Date: 06/05/2019	Photo Coordinates		Lat	46.291671	Long	-111.942393	Direction Photo Taken: 277.33		Description: Screening 5-point background composite locations for sample UE-SO-BK01		
Photo No. 46	Date: 06/05/2019												
Photo Coordinates													
Lat	46.291671												
Long	-111.942393												
Direction Photo Taken: 277.33													
Description: Screening 5-point background composite locations for sample UE-SO-BK01													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 47</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.291592</td></tr> <tr> <td>Long</td><td>-111.943261</td></tr> <tr> <td colspan="2">Direction Photo Taken: 137.904384574749</td></tr> <tr> <td colspan="2"> Description: Screening of 5-point composite locations for sample UE-WR-01 </td></tr> </table>	Photo No. 47	Date: 06/05/2019	Photo Coordinates		Lat	46.291592	Long	-111.943261	Direction Photo Taken: 137.904384574749		Description: Screening of 5-point composite locations for sample UE-WR-01		
Photo No. 47	Date: 06/05/2019												
Photo Coordinates													
Lat	46.291592												
Long	-111.943261												
Direction Photo Taken: 137.904384574749													
Description: Screening of 5-point composite locations for sample UE-WR-01													
<table> <tr> <td>Photo No. 48</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.291508</td></tr> <tr> <td>Long</td><td>-111.943208</td></tr> <tr> <td colspan="2">Direction Photo Taken: 236.42</td></tr> <tr> <td colspan="2"> Description: Location of sample UE-WR-02 </td></tr> </table>	Photo No. 48	Date: 06/05/2019	Photo Coordinates		Lat	46.291508	Long	-111.943208	Direction Photo Taken: 236.42		Description: Location of sample UE-WR-02		
Photo No. 48	Date: 06/05/2019												
Photo Coordinates													
Lat	46.291508												
Long	-111.943208												
Direction Photo Taken: 236.42													
Description: Location of sample UE-WR-02													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 49	Date: 06/05/2019
Photo Coordinates	
Lat	46.291408
Long	-111.943375
Direction Photo Taken: 152.935104364326	
Description: Screening 5-point composite locations for sample UE-WR-03	



Photo No. 50	Date: 06/05/2019
Photo Coordinates	
Lat	46.291454
Long	-111.943242
Direction Photo Taken: 21.15	
Description: Location of sample UE-WR-04	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table border="1"> <tr> <td>Photo No. 51</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.291178</td></tr> <tr> <td>Long</td><td>-111.942528</td></tr> <tr> <td colspan="2">Direction Photo Taken: 170.28</td></tr> <tr> <td colspan="2">Description: Showing 5-point composite location for sample UE-WR-05</td></tr> </table>	Photo No. 51	Date: 06/05/2019	Photo Coordinates		Lat	46.291178	Long	-111.942528	Direction Photo Taken: 170.28		Description: Showing 5-point composite location for sample UE-WR-05		
Photo No. 51	Date: 06/05/2019												
Photo Coordinates													
Lat	46.291178												
Long	-111.942528												
Direction Photo Taken: 170.28													
Description: Showing 5-point composite location for sample UE-WR-05													
<table border="1"> <tr> <td>Photo No. 52</td><td>Date: 06/05/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.291178</td></tr> <tr> <td>Long</td><td>-111.942527</td></tr> <tr> <td colspan="2">Direction Photo Taken: 305.3</td></tr> <tr> <td colspan="2">Description: Location of sample UE-WR-06</td></tr> </table>	Photo No. 52	Date: 06/05/2019	Photo Coordinates		Lat	46.291178	Long	-111.942527	Direction Photo Taken: 305.3		Description: Location of sample UE-WR-06		
Photo No. 52	Date: 06/05/2019												
Photo Coordinates													
Lat	46.291178												
Long	-111.942527												
Direction Photo Taken: 305.3													
Description: Location of sample UE-WR-06													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 53</td><td>Date: 09/12/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.279747</td></tr> <tr> <td>Long</td><td>-111.971419</td></tr> <tr> <td colspan="2">Direction Photo Taken: 18.8727722128268</td></tr> <tr> <td colspan="2">Description: Greyback Gulch confluence with an unnamed tributary</td></tr> </table>	Photo No. 53	Date: 09/12/2019	Photo Coordinates		Lat	46.279747	Long	-111.971419	Direction Photo Taken: 18.8727722128268		Description: Greyback Gulch confluence with an unnamed tributary		
Photo No. 53	Date: 09/12/2019												
Photo Coordinates													
Lat	46.279747												
Long	-111.971419												
Direction Photo Taken: 18.8727722128268													
Description: Greyback Gulch confluence with an unnamed tributary													
<table> <tr> <td>Photo No. 54</td><td>Date: 09/12/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.280731</td></tr> <tr> <td>Long</td><td>-111.969519</td></tr> <tr> <td colspan="2">Direction Photo Taken: 185.753082191781</td></tr> <tr> <td colspan="2">Description: The road to Greyback Gulch</td></tr> </table>	Photo No. 54	Date: 09/12/2019	Photo Coordinates		Lat	46.280731	Long	-111.969519	Direction Photo Taken: 185.753082191781		Description: The road to Greyback Gulch		
Photo No. 54	Date: 09/12/2019												
Photo Coordinates													
Lat	46.280731												
Long	-111.969519												
Direction Photo Taken: 185.753082191781													
Description: The road to Greyback Gulch													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 55	Date: 09/12/2019
Photo Coordinates	
Lat	46.280628
Long	-111.969392
Direction Photo Taken: 120.577802565533	
Description: Location of sample GG-SW/SD-01	



Photo No. 56	Date: 09/12/2019
Photo Coordinates	
Lat	46.280706
Long	-111.970214
Direction Photo Taken: 207.638794084187	
Description: Location of sample GG-SW/SD-02	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 57	Date: 09/12/2019
Photo Coordinates	
Lat	46.279628
Long	-111.971656
Direction Photo Taken: 17.4432983398438	
Description: Location of sample GG-SW/SD-03	



Photo No. 58	Date: 06/04/2019
Photo Coordinates	
Lat	46.271418
Long	-111.973614
Direction Photo Taken: 8.16	
Description: Location of Turnley Creek background sample THL-SW/SD-BK01	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 59		Date: 06/04/2019	
Photo Coordinates			
Lat	46.271468		
Long	-111.973635		
Direction Photo Taken: 349.53			
Description: Collection of sample THL-SW-BK01			

Photo No. 60		Date: 09/09/2019	
Photo Coordinates			
Lat	46.273708		
Long	-111.975931		
Direction Photo Taken: 41.5195922989807			
Description: Collection of sample THL-SW-BK01			

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 61</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.270388</td></tr> <tr> <td>Long</td><td>-111.970329</td></tr> <tr> <td colspan="2">Direction Photo Taken: 48.29</td></tr> <tr> <td colspan="2">Description: Location of sample THL-SW/SD-01</td></tr> </table>	Photo No. 61	Date: 06/04/2019	Photo Coordinates		Lat	46.270388	Long	-111.970329	Direction Photo Taken: 48.29		Description: Location of sample THL-SW/SD-01		
Photo No. 61	Date: 06/04/2019												
Photo Coordinates													
Lat	46.270388												
Long	-111.970329												
Direction Photo Taken: 48.29													
Description: Location of sample THL-SW/SD-01													
<table> <tr> <td>Photo No. 62</td><td>Date: 09/09/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.270561</td></tr> <tr> <td>Long</td><td>-111.970397</td></tr> <tr> <td colspan="2">Direction Photo Taken: 43.8460388183594</td></tr> <tr> <td colspan="2">Description: Location of sample THL-SW/SD-01</td></tr> </table>	Photo No. 62	Date: 09/09/2019	Photo Coordinates		Lat	46.270561	Long	-111.970397	Direction Photo Taken: 43.8460388183594		Description: Location of sample THL-SW/SD-01		
Photo No. 62	Date: 09/09/2019												
Photo Coordinates													
Lat	46.270561												
Long	-111.970397												
Direction Photo Taken: 43.8460388183594													
Description: Location of sample THL-SW/SD-01													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table border="1"> <tr> <td>Photo No. 63</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.268952</td></tr> <tr> <td>Long</td><td>-111.968611</td></tr> <tr> <td colspan="2">Direction Photo Taken: 33.62</td></tr> <tr> <td colspan="2">Description: Location of sample THL-SW/SD-02</td></tr> </table>	Photo No. 63	Date: 06/04/2019	Photo Coordinates		Lat	46.268952	Long	-111.968611	Direction Photo Taken: 33.62		Description: Location of sample THL-SW/SD-02		
Photo No. 63	Date: 06/04/2019												
Photo Coordinates													
Lat	46.268952												
Long	-111.968611												
Direction Photo Taken: 33.62													
Description: Location of sample THL-SW/SD-02													
<table border="1"> <tr> <td>Photo No. 64</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.268977</td></tr> <tr> <td>Long</td><td>-111.968595</td></tr> <tr> <td colspan="2">Direction Photo Taken: 49</td></tr> <tr> <td colspan="2">Description: Collection of sample THL-SD-02</td></tr> </table>	Photo No. 64	Date: 06/04/2019	Photo Coordinates		Lat	46.268977	Long	-111.968595	Direction Photo Taken: 49		Description: Collection of sample THL-SD-02		
Photo No. 64	Date: 06/04/2019												
Photo Coordinates													
Lat	46.268977												
Long	-111.968595												
Direction Photo Taken: 49													
Description: Collection of sample THL-SD-02													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 65</td><td>Date: 09/09/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.268739</td></tr> <tr> <td>Long</td><td>-111.968436</td></tr> <tr> <td colspan="2">Direction Photo Taken: 24.7331237590999</td></tr> <tr> <td colspan="2">Description: Location of sample THL-SW/SD-02</td></tr> </table>	Photo No. 65	Date: 09/09/2019	Photo Coordinates		Lat	46.268739	Long	-111.968436	Direction Photo Taken: 24.7331237590999		Description: Location of sample THL-SW/SD-02		
Photo No. 65	Date: 09/09/2019												
Photo Coordinates													
Lat	46.268739												
Long	-111.968436												
Direction Photo Taken: 24.7331237590999													
Description: Location of sample THL-SW/SD-02													
<table> <tr> <td>Photo No. 66</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.258436</td></tr> <tr> <td>Long</td><td>-111.962721</td></tr> <tr> <td colspan="2">Direction Photo Taken: 59.8</td></tr> <tr> <td colspan="2">Description: Location of sample THL-SW/SD-03</td></tr> </table>	Photo No. 66	Date: 06/04/2019	Photo Coordinates		Lat	46.258436	Long	-111.962721	Direction Photo Taken: 59.8		Description: Location of sample THL-SW/SD-03		
Photo No. 66	Date: 06/04/2019												
Photo Coordinates													
Lat	46.258436												
Long	-111.962721												
Direction Photo Taken: 59.8													
Description: Location of sample THL-SW/SD-03													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 67</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.258377</td></tr> <tr> <td>Long</td><td>-111.962764</td></tr> <tr> <td colspan="2">Direction Photo Taken: 75.06</td></tr> <tr> <td colspan="2">Description: Collection of sample THL-SD-03</td></tr> </table>	Photo No. 67	Date: 06/04/2019	Photo Coordinates		Lat	46.258377	Long	-111.962764	Direction Photo Taken: 75.06		Description: Collection of sample THL-SD-03		
Photo No. 67	Date: 06/04/2019												
Photo Coordinates													
Lat	46.258377												
Long	-111.962764												
Direction Photo Taken: 75.06													
Description: Collection of sample THL-SD-03													
<table> <tr> <td>Photo No. 68</td><td>Date: 09/09/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.258228</td></tr> <tr> <td>Long</td><td>-111.962647</td></tr> <tr> <td colspan="2">Direction Photo Taken: 307.304092382496</td></tr> <tr> <td colspan="2">Description: Location of sample THL-SW/SD-03</td></tr> </table>	Photo No. 68	Date: 09/09/2019	Photo Coordinates		Lat	46.258228	Long	-111.962647	Direction Photo Taken: 307.304092382496		Description: Location of sample THL-SW/SD-03		
Photo No. 68	Date: 09/09/2019												
Photo Coordinates													
Lat	46.258228												
Long	-111.962647												
Direction Photo Taken: 307.304092382496													
Description: Location of sample THL-SW/SD-03													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 69</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.268573</td></tr> <tr> <td>Long</td><td>-111.973945</td></tr> <tr> <td colspan="2">Direction Photo Taken: 278.9</td></tr> <tr> <td colspan="2"> Description: Showing 5-point background composite locations for sample THL-SO-BK01 </td></tr> </table>	Photo No. 69	Date: 06/04/2019	Photo Coordinates		Lat	46.268573	Long	-111.973945	Direction Photo Taken: 278.9		Description: Showing 5-point background composite locations for sample THL-SO-BK01		
Photo No. 69	Date: 06/04/2019												
Photo Coordinates													
Lat	46.268573												
Long	-111.973945												
Direction Photo Taken: 278.9													
Description: Showing 5-point background composite locations for sample THL-SO-BK01													
<table> <tr> <td>Photo No. 70</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.268577</td></tr> <tr> <td>Long</td><td>-111.973972</td></tr> <tr> <td colspan="2">Direction Photo Taken: 277.36</td></tr> <tr> <td colspan="2"> Description: Showing 5-point background composite locations for sample THL-SO-BK01 </td></tr> </table>	Photo No. 70	Date: 06/04/2019	Photo Coordinates		Lat	46.268577	Long	-111.973972	Direction Photo Taken: 277.36		Description: Showing 5-point background composite locations for sample THL-SO-BK01		
Photo No. 70	Date: 06/04/2019												
Photo Coordinates													
Lat	46.268577												
Long	-111.973972												
Direction Photo Taken: 277.36													
Description: Showing 5-point background composite locations for sample THL-SO-BK01													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table border="1"> <tr> <td>Photo No. 71</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.268648</td></tr> <tr> <td>Long</td><td>-111.972503</td></tr> <tr> <td colspan="2">Direction Photo Taken: 235.07</td></tr> <tr> <td colspan="2">Description: Showing 30-point composite locations for sample THL-WR-01</td></tr> </table>	Photo No. 71	Date: 06/04/2019	Photo Coordinates		Lat	46.268648	Long	-111.972503	Direction Photo Taken: 235.07		Description: Showing 30-point composite locations for sample THL-WR-01		
Photo No. 71	Date: 06/04/2019												
Photo Coordinates													
Lat	46.268648												
Long	-111.972503												
Direction Photo Taken: 235.07													
Description: Showing 30-point composite locations for sample THL-WR-01													
<table border="1"> <tr> <td>Photo No. 72</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.268966</td></tr> <tr> <td>Long</td><td>-111.972193</td></tr> <tr> <td colspan="2">Direction Photo Taken: 273.13</td></tr> <tr> <td colspan="2">Description: Location of sample THL-WR-02</td></tr> </table>	Photo No. 72	Date: 06/04/2019	Photo Coordinates		Lat	46.268966	Long	-111.972193	Direction Photo Taken: 273.13		Description: Location of sample THL-WR-02		
Photo No. 72	Date: 06/04/2019												
Photo Coordinates													
Lat	46.268966												
Long	-111.972193												
Direction Photo Taken: 273.13													
Description: Location of sample THL-WR-02													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 73</td><td>Date: 09/11/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.289692</td></tr> <tr> <td>Long</td><td>-111.889389</td></tr> <tr> <td colspan="2">Direction Photo Taken: 22.0534973097617</td></tr> <tr> <td colspan="2">Description: Skyline Mine adit and tailings pile</td></tr> </table>	Photo No. 73	Date: 09/11/2019	Photo Coordinates		Lat	46.289692	Long	-111.889389	Direction Photo Taken: 22.0534973097617		Description: Skyline Mine adit and tailings pile		
Photo No. 73	Date: 09/11/2019												
Photo Coordinates													
Lat	46.289692												
Long	-111.889389												
Direction Photo Taken: 22.0534973097617													
Description: Skyline Mine adit and tailings pile													
<table> <tr> <td>Photo No. 74</td><td>Date: 09/11/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.289517</td></tr> <tr> <td>Long</td><td>-111.889283</td></tr> <tr> <td colspan="2">Direction Photo Taken: 348.09033203125</td></tr> <tr> <td colspan="2">Description: Skyline Mine adit, tailings pile, and the creek</td></tr> </table>	Photo No. 74	Date: 09/11/2019	Photo Coordinates		Lat	46.289517	Long	-111.889283	Direction Photo Taken: 348.09033203125		Description: Skyline Mine adit, tailings pile, and the creek		
Photo No. 74	Date: 09/11/2019												
Photo Coordinates													
Lat	46.289517												
Long	-111.889283												
Direction Photo Taken: 348.09033203125													
Description: Skyline Mine adit, tailings pile, and the creek													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 75	Date: 09/11/2019
Photo Coordinates	
Lat	46.289714
Long	-111.889442
Direction Photo Taken: 330.173950299914	
Description: Skyline Mine upper adit	



