**THIRD FIVE-YEAR REVIEW REPORT FOR
BLACKBIRD MINE SITE
LEMHI COUNTY, IDAHO**

Prepared by:

ch2m

Boise, Idaho

**Prepared for:
U.S. Environmental Protection Agency
Region 10
Seattle, Washington**

Sheryl Bilbrey

**Sheryl Bilbrey, Director
Office of Environmental Cleanup**

8/22/18

Date

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

List of Tables

List of Figures

TABLE OF CONTENTS (CONTINUED)

Appendices

LIST OF ABBREVIATIONS & ACRONYMS

AOC	Administrative Order on Consent
BLM	biotic ligand model
BMSG	Blackbird Mine Site Group
CCC	criteria continuous concentration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CH2M	CH2M HILL, Inc.
CMC	criteria maximum concentration
COC	contaminant of concern
CUL	cleanup level
DEQ	Idaho Department of Environmental Quality
DOC	dissolved organic carbon
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
FYR	Five-Year Review
gpm	gallons per minute
HDPE	high-density polyethylene
HQ	hazard quotient
ICP	Idaho Cobalt Project
IC	institutional control
IWQS	Idaho Water Quality Standard
MCL	maximum contaminant level
mg/kg	milligram per kilogram
mg/L	milligrams per liter
MOU	Memorandum of Understanding
NCP	National Contingency Plan
O&M	operations and maintenance
OU	Operable Unit
RAO	Remedial Action Objectives
RI	Remedial Investigation
ROD	Record of Decision
Site	Blackbird Mine Superfund Site
SOW	Statement of Work
Trustees	Natural Resource Trustees
UAO	Unilateral Administrative Order
U.S.	United States
USFS	United States Forest Service
WSREL	Wilcoxon Signed Rank Test Exceedance Location
WSRT	Wilcoxon Signed Rank Test
WTP	Water Treatment Plant
WQC	EPA's Water Quality Criteria
yd^3	cubic yard(s)

I. INTRODUCTION

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy to determine if the remedy is, and will continue to be, protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) prepared this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121 (42 U.S.C § 9621), consistent with the National Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] Section 300.430(f)(4)(ii)) and considering EPA policy.

This statutory review is the third FYR for the Blackbird Mine Superfund Site (Site), and its completion was triggered by the completion date of the previous FYR in 2013. FYRs are required for this Site because hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure.

This third FYR was led by Matt Wilkening (EPA) with assistance from Allan Erickson/Project Manager and Hydrogeologist (CH2M HILL, Inc. [CH2M]) along with other participants from CH2M; Jeff Schut/Risk Assessor, and Greg Warren/Geologist. The Blackbird Mine Site Group (BMSG) was notified of the initiation of the FYR, which began in October 2017 with the Site inspection.

Site Background

Discovered in 1893, the Site is located within one of the largest of North America's cobalt deposits. The mine sits within the Salmon-Challis National Forest, approximately 25 miles west of the town of Salmon in Lemhi County, Idaho. The former mining town of Cobalt is located approximately 8 miles east from the mine along Panther Creek (Figure 1). The River of No Return Wilderness area is located approximately 5 miles north of the mine site.

The mine site lies within two primary drainages: Bucktail Creek and Meadow/Blackbird Creek (Figure 1). The northern portion of the mine site includes the area surrounding the Blacktail open-pit and several sub-basins that drain into Bucktail Creek. The southern portion of the mine site drains into Meadow Creek, eventually draining into Blackbird Creek. Both drainage basins discharge to Panther Creek, which is one of seven major tributaries to the Salmon River.

The Blackbird Mine consists of approximately 830 acres of private patented mining claims and surrounding U.S. National Forest land. The former Cobalt Townsite is located on Panther Creek road approximately 8 miles east of the mine and has no permanent residences. The closest inhabited town is Salmon, approximately 25 miles east of the mine site and the location of the Lemhi County seat. The Panther Creek drainage basin downstream of the mine is rural and sparsely populated with seasonal and year-round residences.

The historical mining activities resulted in construction of approximately 14 miles of underground workings (12 levels with more than 15 adits and portals) and a 12-acre open-pit mine. Additionally, the mine site included a mill, graded roads, numerous piles of waste rock, a tailings impoundment, sedimentation ponds, office, maintenance shop, and warehouse structures. A small reservoir located on upper Blackbird Creek provided potable water. Lemhi County and United States Forest Service (USFS) roads provide access to the Site.