Photo No. 76	Date: 09/11/2019
Photo Coordinates	
Lat	46.290433
Long	-111.890244
Direction Photo Taken: 129.084610027855	
Description: Skyline Mine upper tailings pile and mine adit	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 77		Date: 09/11/2019
Photo Coordinates		
Lat	46.290428	
Long	-111.889161	
Direction Photo Taken: 311.027496382055		
Description: The road to Skyline Mine cut through the tailings pile		
		

Photo No. 78		Date: 09/11/2019
Photo Coordinates		
Lat	46.290383	
Long	-111.88865	
Direction Photo Taken: 34.1156616297133		
Description: Location of sample SM-SD-BK01 and SM-SD-BK02		
		

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 79	Date: 09/11/2019
Photo Coordinates	
Lat	46.2906
Long	-111.889367
Direction Photo Taken: 12.1148986889154	
Description: Location of sample SM-SW-BK01	



Photo No. 80	Date: 09/11/2019
Photo Coordinates	
Lat	46.289439
Long	-111.889153
Direction Photo Taken: 258.138168343039	
Description: Location of sample SM-SW/SD-01	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 81	Date: 09/11/2019
Photo Coordinates	
Lat	46.289422
Long	-111.889131
Direction Photo Taken: 316.475387727579	
Description: Location of sample SM-SW/SD-02	



Photo No. 82	Date: 09/11/2019
Photo Coordinates	
Lat	46.288575
Long	-111.888322
Direction Photo Taken: 44.306243902439	
Description: Location of sample SM-SW/SD-03	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 83</td><td>Date: 09/11/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.283342</td></tr> <tr> <td>Long</td><td>-111.944236</td></tr> <tr> <td colspan="2">Direction Photo Taken: 234.68338028169</td></tr> <tr> <td colspan="2">Description: Location of sample SM-SW/SD-04</td></tr> </table>	Photo No. 83	Date: 09/11/2019	Photo Coordinates		Lat	46.283342	Long	-111.944236	Direction Photo Taken: 234.68338028169		Description: Location of sample SM-SW/SD-04		
Photo No. 83	Date: 09/11/2019												
Photo Coordinates													
Lat	46.283342												
Long	-111.944236												
Direction Photo Taken: 234.68338028169													
Description: Location of sample SM-SW/SD-04													
<table> <tr> <td>Photo No. 84</td><td>Date: 09/11/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.289539</td></tr> <tr> <td>Long</td><td>-111.889228</td></tr> <tr> <td colspan="2">Direction Photo Taken: 108.904270164666</td></tr> <tr> <td colspan="2">Description: Location of sample SM-WR-08</td></tr> </table>	Photo No. 84	Date: 09/11/2019	Photo Coordinates		Lat	46.289539	Long	-111.889228	Direction Photo Taken: 108.904270164666		Description: Location of sample SM-WR-08		
Photo No. 84	Date: 09/11/2019												
Photo Coordinates													
Lat	46.289539												
Long	-111.889228												
Direction Photo Taken: 108.904270164666													
Description: Location of sample SM-WR-08													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 85	Date: 06/04/2019
Photo Coordinates	
Lat	46.259864
Long	-111.9479
Direction Photo Taken: 1.13213348331459	
Description: Waste pile located southwest of adit opening. Fire pit on top of pile.	



Photo No. 86	Date: 06/04/2019
Photo Coordinates	
Lat	46.260842
Long	-111.945625
Direction Photo Taken: 225.688201892744	
Description: Location of sample BM-SW/SD-BK01; upstream of creek-road crossing	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 87	Date: 09/09/2019
Photo Coordinates	
Lat	46.260722
Long	-111.945633
Direction Photo Taken: 320.865539452496	
Description: Location of sample BM-SW/SD-BK01	



Photo No. 88	Date: 06/04/2019
Photo Coordinates	
Lat	46.259419
Long	-111.948625
Direction Photo Taken: 353.359047078843	
Description: Location of sample BM-SW/SD-01; downstream of probable point of entry from Boulaway mine	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 89	Date: 06/04/2019
Photo Coordinates	
Lat	46.259369
Long	-111.948669
Direction Photo Taken: 15.2042007449219	
Description: Location of sample BM-SD-01; downstream of probable point of entry from Boulaway mine	



Photo No. 90	Date: 09/09/2019
Photo Coordinates	
Lat	46.259481
Long	-111.948075
Direction Photo Taken: 133.383857642199	
Description: Location of sample BM-SW/SD-01	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 91	Date: 06/04/2019
Photo Coordinates	
Lat	46.257172
Long	-111.950583
Direction Photo Taken: 291.154357950765	
Description: Location of sample BM-SW/SD-02	



Photo No. 92	Date: 06/04/2019
Photo Coordinates	
Lat	46.257256
Long	-111.9507
Direction Photo Taken: 221.944213649852	
Description: Location of sample BM-SD-02	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 93</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.260925</td></tr> <tr> <td>Long</td><td>-111.944397</td></tr> <tr> <td colspan="2">Direction Photo Taken: 157.278427205101</td></tr> <tr> <td colspan="2"> Description: Showing 5-point background composite locations for sample BM-SO-BK01 </td></tr> </table>	Photo No. 93	Date: 06/04/2019	Photo Coordinates		Lat	46.260925	Long	-111.944397	Direction Photo Taken: 157.278427205101		Description: Showing 5-point background composite locations for sample BM-SO-BK01		
Photo No. 93	Date: 06/04/2019												
Photo Coordinates													
Lat	46.260925												
Long	-111.944397												
Direction Photo Taken: 157.278427205101													
Description: Showing 5-point background composite locations for sample BM-SO-BK01													
<table> <tr> <td>Photo No. 94</td><td>Date: 09/09/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.257314</td></tr> <tr> <td>Long</td><td>-111.9505</td></tr> <tr> <td colspan="2">Direction Photo Taken: 56.0015564202335</td></tr> <tr> <td colspan="2"> Description: Location of sample BM-SW/SD-02 </td></tr> </table>	Photo No. 94	Date: 09/09/2019	Photo Coordinates		Lat	46.257314	Long	-111.9505	Direction Photo Taken: 56.0015564202335		Description: Location of sample BM-SW/SD-02		
Photo No. 94	Date: 09/09/2019												
Photo Coordinates													
Lat	46.257314												
Long	-111.9505												
Direction Photo Taken: 56.0015564202335													
Description: Location of sample BM-SW/SD-02													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 95	Date: 06/04/2019
Photo Coordinates	
Lat	46.260844
Long	-111.944367
Direction Photo Taken: 321.426052104208	
Description: Location of background grab sample BM-SO-BK02	



Photo No. 96	Date: 06/04/2019
Photo Coordinates	
Lat	46.260964
Long	-111.948744
Direction Photo Taken: 240.976806422837	
Description: Showing 5-point composite locations for sample BM-WR-05	



Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 97</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.260086</td></tr> <tr> <td>Long</td><td>-111.948167</td></tr> <tr> <td colspan="2">Direction Photo Taken: 273.874176153385</td></tr> <tr> <td colspan="2">Description: Location of sample BM-WR-14</td></tr> </table>	Photo No. 97	Date: 06/04/2019	Photo Coordinates		Lat	46.260086	Long	-111.948167	Direction Photo Taken: 273.874176153385		Description: Location of sample BM-WR-14		
Photo No. 97	Date: 06/04/2019												
Photo Coordinates													
Lat	46.260086												
Long	-111.948167												
Direction Photo Taken: 273.874176153385													
Description: Location of sample BM-WR-14													
<table> <tr> <td>Photo No. 98</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.260131</td></tr> <tr> <td>Long</td><td>-111.948111</td></tr> <tr> <td colspan="2">Direction Photo Taken: 350.005707038681</td></tr> <tr> <td colspan="2">Description: Location of sample BM-WR-16</td></tr> </table>	Photo No. 98	Date: 06/04/2019	Photo Coordinates		Lat	46.260131	Long	-111.948111	Direction Photo Taken: 350.005707038681		Description: Location of sample BM-WR-16		
Photo No. 98	Date: 06/04/2019												
Photo Coordinates													
Lat	46.260131												
Long	-111.948111												
Direction Photo Taken: 350.005707038681													
Description: Location of sample BM-WR-16													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table border="1"> <tr> <td>Photo No. 99</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.259805</td></tr> <tr> <td>Long</td><td>-111.948484</td></tr> <tr> <td colspan="2">Direction Photo Taken: 299.75</td></tr> <tr> <td colspan="2"> Description: Location of sample BM-WR-18 </td></tr> </table>	Photo No. 99	Date: 06/04/2019	Photo Coordinates		Lat	46.259805	Long	-111.948484	Direction Photo Taken: 299.75		Description: Location of sample BM-WR-18		
Photo No. 99	Date: 06/04/2019												
Photo Coordinates													
Lat	46.259805												
Long	-111.948484												
Direction Photo Taken: 299.75													
Description: Location of sample BM-WR-18													
<table border="1"> <tr> <td>Photo No. 100</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.25965</td></tr> <tr> <td>Long</td><td>-111.948394</td></tr> <tr> <td colspan="2">Direction Photo Taken: 32.9329223543226</td></tr> <tr> <td colspan="2"> Description: Showing 15-point composite locations for sample BM-WR-17 and duplicate sample BM-WR-19 </td></tr> </table>	Photo No. 100	Date: 06/04/2019	Photo Coordinates		Lat	46.25965	Long	-111.948394	Direction Photo Taken: 32.9329223543226		Description: Showing 15-point composite locations for sample BM-WR-17 and duplicate sample BM-WR-19		
Photo No. 100	Date: 06/04/2019												
Photo Coordinates													
Lat	46.25965												
Long	-111.948394												
Direction Photo Taken: 32.9329223543226													
Description: Showing 15-point composite locations for sample BM-WR-17 and duplicate sample BM-WR-19													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table border="1"> <tr> <td>Photo No. 101</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.259986</td></tr> <tr> <td>Long</td><td>-111.948381</td></tr> <tr> <td colspan="2">Direction Photo Taken: 194.149337748344</td></tr> <tr> <td colspan="2">Description: Location of sample BM-WR-OP-02</td></tr> </table>	Photo No. 101	Date: 06/04/2019	Photo Coordinates		Lat	46.259986	Long	-111.948381	Direction Photo Taken: 194.149337748344		Description: Location of sample BM-WR-OP-02		
Photo No. 101	Date: 06/04/2019												
Photo Coordinates													
Lat	46.259986												
Long	-111.948381												
Direction Photo Taken: 194.149337748344													
Description: Location of sample BM-WR-OP-02													
<table border="1"> <tr> <td>Photo No. 102</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.245996</td></tr> <tr> <td>Long</td><td>-111.946057</td></tr> <tr> <td colspan="2">Direction Photo Taken: 86.7</td></tr> <tr> <td colspan="2">Description: Showing 5-point background composite locations for sample EQ-SO-BK01</td></tr> </table>	Photo No. 102	Date: 06/03/2019	Photo Coordinates		Lat	46.245996	Long	-111.946057	Direction Photo Taken: 86.7		Description: Showing 5-point background composite locations for sample EQ-SO-BK01		
Photo No. 102	Date: 06/03/2019												
Photo Coordinates													
Lat	46.245996												
Long	-111.946057												
Direction Photo Taken: 86.7													
Description: Showing 5-point background composite locations for sample EQ-SO-BK01													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 103</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.245967</td></tr> <tr> <td>Long</td><td>-111.945859</td></tr> <tr> <td colspan="2">Direction Photo Taken: 31.25</td></tr> <tr> <td colspan="2">Description: Location of background grab sample EQ-SO-BK02</td></tr> </table>	Photo No. 103	Date: 06/03/2019	Photo Coordinates		Lat	46.245967	Long	-111.945859	Direction Photo Taken: 31.25		Description: Location of background grab sample EQ-SO-BK02		
Photo No. 103	Date: 06/03/2019												
Photo Coordinates													
Lat	46.245967												
Long	-111.945859												
Direction Photo Taken: 31.25													
Description: Location of background grab sample EQ-SO-BK02													
<table> <tr> <td>Photo No. 104</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.253545</td></tr> <tr> <td>Long</td><td>-111.955428</td></tr> <tr> <td colspan="2">Direction Photo Taken: 173.01</td></tr> <tr> <td colspan="2">Description: Location of sample EQ-SW/SD-01</td></tr> </table>	Photo No. 104	Date: 06/04/2019	Photo Coordinates		Lat	46.253545	Long	-111.955428	Direction Photo Taken: 173.01		Description: Location of sample EQ-SW/SD-01		
Photo No. 104	Date: 06/04/2019												
Photo Coordinates													
Lat	46.253545												
Long	-111.955428												
Direction Photo Taken: 173.01													
Description: Location of sample EQ-SW/SD-01													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table border="1"> <tr> <td>Photo No. 105</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.253567</td></tr> <tr> <td>Long</td><td>-111.955391</td></tr> <tr> <td colspan="2">Direction Photo Taken: 181.11</td></tr> <tr> <td colspan="2">Description: Collection of sample EQ-SD-01</td></tr> </table>	Photo No. 105	Date: 06/04/2019	Photo Coordinates		Lat	46.253567	Long	-111.955391	Direction Photo Taken: 181.11		Description: Collection of sample EQ-SD-01		
Photo No. 105	Date: 06/04/2019												
Photo Coordinates													
Lat	46.253567												
Long	-111.955391												
Direction Photo Taken: 181.11													
Description: Collection of sample EQ-SD-01													
<table border="1"> <tr> <td>Photo No. 106</td><td>Date: 09/09/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.254197</td></tr> <tr> <td>Long</td><td>-111.954278</td></tr> <tr> <td colspan="2">Direction Photo Taken: 35.7450256410256</td></tr> <tr> <td colspan="2">Description: Location of sample EQ-SW/SD-01</td></tr> </table>	Photo No. 106	Date: 09/09/2019	Photo Coordinates		Lat	46.254197	Long	-111.954278	Direction Photo Taken: 35.7450256410256		Description: Location of sample EQ-SW/SD-01		
Photo No. 106	Date: 09/09/2019												
Photo Coordinates													
Lat	46.254197												
Long	-111.954278												
Direction Photo Taken: 35.7450256410256													
Description: Location of sample EQ-SW/SD-01													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 107</td><td>Date: 09/09/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td></td></tr> <tr> <td>Long</td><td></td></tr> <tr> <td colspan="2">Direction Photo Taken:</td></tr> <tr> <td colspan="2"> Description: Dry creek bed of EQ-SW/SD-02; no sample was collected </td></tr> </table>	Photo No. 107	Date: 09/09/2019	Photo Coordinates		Lat		Long		Direction Photo Taken:		Description: Dry creek bed of EQ-SW/SD-02; no sample was collected		
Photo No. 107	Date: 09/09/2019												
Photo Coordinates													
Lat													
Long													
Direction Photo Taken:													
Description: Dry creek bed of EQ-SW/SD-02; no sample was collected													
<table> <tr> <td>Photo No. 108</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.252735</td></tr> <tr> <td>Long</td><td>-111.956748</td></tr> <tr> <td colspan="2">Direction Photo Taken: 73.56</td></tr> <tr> <td colspan="2"> Description: Location of sample EQ-SW/SD-03 </td></tr> </table>	Photo No. 108	Date: 06/04/2019	Photo Coordinates		Lat	46.252735	Long	-111.956748	Direction Photo Taken: 73.56		Description: Location of sample EQ-SW/SD-03		
Photo No. 108	Date: 06/04/2019												
Photo Coordinates													
Lat	46.252735												
Long	-111.956748												
Direction Photo Taken: 73.56													
Description: Location of sample EQ-SW/SD-03													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 109</td><td>Date: 06/04/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.252721</td></tr> <tr> <td>Long</td><td>-111.956727</td></tr> <tr> <td colspan="2">Direction Photo Taken: 59.46</td></tr> <tr> <td colspan="2">Description: Collection of sample EQ-SW-03</td></tr> </table>	Photo No. 109	Date: 06/04/2019	Photo Coordinates		Lat	46.252721	Long	-111.956727	Direction Photo Taken: 59.46		Description: Collection of sample EQ-SW-03		
Photo No. 109	Date: 06/04/2019												
Photo Coordinates													
Lat	46.252721												
Long	-111.956727												
Direction Photo Taken: 59.46													
Description: Collection of sample EQ-SW-03													
<table> <tr> <td>Photo No. 110</td><td>Date: 09/09/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.253364</td></tr> <tr> <td>Long</td><td>-111.955544</td></tr> <tr> <td colspan="2">Direction Photo Taken: 48.1447143345878</td></tr> <tr> <td colspan="2">Description: Location of sample EQ-SW/SD-03</td></tr> </table>	Photo No. 110	Date: 09/09/2019	Photo Coordinates		Lat	46.253364	Long	-111.955544	Direction Photo Taken: 48.1447143345878		Description: Location of sample EQ-SW/SD-03		
Photo No. 110	Date: 09/09/2019												
Photo Coordinates													
Lat	46.253364												
Long	-111.955544												
Direction Photo Taken: 48.1447143345878													
Description: Location of sample EQ-SW/SD-03													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 111</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.246561</td></tr> <tr> <td>Long</td><td>-111.946301</td></tr> <tr> <td colspan="2">Direction Photo Taken: 300.94</td></tr> <tr> <td colspan="2">Description: Collecting sample EQ-WR-01</td></tr> </table>	Photo No. 111	Date: 06/03/2019	Photo Coordinates		Lat	46.246561	Long	-111.946301	Direction Photo Taken: 300.94		Description: Collecting sample EQ-WR-01		
Photo No. 111	Date: 06/03/2019												
Photo Coordinates													
Lat	46.246561												
Long	-111.946301												
Direction Photo Taken: 300.94													
Description: Collecting sample EQ-WR-01													
<table> <tr> <td>Photo No. 112</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.246629</td></tr> <tr> <td>Long</td><td>-111.946321</td></tr> <tr> <td colspan="2">Direction Photo Taken: 239.48</td></tr> <tr> <td colspan="2">Description: Collecting sample EQ-WR-02</td></tr> </table>	Photo No. 112	Date: 06/03/2019	Photo Coordinates		Lat	46.246629	Long	-111.946321	Direction Photo Taken: 239.48		Description: Collecting sample EQ-WR-02		
Photo No. 112	Date: 06/03/2019												
Photo Coordinates													
Lat	46.246629												
Long	-111.946321												
Direction Photo Taken: 239.48													
Description: Collecting sample EQ-WR-02													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table border="1"> <tr> <td>Photo No. 113</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.246521</td></tr> <tr> <td>Long</td><td>-111.94657</td></tr> <tr> <td colspan="2">Direction Photo Taken: 185.83</td></tr> <tr> <td colspan="2"> Description: Showing 5-point composite locations for sample EQ-WR-03 </td></tr> </table>	Photo No. 113	Date: 06/03/2019	Photo Coordinates		Lat	46.246521	Long	-111.94657	Direction Photo Taken: 185.83		Description: Showing 5-point composite locations for sample EQ-WR-03		
Photo No. 113	Date: 06/03/2019												
Photo Coordinates													
Lat	46.246521												
Long	-111.94657												
Direction Photo Taken: 185.83													
Description: Showing 5-point composite locations for sample EQ-WR-03													
<table border="1"> <tr> <td>Photo No. 114</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.246519</td></tr> <tr> <td>Long</td><td>-111.946684</td></tr> <tr> <td colspan="2">Direction Photo Taken: 167.43</td></tr> <tr> <td colspan="2"> Description: Location of sample EQ-WR-04 </td></tr> </table>	Photo No. 114	Date: 06/03/2019	Photo Coordinates		Lat	46.246519	Long	-111.946684	Direction Photo Taken: 167.43		Description: Location of sample EQ-WR-04		
Photo No. 114	Date: 06/03/2019												
Photo Coordinates													
Lat	46.246519												
Long	-111.946684												
Direction Photo Taken: 167.43													
Description: Location of sample EQ-WR-04													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