Subsequent to mining operations, debris flows, erosion, and acid rock drainage resulted in the spreading of arsenic, cobalt, and copper from the original mining waste disposal areas to downstream locations. The tailings and waste rock materials were deposited in overbank areas along Bucktail Creek, South Fork Big Deer Creek, Big Deer Creek, Blackbird Creek, and Panther Creek.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Blackbird Mine Site		
EPA ID: IDD980725832		
Region: 10	**State:** ID	**City/County:** 25 West of the city of Salmon, Lemhi County
SITE STATUS		
NPL Status: Proposed		
Multiple OUs? No	**Has the site achieved construction completion?** No	
REVIEW STATUS		
Lead agency: EPA ***[If "Other Federal Agency", enter Agency name]*:**		
Author name (Federal or State Project Manager): Matt Wilkening		
Author affiliation: EPA Region 10		
Review period: 10/12/2017 - 8/25/2018		
Date of site inspection: 10/12/2017		
Type of review: Statutory		
Review number: 3		
Triggering action date: 8/25/2013		
Due date *(five years after triggering action date)*: 8/25/2018		

II. RESPONSE ACTION SUMMARY

The following sections provide a summary of the response actions conducted at the Site.

Basis for Taking Action

The initial preliminary assessments and remedial investigations found the West Fork Blackbird Creek flowed through a buried concrete culvert beneath the tailings pile associated with the mine, creating a potential mass failure of the tailings storage facility. Significantly high concentrations of dissolved cobalt and copper were present in streams downstream from the mine. Concentrations of cobalt and copper were significantly elevated in stream waters and sediments such that the populations of benthic invertebrates and resident fish were severely impacted. In addition, historic populations of anadromous fish (including threatened and endangered species) no longer existed in area streams. These observations promoted initial response actions consisting of both time-critical and non-time critical removal actions.

Following the initial response actions, ecological risk assessments (Golder, 2000; CH2M, 2001), and a human health risk assessment (CH2M, 2002) concluded there were unacceptable risks associated with contaminated media remained following implementation of the initial response actions.

Based on the risk assessment findings, the remaining contamination that needed to be addressed through remedial actions included:

- Surface Water – Concentrations of dissolved cobalt and copper remained above the water quality cleanup levels in Panther Creek, Big Deer Creek, and South Fork Big Deer Creek. This remaining contamination posed unacceptable risks to aquatic organisms.
- Groundwater – Concentrations of arsenic and copper in monitoring wells at the mine were above the maximum contaminant levels (MCL) for potable water. The groundwater would pose unacceptable risks to human health if used as a drinking water source.
- Overbank Deposits – Concentrations of arsenic in overbank deposits not addressed during the initial response actions posed an unacceptable risk to human health and to ecological receptors. These deposits were located along Blackbird Creek and along lower Panther Creek. In addition, overbank deposits along Blackbird Creek could pose a risk to human health if mobilized during high-flow events and deposited at overbank areas downstream along Panther Creek.
- In-stream Sediments – Concentration of arsenic, cobalt, and copper in the in-stream sediments posed an unacceptable risk to human health and to ecological receptors. In-stream sediments themselves posed a risk to aquatic organisms in Panther Creek, Big Deer Creek, and South Fork Big Deer Creek. In addition, in-stream sediments in Blackbird Creek could pose a risk to human health if mobilized during high-flow events and deposited at overbank areas downstream along Panther Creek.

Initial Response Actions

Initial response actions at the Site were conducted under EPA's removal authority and included both time-critical removals (emergency actions) and non-time-critical removals. The site was proposed by EPA for the National Priorities List (NPL) in May 1993, but has not been finalized on the NPL. The Record of Decision (ROD) (EPA, 2003) selected Site-specific remedial actions to take place subsequent to the initial response actions. The ROD incorporated the initial response actions performed into the selected remedy. The following sections provide an overview of the initial response actions, remedial action objectives (RAO), clean-up levels, and selected remedy components.