<table> <tr> <td>Photo No. 115</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.246839</td></tr> <tr> <td>Long</td><td>-111.946564</td></tr> <tr> <td colspan="2">Direction Photo Taken: 201.195640616693</td></tr> <tr> <td colspan="2"> Description: Showing 5-point composite locations for sample EQ-WR-05 </td></tr> </table>	Photo No. 115	Date: 06/03/2019	Photo Coordinates		Lat	46.246839	Long	-111.946564	Direction Photo Taken: 201.195640616693		Description: Showing 5-point composite locations for sample EQ-WR-05		
Photo No. 115	Date: 06/03/2019												
Photo Coordinates													
Lat	46.246839												
Long	-111.946564												
Direction Photo Taken: 201.195640616693													
Description: Showing 5-point composite locations for sample EQ-WR-05													
<table> <tr> <td>Photo No. 116</td><td>Date: 06/03/2019</td></tr> <tr> <td colspan="2">Photo Coordinates</td></tr> <tr> <td>Lat</td><td>46.246746</td></tr> <tr> <td>Long</td><td>-111.946447</td></tr> <tr> <td colspan="2">Direction Photo Taken: 202.61</td></tr> <tr> <td colspan="2"> Description: Location of sample EQ-WR-06 </td></tr> </table>	Photo No. 116	Date: 06/03/2019	Photo Coordinates		Lat	46.246746	Long	-111.946447	Direction Photo Taken: 202.61		Description: Location of sample EQ-WR-06		
Photo No. 116	Date: 06/03/2019												
Photo Coordinates													
Lat	46.246746												
Long	-111.946447												
Direction Photo Taken: 202.61													
Description: Location of sample EQ-WR-06													

Project Name: Elkhorn Mining District Site Inspection	Site Location: Jefferson County, Montana	Project No. 0004/1807-06
---	--	------------------------------------

Photo No. 117	Date: 06/03/2019	
Photo Coordinates		
Lat	46.247681	
Long	-111.946771	
Direction Photo Taken: 278.17		
Description: Showing 5-point composite locations for sample EQ-WR-07		
Photo No. 118	Date: 06/03/2019	
Photo Coordinates		
Lat	46.247769	
Long	-111.946815	
Direction Photo Taken: 110.48		
Description: Location of sample EQ-WR-08		

APPENDIX B
Field Documentation

**—DEFYING—
MOTHER NATURE®**

SINCE 1916



All components of
this product are recyclable

Rite in the Rain

A patented, environmentally
responsible, all-weather writing paper
that sheds water and enables you to
write anywhere, in any weather.

Using a pencil or all-weather pen,
Rite in the Rain ensures that your
notes survive the rigors of the field,
regardless of the conditions.

© 2018
J.L. DARLING LLC
Tacoma, WA 98424-1017 USA
www.RiteintheRain.com

Item No. 391FX
ISBN: 978-1-60134-188-4

Made in the USA
US Pat No. 6,863,940



Elkhorn Mine Sites



Rite in the Rain

ALL-WEATHER
JOURNAL

No 391FX

1 of 2

SINCE 1816 —

— SINCE 1916 —
Rite in the Rain®

== DEFYING MOTHER NATURE ==

Name

Weston Solutions

Address

Address 1435 Garrison St., Ste. 100
Lakewood, CO. 80215

Phone

Phone 303-729-6100

Project

Project Elkhorn Mine Sites
Jefferson County, Montana

TDD 0004/1807-06



RiteintheRain.com

CONTENTS

[illegible]

6/3/19 ~~NR~~

Personnel: Tana Jones, Natalie Quint,
Mindy McCarthy (Weston), Brent
Merritt (RESP), Robyn Blackburn
(USFWS), Joseph Chisholm (EPA),
Joel Chavez (MDEQ), Sonny Thornbrow
(USFS)

Scope: Collect surface water, sediment
and waste material samples at
Elkhorn Creek Tailings and
Elkhorn Queen Mines.

Weather: Sunny, scattered clouds,
slight breeze, ~57°F.

0830 Arrive at USFS picnic area in
Elkhorn. Calibrating XRF and YSI
556 MPS. XRF Olympus Delta B420
Cal Check Passed. Rate (cps) 8335
Resolution (eV) 141. YSI 556 MPS
S/N: H100057. 3-point pH cal. and
Conductivity, and ORP.

0915 Safety tailgate topics, slips, trips,
falls, hydrations, sun exposure, ticks,
working near water, lightning, heat
stress.

0957 Collecting ECT-SW/SD-04 in most
downstream wetland area. Water
clear. Channel ~ 1.5 ft wide x

6/3/19 ~~NR~~

6 in. deep. Flow ~ 50-80 gpm. ~ 6 ft in
4 seconds. Water quality Temp. 7.5°
pH 7.57, Cond. 276 μ S/cm, DO 11.1
mg/L, ORP 64.5 mV. Robyn, Sonny,
Brent and Natalie present.

1049 Arrive at ECT-SW/SD-03 and
ECT-SW/SD-05. Scouting for PPE
location.

1124 Collecting ECT-SW/SD-03 and
ECT-SW/SD-05 Dup. Water quality:
Temp. 7.97°C 8.43°C DO 10.29 mg/L
pH 7.97 ORP 4.4 mV.
Cond. 276 μ S/cm

Creek 1 ft - 2 ft. wide. ~ 6-8 in.
deep. 6 ft. in 4 sec. Tailings observed
in creek. Water observed draining
into creek through wetland downstream
of pile. Not collecting ECT-SW/SD-01
as SW/SD-03 and 05 location
representative of most downstream
PPE in Elkhorn Creek and within
wetland area.

1219 Walking southern tailings pile
and laying pin flags in 3 transects
of 10 at 50 ft apart.

XRF Elkhorn Mine Sites		6/3/19 NR				
Sample #	Run ID	As	Cu	Pb	Zn	Mg
1	2	165	247	2057	8,483	ND
2	3	98	184	1,787	7,895	ND
3	3	108	196	1,870	9,869	ND
4	5	186	255	2,887	9,513	ND
5	8	84	177	1,434	7,758	ND
6	9	83	148	1,389	8,242	ND
7	10	60	175	1,646	7,525	ND
8	11	97	212	1,702	8,317	ND
9	12	172	261	1,892	9,577	ND
10	13	72	178	1,827	8,924	ND
11	14	177	263	1,778	1.23%	ND
12	15	81	201	2,120	9,449	ND
13	16	120	174	1,832	7,807	ND
14	17	231	384	3,886	1.36%	ND *
15	18	122	289	3,404	1.03%	ND
16	19	67	202	1,484	8,485	ND
17	20	71	392	3,421	1.52%	ND
18	21	213	394	3,701	1.33%	ND
19	22	49	185	1,155	8,273	ND
20	23	116	242	1,377	9,018	14
21	24	77	224	1,266	7,453	ND
22	25	58	186	1,308	6,819	ND
23	26	81	161	1,191	7,290	ND
24	27	NA	NA	NA	NA	NA
25	28	NA	NA	NA	NA	NA

Elkhorn Mine Sites		NR 6/3/19	
Run ID	Lat	Long	
2	46.265272088	-111.95613761442895	
3	46.2650933862	-111.95614272738989	
4	46.264975327110	-111.95614616397019	
5/6	46.26485433433780	-111.95606888282295	
8	46.26462035351085	-111.95615211512144	
9	46.264543994372	-111.95619419227536	
10	46.26436701098749	-111.95627517819322	
11	46.26424681399601	-111.95634808401759	
12	46.26424815510052	-111.95623836490508	
13	46.2640998792341	-111.95664849142726	
14	46.264321329115205	-111.95666257302459	
15	46.2644966785295	-111.95658378313477	
16	46.2646325491799	-111.95662024441557	
17	46.2647651089786	-111.9565603138089	
18	46.264905296309166	-111.95650532852109	
19	46.2650423823355	-111.95645210843595	
20	46.26522804149078	-111.9564493374079	
21	46.26541152135121	-111.95652611564095	
22	46.265356033152	-111.95656576204296	
23	46.265288686507	-111.95657632324095	
24	46.2651102338417	-111.95669677118953	
25	46.264929017095	-111.95670615892108	
26	46.2647644450597	-111.95677396851774	
27	46.264578024899	-111.95677380087967	
28	46.2643291269108	-111.95694739009436	

Elkhorn Sites

6/3/18 NR

Sample#	Run ID	As	Cu	Pb	Zn	Hg
26	29	NA	NA	NA	NA	NA
27	30 29	91	182	1411	1.02%	ND
28	31 30	9167	18251	1411	1.02%	ND
29	32 31	NA	NA	NA	NA	NA
30	33 32	NA	NA	NA	NA	NA

Na

Sample#

Lat

Long

29

46.264446960498231 -111.95694579753274

30

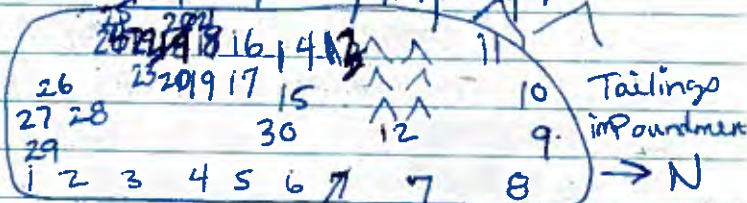
46.2645288650376 -111.95717643514

NR

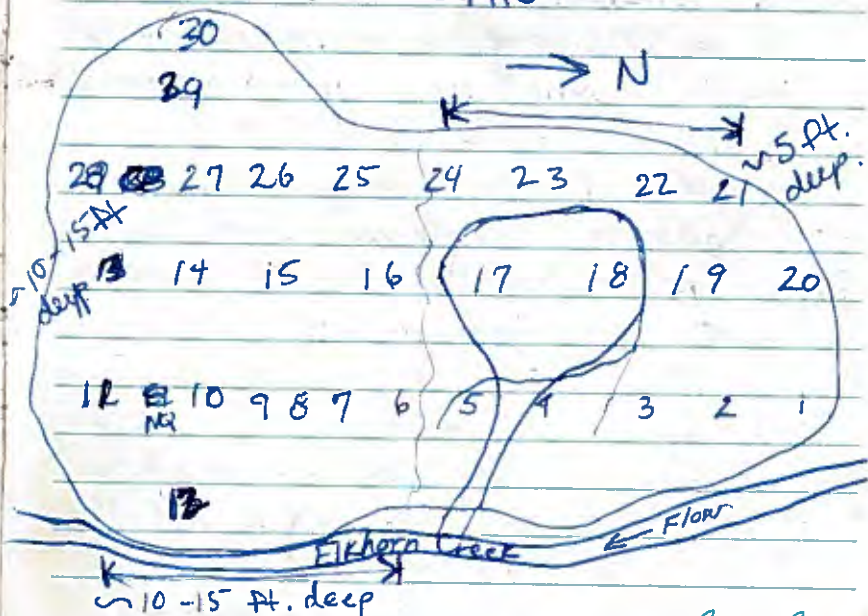
Collecting grab sample ECT-WR-06
1515 at aliquot location 17. Brown
sandy clay in central portion of
south pile. Numerous erosion
channels in central portion of pile.
1535 Collecting composite sample in
tailings impoundment.

Sample#	Run ID	As	Cu	Pb	Zn	Hg
1	2 31	182	453	4390	1.35%	17
2	4 32	369	1,325	1,111	2.15%	ND
3	6 33	312	1,033	6,155	3.06%	ND
4	8 34	218	417	3,217	9.009	25
5	10 35	209	432	3,986	1.27%	25
6	12 36	408	790	7,365	2.56%	60
7	14 37	271	764	7,520	2.56%	28

Sample#	Run ID	As	Cu	Pb	Zn	Hg
8	16 16 38	150	479	9,617	1.52%	27
9	18 39	147	700	6,740	2.28%	49
10	20 40	583	1,812	1,578	4.66%	108 *
11	22 41	586	2,292	6,756	5.47%	119
12	24 42	676	1,535	1,691	3.50%	109
13	26 43	259	584	4,857	1.51%	46
14	28 44	377	1,124	9,467	2.93%	29
15	30 46	334	699	6,444	2.22%	42

NR
6/3/19

South Pile



Rise in the Rain

Elkhorn Mine Sites

6/3/19 NO

Loc #	Lat.	Long.
4	46.2663820900099	-111.95608715537186
6	46.2666295376	-111.95624934579823
8	46.2668674998414624	-111.95626671955683
10	46.266913516410085	-111.9563930791751
12	46.26674989183061	-111.95662518973644
14	46.26656503886568	-111.9569718625162
16	46.26647384375917	-111.9570651587392
18	46.26637673941093	-111.9570902177244
20	46.26637552403497	-111.95693020119285
22	46.26621341802763	-111.95693682889636
24	46.2661485163666	-111.9568008714192
26	46.265857857695016	-111.9564319030493
28	46.2653601894217	-111.95626535463329
30	iphone 8 photos	iphone 8 photos

55-gallon drum - half full of white powder. Adjacent to sample location aliquot # 24 and former wood structure.

1726 XRF readings on east side of road just north of ECT impoundment.

AS 189 Cu 370 Hg 31

Pb 2,649 Zn 8,923

Between Elkhorn Creek and Road.

AS 539 Pb 7,954 Hg 173

Cu 2678 Zn 6.67%

photos on iphone 8. ECT-SDP-01.

Elkhorn Creek Tailings Mine Site 6/3/19

- ECT north pile is ~ 5 ft. deep and heavily eroded. Creek runs through tailings. Shed and garage/barn located on west side of Elkhorn Rd. west of pile. Appears to be a vacation/summer property. No living space present (i.e. no house/cabin)
- Lots of metal and wood mining debris scattered throughout the tailings impoundment. Seep located on central western portion of site.

1626 Collecting BM-SW-BK01. Clear.

Water Quality YSI's

Temp 7.61°C DO 10.39 mg/L

pH 7.26 ORP 32.6 mV

Cond. 43 µS/cm

Creek ~ 2.5-3 ft. wide x 1 ft. deep

Flow ~ 6 ft. in 3 sec., ~ 100 gpm.

1631 Collecting BM-SD-BK01. Gravelly sand.

Elkhorn Mine Sites 6/4/19^{NR}

Personnel: Natalie Quiet, Tara Jones
Brent Merritt, Mind McCarthy,
Robyn Blackburn (EPA), Joseph Chisholm.

Scope: Collect samples at Boulaway,
Thumley Heap Leach, Opportunity
at ECT, and SW/SD samples for
Elkhorn Queen.

Weather: Sunny, ~60°F, no wind.

0815 Arrive at Elkhorn USFS restroom
area. Calibrate XRF. Check passed
Rate (cps) 37627 Resolution (eV)
141.

0842 Collecting opportunity sample on
east side of Elkhorn Road across
from Elkhorn Creek Tailings
Impoundment. ECT-SD-OP-01.
Reddish-brown sandy clay. Small
berm area located ~10 ft west of
Elkhorn Creek.

0927 Depart truck to top/upslope pile at
Boulaway Mine.

1023 Arrive at BM-WR-01/02. XRF
readings 6/4/19#5-9 indicated
low Pb metals concentrations in
piles upslope and downslope of road.

1042 Arrive at 6/4/19 XRF #12^{NR} at BM-

Elkhorn Mine Sites.

NR
6/4/19¹¹

WR-03/04. XRF readings
As 312 Pb 103 Hg 14
Cu 964 Zn 2981

Not collecting sample due to low
Pb readings per Robyn. Did not collect
BM-WR-01/02 per Robyn also.

1015 Arrive at BM-WR-05/06. XRF readings
#14-18.

Run ID #	Zn	As	Cu	Pb	Hg
14	8300	701	747	120	ND
15	1,029	786	1,033	221	13 *
16	9386	861	1,041	158	18
17	4,134	770	487	126	ND
18	3,812	867	306	128	ND

1100 Light brown waste rock pile,
gravelly sandy clay. Pile ~15 ft wide
by 30 ft long, 3-5 ft. deep. BM-WR-06
(grab) and BM-WR-05 (composite)
collected. BM-WR-06 at XRF run ID
#15. Run 19 on N side of pile, 20 on South pile.

1146 Arrive at BM-WR-07/08. XRF readings

Run ID	Zn	As	Cu	Pb	Hg
19	5832	784	906	130	17
20	6,070	574	3,015	90	29

Pile at light reddish-brown. Volume/total
pile ~ 20 ft wide x 30 ft tall x 10 ft deep.

Elkhorn Mine Sites ^{NO} 6/4/19

Located upslope of collapsed adit.
No sample per Robyn. Low metals concentrations.

1200 Amirc at BM-WR-n/12. XRF reading
#21. As 34.5 Pb 39 Cu 145 Zn 421
Hg 10. No sample per Robyn due
to low metals conc. XRF at BM-WR-B/H

XRF Run ID	As	Cu	Pb	Zn	Hg
22	1,115	557	628	1.24%	ND
23	426	1,756	128	4,216	17
24	1,601	718	656	7,477	18
25	8,053	935	247	3,845	21
26	1,462	740	684	5,426	ND
27	1,186	3,471	482	4.47%	ND
28	927	3,197	371	5.08%	ND
29	997	2,674	140	3.75%	ND
30	1,143	446	191	4,576	12
31	2,640	5007	157	2.55%	ND

32	35.5	104	29	217	13
33	26	57	132	201	15

34 NQ No XRF readings or sample

35 since metals results for XRF ID's

36 32+33 were low per Robyn.

BM-WR-13/14 dark red to light brown
yellow waste rock & sandy-clayey gravel
Pile ~ 30 ft. wide x 40 ft. long x 10 ft. deep

Elkhorn Mine Sites ^{NO} 6/4/19

- BM-WR-15/16 dark reddish-brown ^{gravelly} sandy-clayey gravel. Pile ~ 15 ft. wide x 30 ft. long x 10 ft. high.

- Small surficial waste rock pile adjacent to shaft opening. XRF IDs 32+33. 5 in. deep x 30 ft. x 12 ft. wide

1215 Collection BM-WR-13, composite.

1230 Collecting BM-WR-15, composite.

1235 Collecting BM-WR-14, grab.

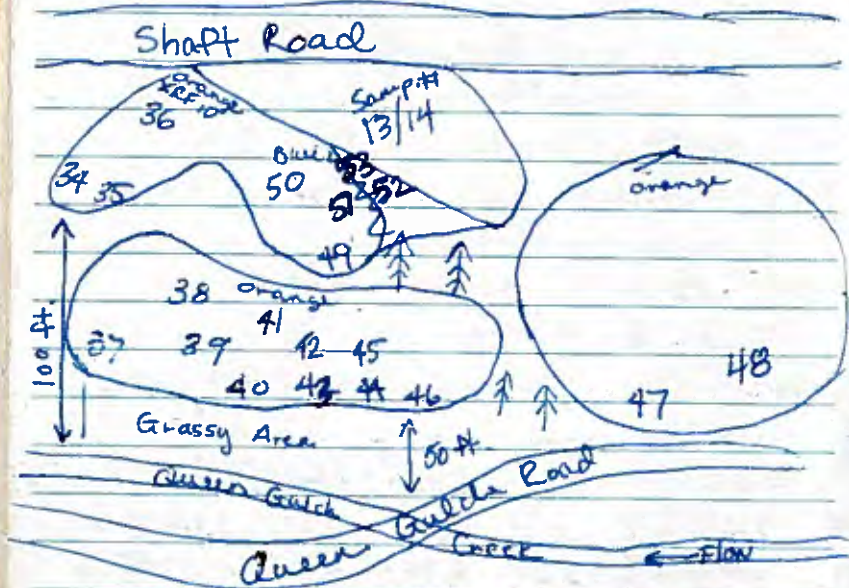
1240 Collecting BM-WR-16, grab.

1300 Amirc at BM-WR-17/18. XRF

Readings:

XRF Run ID	As	Cu	Pb	Zn
1 34	204	7271	35	2.68%
2 35	249	8,093	57	4.07% *
3 36	174	501	57	4.20%
4 37	149	100	29	467
5 38	230	193	51	2380
6 39	354	502	61	6,329
7 40	843	652	159	8,054
8 41	865	944	104	1.67%
9 42	724	301	124	1.23%
10 43	1,061	523	101	6,241
11 44	416	2,798	60	6,885
12 45	308	1,679	39	5,656
13 46	601	4,232	98	1.22%

14	XRF RunID	As	Cu	Pb	Zn	6/4/19
14	47	781	3,473	543	1.36%	
15	48	722	3,959	174	1.05%	



XRF RunID	As	Cu	Pb	Zn
49	99	1.14%	19	3.37%
50	125	1.30%	40	6.04%
51	46.3	8,553	10.6	2.09%
52	113	1.72%	21	4.26%
53	811	1.24%	23	9.88%*

1345 Collecting BM-WR-18, grab. Yellow-light brown waste rock, sandy clay w/some gravel. Mostly vegetated pile. Pile ~ 100 ft. wide x 5 ft. deep x 175 ft. long.

1350 Collecting BM-WR-17, composite (15-pt).

Elkhorn Mine Sites

6/4/19

1415 Collecting BM-WR-OP-02, grab from blue waste rock pile. Pile ~ 5 ft. deep x 30 ft long x 10 ft. wide. Runs southwest off toe of pile where BM-WR-13/14 collected. Gravelly sand, dark brown to brown.

1418 Collecting BM-WR-OP-01, 5-point composite.

1425 Collecting BM-WR-19 (Dup of 17)

1427 Collecting BM-WR-20 (Dup of 18)

XRF Reading #54 collected on pile in meadow southwest of adit. Fire pit on top of pile appears to be used frequently. Photo on iPhone 8.

1512 Collecting BM-SW-02 for total and dissolved metals. Clear water stream ~ 3 ft. wide x 1 ft. deep. 6 ft. in 3 sec. flow. ~ 100 gpm. Larger stream than Elkhorn Creek in upper basin portion.

1520 Collecting BM-SD-02 in creek bed.

1555 Collecting BM-SW-01 at most downstream PPE of site. Water Quality YSI readings:
Temp 6.96°C 7.71°F Cond. 46 µS/cm ORP 47.7 mV
pH 6.96 DO 10.6 mg/L *Rate in the Rain*

Elkhorn Mine Sites

6/4/19

1605 Collecting BM-SD-01 on west side of creek.

- See pg. 9 for info. of samples BM-SW/SD-BK01.

1649 Collecting background soil samples BM-SD-BK01 and BM-SD-BK02.

Dark black soil, 2-3 in. organic forest floor layer over top of soil.

Run ID	As	Cu	Pb	Zn
55	10.9	35	134	161

1710 Depart site to meet Tana, Mindy, and Joseph at Restroom parking area in Elkhorn.

1730 Arrive at USFS parking area. Joseph to call and see if we can get access to Greyback Gulch sample locations tomorrow. If not, will sample at a later date.

1745 Depart for Boulder, MT.

1815 Arrive in Boulder, MT. End of day.

4/3/19
4 NR

6/5/19 Elkhorn Mine Sites

0800 Arrive on site, Sunny, 50°F
J. Chisholm, R. Blackburn, T. Jones,
M. McCarthy, B. Hermit

0805 Began equip cal (recorded in logbook #2)

0810 Hg S tailgate and P.O.D.
review by T. Jones

0820 Depart Br CS D

0833 Arrive @ CS D

0855 Set up @ CD-WR-09/10/Matrix: taking

ph	Zn	Cu	As
5168	4303	612	1329

① #2 Lat

46.288309 Long

2057	2566	507	4408
------	------	-----	------

② #3 Lat

46.28826 Long

3100	1419	1261	8319
------	------	------	------

③ #4 Lat

46.288296 Long

088	511	037	8482
-----	-----	-----	------

④ #5 Lat

46.28829 Long

2470	1365	2561	1.69%
------	------	------	-------

⑤ #6 Lat

46.28834 Long

18 XRF	Pb	Zn	Cu	As	GB/A
① #7	4881	1270	1497	1.91%	
46.288357	Lat				
-111.934309	Long				
② #8	4497	559	458	7563	
46.288347	Lat				
-111.934327	Long				
③ #9	4419	677	631	1.77%	
46.288349	Lat				
-111.934319	Long				
④ #10	1.40%	1460	3716	1.32%	
46.288345	Lat				
-111.934311	Long				
⑤ #11	1514	492	579	2932	
46.288345	Lat				
-111.934357	Long				
⑥ #12	2066	765	551	4386	
46.28832	Lat				
-111.934339	Long				
⑦ #13	1557	779	723	2.17%	
46.28831	Lat				
-111.934187	Long				
⑧ #14	7940	857	780	1.68%	
46.28833	Lat				
-111.934116	Long				

fin

XRF	Pb	Zn	Cu	As	GB/A
① #15	5128	769	837	1.25%	
46.28833	Lat				
-111.934147	Long				
② #16	5947	1162	719	9282	
46.288348	Lat				
-111.934119	Long				

colle 0933 collected CD-WR-09
0933 collected CD-WR-10
Pile site: 75 x 50 x 40
1000 Departed CD
1314 Arrive on roadway to union,
many down trees, parked
1330 Arrive @ Union Akhony
1335 Set up on WR-03/04

XRF	Pb	Zn	Cu	As	
① #17	4604	807	383	637	collected
② #18	8839	1.00%	787	740	③ 1345
③ #19	8238	5675	678	831	UE-WR-03
④ #20	126%	6371	672	1078	+ MS/MSD
⑤ #21	9537	9520	709	510	UE-WR-04 1347
⑥ #22	129%	666%	2076	1905	1350
⑦ #23	1.09%	1.96%	1950	486	collected
⑧ #24	1.01%	2.86%	1314	488	UE-WR-01
⑨ #25	1.15%	1.04%	1898	488	1357 collected
⑩ #27	8007	8107	1058	678	MS/MSD Return to Room

WR-01/02 pile: 60 x 28 x 4 6/5/19

WR-02/01 pile: 50 x 30 x 4

XRF	Pb	Zn	Cu	As	Lat	Long
① #28	5359	1455	418	468	46.291216/-111.9427019	
② #29	1265	2435	ND	445	46.29471/-111.9426784	
③ #30	1612	1486	1491	358	46.291263/-111.9428444	
④ #31	1529	3673	154	104	46.291279/-111.9426258	
⑤ #32	851	1329	137	468	46.292248/-111.94260957	
⑥ #33	1138	1146	717	144	46.2913289/-111.942644175	
⑦ #34	1713	1999	537	654	46.2912021/-111.94254524	
⑧ #35	2198	1806	401	789	46.29121328/-111.942573348	
⑨ #36	1668	1322	796	400	46.29115553/-111.942639720	
⑩ #37	1637	3433	409	205	46.29106899/-111.942602885	
⑪ #38	1683	556	551	314	46.29106824/-111.741688041	
⑫ #39	1453	1454	422	401	46.2910806737/-111.94258706	
⑬ #40	3663	4956	567	369	46.2910334839/-111.9425623	
⑭ #41	7577	6586	531	695	46.2916955138/-111.94257592	
⑮ #42	1913	1319	344	278	46.2911583746/-111.942508556	

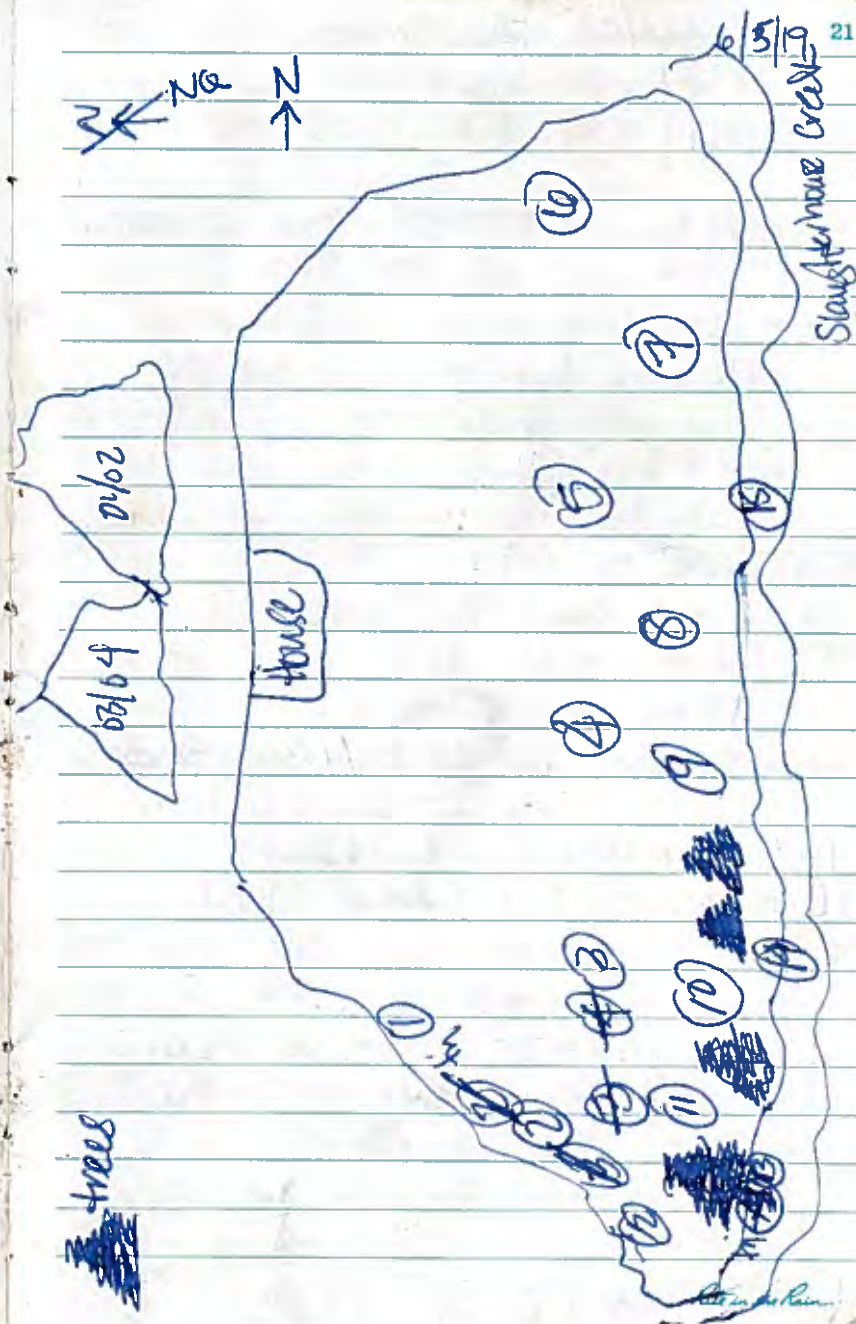
Location # 14 is ~ 8 feet from creek

* waste rock observed in creek

1452 collected WG-WR-05/07/15-pt LAMP

1455 collected WG-WR-06/08 grab from aliquot location #8

XRF	Pb	Zn	Cu	As	XRF	Pb	Zn	Cu	As
① #43	149	125	32	55	④ #46	76	178	ND	95
② #44	86	21	ND	88	⑤ #47	53	169	66	45
③ #45	143	358	90	131	1504 collected WG-SO-01/01				



UE-SW/SD-BK01 surface water samples 6/5/19
 YSI | pH | temp | DO | cond | ORP
 SW/SD-BK01 | 7.89 | 7.7 | 10.05 | 104 | -19.4

Sample time - UE-SW-BK01 @ 1522
 " - UE-SD-BK01 @ 1534

Adit was draining; collected T₄ Diss sample from pipe. UE-SW-04

YSI | pH | temp | DO | cond | ORP
 UE-SW-04 | 6.64 | 6.42 | 5.81 | 483_{us} | 79.3

sample time @ 1545 min

UE-SW-01 (03)

YSI | pH | temp | DO | cond | ORP
 UE-SW-01 | 8.31 | 8.31 | 9.69 | 103_{us} | 39.7
 7.61

Sample time - UE-SW-01/03 @ 1553

" - UE-SD-01/03 @ 1604

1630 Departed Union Forkhorn

1640 Arrived CD-SW/SD-BK01

YSI | pH | temp | DO | cond | ORP
 CD-SW-BK01 | 7.26 | 7.06 | 11.76 | 46_{us} | 90.2

1649 collected CD-SW-BK01

1651 collected CD-SD-BK01

1656 arrived @ CD-SW-01

YSI | pH | temp | DO | cond | ORP
 CD-SW-01 | 7.30 | 6.84 | 11.35 | 46_{us} | 69.8

1707 collected CD-SW-01 / 1711 CD-SD-01

1721 Departed site for Boulder 6/5/19²³

Natalie Dwyer 6/5/19

Elkhorn Mine Sites

6/6/19

- 0940 Arrive at USES restroom parking area. Removed trailer. Depart to look for access to sample location for UE-SW/SD-02.
- 1030 arrive at top of mtn. Steep slope down to valley floor/slaughterhouse Gulch. Appears too steep to descend safely into gulch. Can see road (Slaughterhouse) in mine complex goes near sample location.
- 1045 Arrive back at vehicle to see if can locate roads that will access area from east side of the mountain. Cannot locate a road that goes all the way around south side of the mountain into the gulch.
- 1100 Depart site for Denver, CO. Tana Jones and Natalie Quiet (Weston) were only personnel onsite.
- All surface water quality screening readings were collected with a YSI 556 (S/N: 141700057), except at Trumley Heap Leach and Elkhorn

Elkhorn Mine Sites

6/6/19

- Queen, where a Horiba U-53 (EPA ID #965857). The meters were decontaminated after each use by rinsing with DI water as described in the approved SAP.
- All sample coordinates collected on 6/3/19 were collected using a Garmin GLO on an Apple iPad 2. All other coordinates were collected on the internal GPS on the iPad 2 or Apple iPhone 8.
 - All sample and field documentation was collected in the Survey123 application on the Apple iPad 2.
 - All photo documentation was collected using the camera app of the iPad 2 or iPhone 8 (IMG-0142, 0145-0151, 0155-0159).
 - All surface water samples were ^{NA} and screening readings were collected between 0-12 inches below water surface, except sample UE-SW-04 collected directly from the pipe coming out of the adit. Screening reading of surface water for *Rotten the Rain*

Elkhorn Mine Sites 6/6/19

temperature, pH, conductivity, and DO were recorded at all locations. Other parameters were recorded for detected results or at the samplers discretion.

- All sample locations were accessed using high-clearance 4-wheel drive vehicles or on foot (Union Elkhorn mine).
- The PTL was responsible for sample location evaluation and documentation.

Noted

DEFYING
MOTHER NATURE®

SINCE 1918



All components of
this product are recyclable

Rite in the Rain

A patented, environmentally
responsible, all-weather writing paper
that sheds water and enables you to
write anywhere, in any weather.

Using a pencil or all-weather pen,
Rite in the Rain ensures that your
notes survive the rigors of the field,
regardless of the conditions.

© 2018

JL DARLING LLC
Tacoma, WA 98424-1017 USA
www.RiteintheRain.com

Item No. 391FX

ISBN: 978-1-60134-188-4

Made in the USA
US Pat No. 6,863,940



Elkhorn Mines Sites



Rite in the Rain®

ALL-WEATHER
JOURNAL

Nº 391FX

2 of 2



Name Weston Solutions

Address 1435 Garrison St., Ste. 100
Lakewood, CO. 80215

Phone 303-729-6100

Project Elkhorn Mine Sites
Jefferson County
Montana

TDD 0004/1807-06



RiteintheRain.com

CONTENTS

[illegible]

2 6/3/19 Elkhorn Mine Sites

0830 Arrive at site, sunny 60°F, T. Jones,
N. Quiet, B. Merritt, M. M. McCarthy w/
The Weston Team, J. Chavez-DEQ, ~~left~~
R. Blackburn & J. Chisholm-EPA, S. Thorne
USFS.

- started calibration of equipment,
Team 2, T. Jones & M. McCarthy
Team 1, N. Quiet & B. Merritt

0840 XRF cal
passed

Rate (cps) 7582

Resolution (eV) 219

1850 YSI

Conductivity 1602

ORP 236

pH 6.38

3.98 / 10.32

DD 10.77

0915 HSS tailgate

0930 Depart Elkhorn Queen

1000 Arrive @ Elkhorn Queen

1015 - EQ-WR-~~0102~~ 01/02

XRF (5-pt) 03/04

① Pb - 2.18% Cu - ND

② As - 1.64%

③ Zn - 7.241% 6319 #5
7241%

Elkhorn Mine Sites 6/3/19 3

② Pb - 1.37% Zn - 2.54%
As - 2.49% Cu - ND

③ Pb - 1.34% Zn - 1.93%
As - 2.13% Cu - ND

④ Pb - 6.773% Zn - 1.23%
As - ~~40.40~~ 4.040% Cu - ND

⑤ Pb - 50.66% Zn - 7737%
As - 48.96% Cu - ND

Time of sample 1022 (composite)
EQ - WR-~~03~~ 01

Time of sample 1041 (grab)
EQ - WR-~~04~~ 02

matrix: tailings

1045 - EQ-WR-~~03~~ 05/06
XRF - 5pt

① Pb 2,809 Zn 6,823 #17
As 2,186 Cu 73

Elkhorn Mine Sites 6/3/19

② Pb-4645 Zn-5267 #18
As-2014 Cu-49

③ Pb-74 Zn-4989 #19
As-2917 Cu-129

④ Pb-2412 Zn-5439 #20
As-2190 Cu-ND

⑤ Pb-402 Zn-3179 #21
As-449 Cu-ND 1054

Time of sample (composite) ~~1054~~ 1104
EQ-WR-03 05
mm

Time of sample (grab) #17 1104
EQ-WR-04 06
mm

SAP-deviation - 5pt for 05/06
composite

per EPA

1200 EQ-WR-07/08 Matrix WR Plc: 25 X ^{hi} 35 X 3

1204 EQ-WR-07/08

XRF - 5pt composite

① As 346 Zn 771 #22
Pb 631 Cu ND

Elkhorn Mine Sites 6/3/19⁵

② Pb 98 Zn 433 #23
As 297 Cu ND

③ Pb 846 Zn 954 #24
As 387 Cu ND

④ Pb 106 Zn 4971 #25
As 205 Cu 148

⑤ Pb 118 Zn 288 #26
As 319 Cu ND

1201 collected 5pt comp

1222 collected EQ-WR-08 grab from
comp location #3

Arrive @ EQ-WR-03/04 @ 1238

XRF - 5pt composite

① Pb - 2636 Zn - 6582 #28
As - 1340 Cu - ND

② Pb - 2578 Zn - 821 #31
As - 988 Cu - ND

③ Pb - 1582 Zn - 2314 #32
As - 855 Cu - ND

④ Pb - 3267 Zn - 3960 #34
As - 1711 Cu - ND

Elkhorn Mines Sites 6/3/19

⑤ Pb - ^{mm}1724 Zn - 1.21 % #35
As - 1135 Cu - ND

Started composite @ 1247

EC-WR-03

Sampled grab @ 1302

~~mm~~ EC-WR-04

Arrive @ 1314

EQ-SO-BK01 5pt XRF

① Pb 218 Zn 88 #36
As 59 Cu ND

② Pb 176 Zn 186 #37
As 99 Cu ND

③ Pb 196 Zn 173 #38
As 65 Cu ND

④ Pb 60 Zn 85 #39
As 45 Cu ND

⑤ Pb 162 Zn 153 #40
As 95 Cu 70

sample time for composite @ 1320 ^{EQ-SO-BK01}

sample time for grab @ # 39 - 1331

EQ-SO-BK02

1334 - Departure from Elkhorn Queen

Elkhorn Mine Sites 6/3/19

1430 Arrive @ ECT SW SD location #1

ECT-SW-01 set up @

1435 PSI Readings

1458 Temp 9.75°C

Cond 256 uS/cm

DD 9.72 mg/L

pH 7.43

ORP ~~10.6~~ 101.2

collected SW-D1 @ 1458

1513 collected SD-D1

~~1520~~ PSI Readings

1526 Temp 10.0°C

Cond 238

DD 9.5

pH 7.82

ORP 38.4

collected ECT-SW-BK01

~~1532~~ collected ECT-SD-BK01

1532^{mm}

1605 ECT-SO-BK01

① XRF # 41

Pb 727

Zn 1387

As ND

Cu ND

Mined locations

6/3/19

Rite in the Rain

- 6/3/19
- ② XRF #42
Pb 680 Zn 1414
Cu ND As ND
- ③ XRF #43
Pb 877 Zn 1760
Cu ND As ND
- ④ XRF #44
Pb 956 Zn 1930
Cu ND As ND

Moved locations

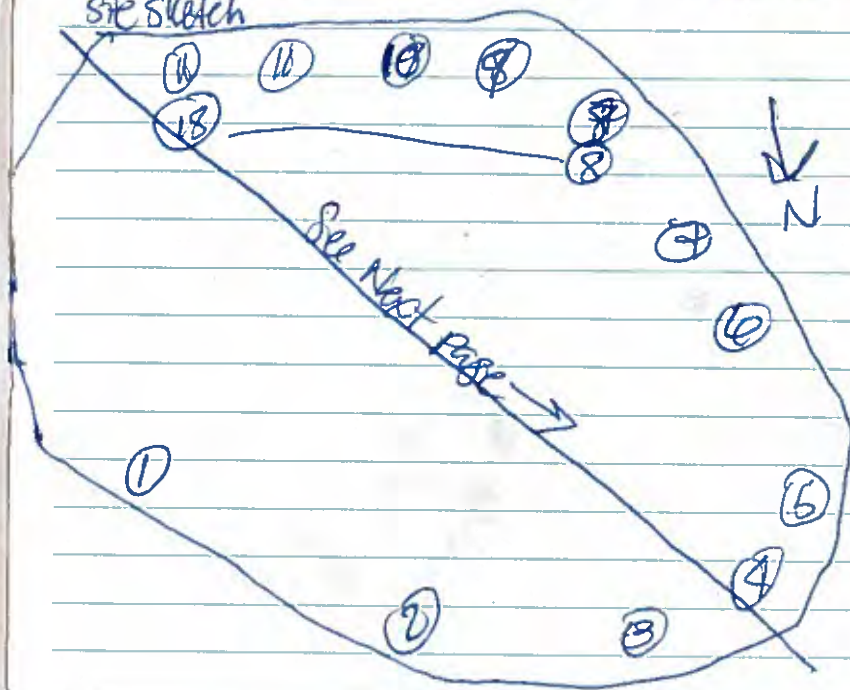
1415 moved locations to find more accurate Bkg

- ① XRF #46
Pb 172 Zn 653
Cu 118 As 49
- ② XRF #47
Pb 235 Zn 843
Cu 104 As 63
- ③ XRF #48
Pb 449 Zn 1204
Cu 80 As 56
- ④ XRF #49
Pb 385 Zn 1040
Cu 72 As 85
- ⑤ XRF #50
Pb 405 Zn 948
Cu 107 As 53

1625 Sample ECT - So Bkdl collected 6/3/19
1680 Moved to Mill site, flagged by
R. Blackburn & J. Chisholm

- ① XRF #51
Pb 4877 Zn 115% As ND Cu ND
- ② XRF #52 Pb 3172 Zn 9109 As 150 Cu 324

Site sketch



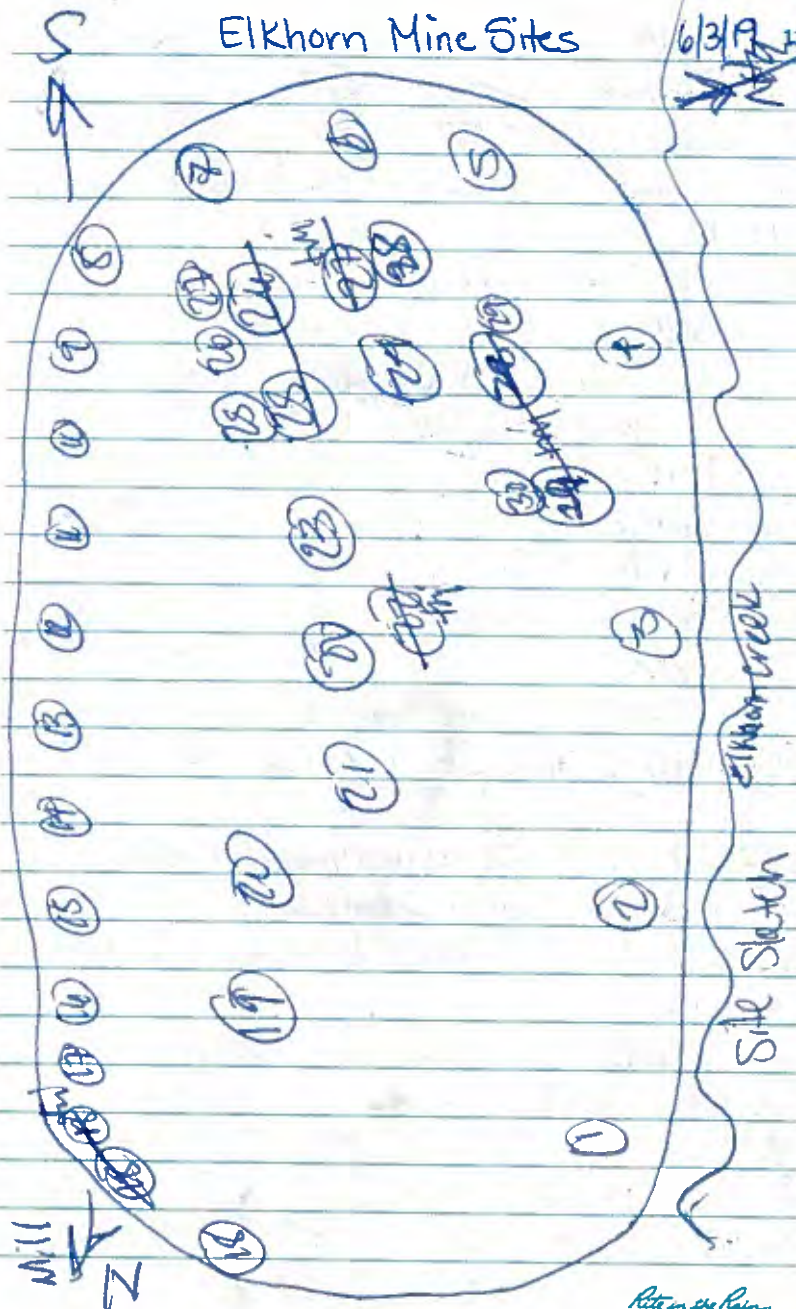
- ③ XRF #53 Pb 3203 Zn 1.03% Cu 322 As 313
- ④ XRF #54 Pb 3624 Zn 7059 Cu 1200 As ND
- ⑤ XRF #55 Pb 4439 Zn 1.25% Cu 399 As 273
- ⑥ XRF #56 Zn 1.56% Pb 5221 As 300 Cu ND
- ⑦ XRF #57 As 165 Cu 348 Pb 4915 Zn 1.24%
- ⑧ XRF #58 Zn 1.03% Pb 5603 Cu 548 As 275

- 10 ⑨ XRF #59 Zn 141% Pb 508 Cu 438 As 334
 ⑩ Skipped
 ⑪ Skipped
 ⑫ XRF #60 Zn 149% Pb 512 Cu 584 As 321
 ⑬ Skipped
 ⑭ XRF #11 Zn 1.87% Pb 7916 Cu 733 As 503
 ⑮ Skipped
 ⑯ XRF #12 Zn 1.81% Pb 6374 Cu 3819 As 527
 ⑰ Skipped
 ⑱ XRF #13 Zn 1.39% Pb 4812 Cu 529 As 355
 ⑲ Skipped
 ⑳ XRF #14 Zn 1.49% Pb 5317 As 509 Cu ND
 ㉑ Skipped
 ㉒ Skipped
 ㉓ Skipped
 ㉔ XRF #15 As 278 Cu 512 Pb 5050 Zn 1.56%
 174 km 1736 collected ECT WR-01
 1741 collected ECT WR-02
 1750 Departed Site

~~1750~~ 6/3/19

Elkhorn Mine Sites

6/3/19
~~1741~~



6/4/19 Elkhorn Mine Sites

0805 Arrive @ Site, Sunny 18°C

T. Jones, N. Quist, H. Marthy, B. Hewitt,
J. Chisholm & R. Blackburn @ tailgate
meeting point

0815 Calibrating Equipment

XRF - Cal check passed

Rate (ps.) 73 (do)

Resolution (ev) 225

Horribg Cal

Temp 17.1°C

pH 3.80

ORP 290 mV

cond 4.4 μ S/cm

DO 9.57

0830 H's Tailgate led by
N. Quist

0838 Depart for Thimbley Heap Leach

0905 Arrive Thimbley Heap Leach

0915 Top of line (See site sketch, next

page)

① XRF #2 46.26844, -111.97097

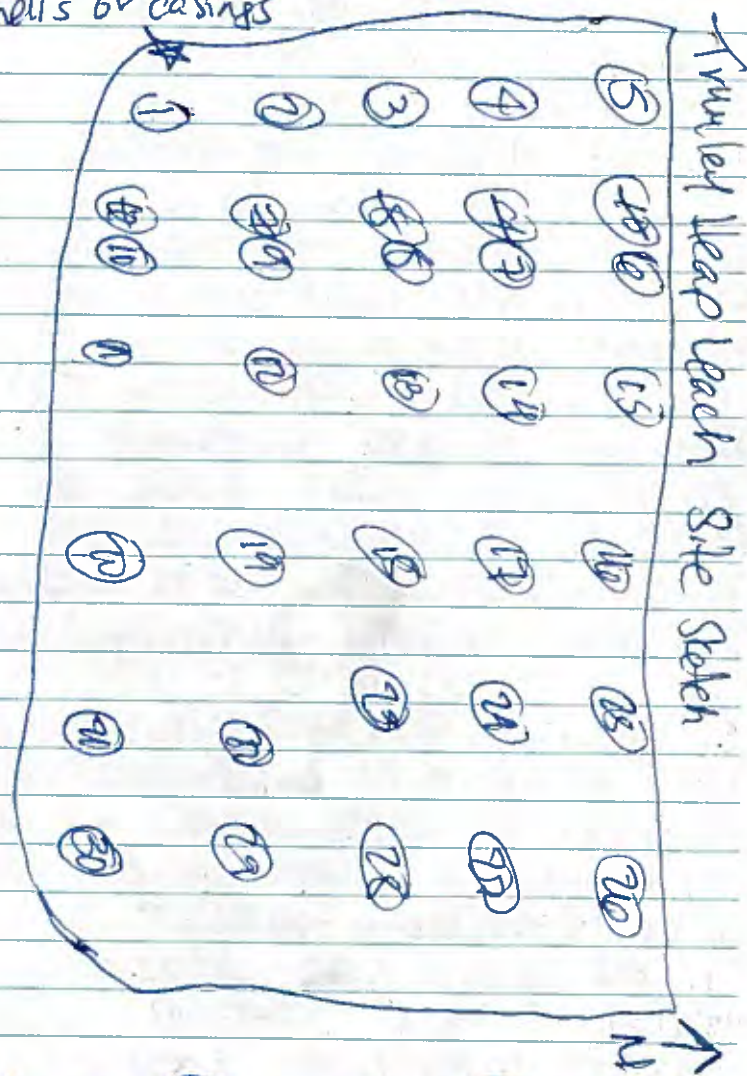
Pb 27 Zn 102 As 21 Cu ND

② XRF #3 46.26882, -111.97277

Pb 174 Zn 110 Cu 70 As 29

③ XRF #4 46.26893, -111.97377

Pb 382 Zn 632 Cu 43 As 49

6/4/19
* Shooting position w/ numerous targets
down range, no significant amount of
shells or casings

Thimbley Creek

6/4/19

- ① XRF #5 46.26937 -111.973036
Cu 26 Pb 37 Zn 186 As ND
- ② XRF #6 46.269263 -111.972626
Pb 57 Zn 240 Cu ND As ND
- ③ XRF #7 46.26901 -111.972237
Pb 65 Zn 548 Cu 53 As 448
- ④ XRF #8 46.26913 -111.972120
Pb 412 Zn 1595 Cu 99 As 56
- ⑤ XRF #9 46.26984 -111.97280
Pb 133 Zn 367 Cu 49 As 26
- ⑥ XRF #10 46.26984 -111.972468
Pb 163 Zn 662 Cu 72 As 61
- ⑦ XRF #11 46.26971 -111.97206
Pb 573 Zn 1827 Cu 73 As 71
- ⑧ XRF #12 46.26945 -111.971675
Pb 1636 Zn 547 Cu 146 As 219
- ⑨ XRF #13 46.26970 -111.97140
WET Pb ND Zn 129 Cu ND As ND
- ⑩ XRF #14 46.269997 -111.972
Pb 103 Zn 443 Cu 22 As 17
- ⑪ XRF #15 46.26900 -111.97108
Pb 197 Zn 191 Cu 45 As 22
- ⑫ XRF #16 46.26928 -111.971669
Pb 269 Zn 175 Cu 66 As 32
- ⑬ XRF #17 46.26985 -111.97126
Pb 454 Zn 2319 Cu 170 As 98

6/4/19¹⁵

- X WAM approved SAP derivation, No 5-pt
composite @ Tunnel Heap Leach as
there was no obvious area or natural
difference in area designated for 5-pt
1004 collected THL-WR-D1 30-pt
composite sample
- 1012 collected THL-WR-D2 grab
sample from Aliquot #20
- 1028 ① Bkg location 46.26559; -111.97382
XRF #18
Zn 137 Pb 44 As ND Cu ND
- XRF #19
Zn 214 Pb 46 As 16 Cu ND
- XRF #20
Zn 166 Pb 36 As ND Cu ND
- XRF #21
Zn 142 Pb 24 As 15 Cu ND
- XRF #22
Zn 237 Pb 50 As ND Cu ND
- 1033 collected THL-SO-BK02, grab
Bkg from middle of comp area 1036
- 1036 collected THL-SO-BK01, 5-pt
composite
- 1100 arrived @ THL-SW-SO-BK01/02, m
collected WQ parameters

M. Kott on the Rain

Homiba 6/4/19
temp 7.15°C
pH 6.70
ORP 167 mV
Cond .074 uS/cm
DO 13.79 mg/L

collected 1105
THL-SW-B01
SD-B01

1130 arrive @ location THL-SW/SD-01
Homiba

temp 7.77
pH 6.10
ORP 199
Cond .074
DO 9.50

collected 1144
THL-SW-01
SV-04
SD-01
SD-04

1200 Depart Trumley Heap Leach
1209 arrive @ THL-SW/SD-02

Homiba
temp 9.02
pH 6.40
ORP 174
Cond .074
DO 9.11

collected 1209
THL-SV-02
SD-02

1231 arrive @ THL-SW/SD-03
Homiba

temp 9.78
pH 6.56
ORP 168

Cond .078
DO 9.15

collected THL-SW/SD-03 @ 1232

1250 Arrive @ EQ-SD-03 / SW-03 6/4/19
Homiba
temp 8.24
pH 6.89
ORP 164
Cond 0.048
DO 11.15

collected 1258
EQ-SD-03
EQ-SW-03

1312 Arrive @ EQ-SW/SD-01

Homiba
temp 8.41
pH 6.86
ORP 170
Cond 0.047
DO 10.41

collected
EQ-SW-01
SD-01

Aug

1520 Arrive @ CD Mine

1533 Arrive @ CD-B01
① XRF # 23

Pb 106 Zn 155 Cu ND As ND

② XRF # 24

Pb 104 Zn 165 Cu 35 As ND

③ XRF # 25

Pb 97 Zn 112 Cu 36 As 20

④ XRF # 26

Pb 106 Zn ND Cu ND As 71

⑤ XRF # 27

Pb 103 Zn 204 Cu ND As 44

Site in the Rain

1546 collected CD-80-BK01
1550 collected CD-50-BK02
Found Mining Marker on tree,
took photo BAR 6 / PRR
1556 Arrived @ WR 11/12 pile
25x 50 x 3

① XRF #28

Pb 129 Zn 461 Cu 157 As 103

② XRF #29

Pb 835 Zn 1745 Cu 119 As 1088

③ XRF #30

As 136 Cu 122 Pb 168 Zn 501

④ XRF #31

As 160 Cu 378 Pb 1015 Zn 2868

⑤ XRF #32

As 4970 Cu 3440 Pb 4956 Zn 675

1616 collected CD-WR-12

1622 collected CD-WR-14

163 Arrived @ WR01/02

⑥ XRF #35

Pb 339 Zn 585 Cu 681 As 2189

⑦ XRF #36

Pb 910 Zn 933 Cu 914 As 2668

⑧ XRF #37

Pb 4132 Zn 1037 Cu 983 As 6419

⑨ XRF #38

Pb 1000 Zn 871 Cu 1230 As 5028

6/4/19

⑩ XRF #39

Pb 737 Zn 788 Cu 999 As 1.89%

1637 collected CD-WR-01

1649 collected CD-WR-02 Bar

Aliquot #2 location

1710 Departed CSD for the day

1744 Depart site for the day

6/4/19 19

0800 Arrive @ tailgate area, J. Chisholm
R. Blackburn, T. Jones, B. Hemitt, M. McCarthy
Sunny and 50°F, began calibrating
XRF cal check (yellow delta)

Rate (cps) 38056

Resolution (eV) 141

XRF cal check (gray delta)

Rate (cps) 7552

Resolution (eV) 219

VSI cal - DO - 11.4 10.85

Homicon cal

temp 71

pH 3.94

cond 4.52

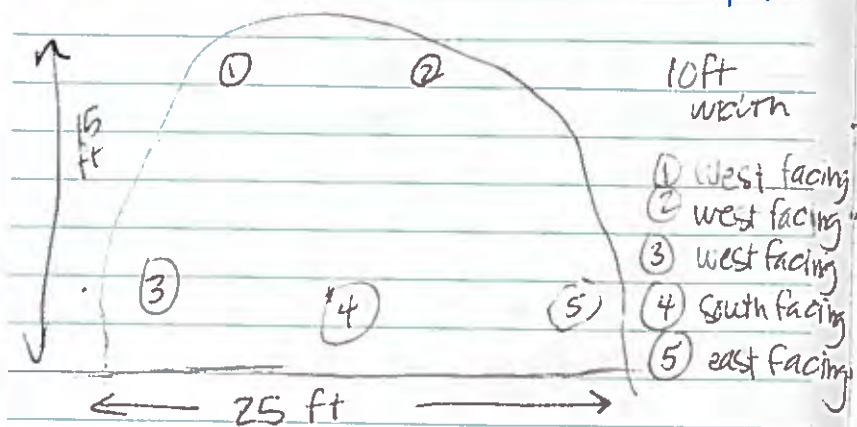
DO 9.11

0836 - Arrive @ CSD mine

5p+ XRF

Site map on next page

6/5/19



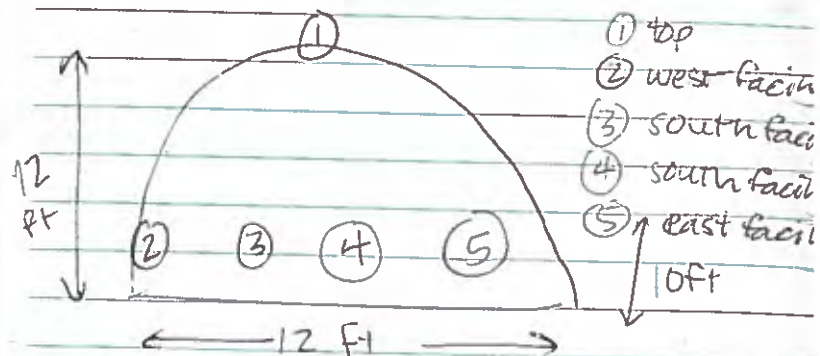
XRF DATA

Run ID	As	Cu	Pb	Zn	Hg	Pile #
2	233	91	813	259		1
3	193	ND	397	503		2
4	221	86	359	444		3
5	93	37	174	204		4
6	444	112	174	595		5

mm
0915 - CD-WR-03 composite
0910mm - CD-WR-04 grab

mm

6/5/19



Run ID	As	Cu	Pb	Zn	Pile #
7	1106	622	4918	5079	1
8	1275	695	6408	5194	2
9	928	607	5710	5106	3
10	2.85%	4773	2746	4119	4
11	946	505	4236	4618	5

0935 CD-WR-05 Comp

0940 CD-WR-06 Grab

CD 07/08

Run ID	As	Cu	Pb	Zn	Pile #
12	1.24%	1051	1.02%	1022	1
13	1.37%	5598	8896	1892	2
14	2.00%	1308	1163	965	3
15	1.44%	790	5707	1209	4
16	1.16%	679	5462	908	5

Figure NEXT PAGE

Return to the Page

Elkhorn Mine Sites

6/5/19

@ CD-WR-07 @ 0955

Camp

CD-WR-08 @ 1000

Camp

Noted
6/5/19