Time-critical Removal (1993 to 1994)

The initial time critical removal action was conducted in 1993 and 1994 at the West Fork Tailings Impoundment to stabilize the dam and to minimize the potential for release of tailings into Blackbird and Panther Creeks. This removal action included the following (Knight Piesold, 1994):

- Construction of a concrete-lined spillway excavated through bedrock at the dam to pass a 500-year flood
- Construction of a new channel for the West Fork Blackbird Creek over the top of the impoundment to convey the 500-year flood; the channel consists of a flood-flow channel, a low-flow channel, and a 2-foot-thick compacted clay liner
- Installation of a slurry cutoff trench into bedrock at the upstream end of the impoundment to minimize alluvial groundwater discharge into the tailings
- Filling of the existing concrete drainage culvert beneath the tailings with pea gravel

Non-time-critical Removals (1995 to 2002)

Non time-critical removal actions were initiated during the summer of 1995 and continued each year through 2002. These actions were conducted in accordance with an Action Memorandum and pursuant to an Administrative Order on Consent (AOC) issued by EPA to the BMSG in June 1995 (EPA Docket No. 10-95-0083, as amended). These actions were conducted in five phases, with the initial phases focused on controlling sources of acid rock drainage that were impacting water quality.

Subsequent to the initiation of these non-time critical actions to address water quality (Phases I through III), EPA determined that arsenic-contaminated materials were present along Blackbird Creek and that some of these materials had been transported down Blackbird Creek and deposited at overbank areas along Panther Creek. Phases IV and V therefore focused on overbank deposit removals conducted along Panther Creek and Blackbird Creek to abate potential risk to human health associated with elevated levels of arsenic present in these deposits. Phase IV and V actions also reduced the potential risk to terrestrial and aquatic ecological receptors. Phase IV activities were initiated in 1998 and completed in 1999. Phase V activities were initiated in 1999; however, a major forest fire during 2000 caused delays, and Phase V was not completed until 2001.

During the fall of 2002, additional removals were performed under the 1995 Administrative Order on Consent to collect contaminated waters in the Bucktail Creek and Meadow Creek drainage basins that were not intercepted during previous actions.

Meadow Creek and Blackbird Creek (1995-2002)

Early actions in Meadow Creek and Blackbird Creek drainages included:

- Construction of an earth-filled clay-core dam (7100 Dam) to collect and store water draining from the waste rock dumps in the Meadow Creek drainage basin
- Installation of piping from the 7100 Dam and from the underground workings at the 6850 adit to the existing water treatment plant
- Upgrade and expansion of the existing WTP to increase flow capacity to 800 gallons per minute (gpm) and to improve effluent quality
- Installation of a sludge pipeline from the WTP to the underground mine at the Hawkeye Ramp to dispose of sludge generated by the WTP
- Construction of contaminated water collection ditches and pipelines to route contaminated water to the 7100 Dam reservoir
- Installation of a series of clean water ditches and pipelines to divert clean water around the contaminated areas and the 7100 Dam reservoir
- Relocation and consolidation of waste rock from the canyon walls of Meadow Creek, Blackbird Creek, and Hawkeye Gulch to the Meadow/Blackbird Creek bottoms
- Covering of waste rock in the Meadow Creek and Blackbird Creek bottoms with a clean earth cap and installation of drains beneath the cap to route contaminated waters to the WTP
- Construction of concrete channels across the top of the capped waste rock to convey Meadow Creek and Blackbird Creek
- Removal of visually obvious and eroding tailings from overbank deposits along Blackbird Creek
- Construction of three sediment basins along Blackbird Creek

Bucktail Creek Drainage (1995-2002)

Early actions in the Bucktail Creek drainage included:

- Construction of an earth-filled clay-core dam (7000 Dam) to collect, store, and divert contaminated water to the WTP through the underground workings via the 6930 adit and 6850 level
- Construction of a groundwater collection system downstream of the 7000 Dam, with a pump station (upper Bucktail Pump Station) and pipelines to the 6930 adit
- Relocation of waste rock piles into the Blacktail Pit
- Construction of a series of clean water ditches and pipelines to divert water around the waste rock dumps and the 7000 Dam, and to deliver water to Bucktail Creek downstream of the 7000 Dam
- Construction of a contaminated water collection ditch (7200 ditch) to divert contaminated water to the 7000 Dam
- Construction of a series of sediment control ditches within the waste rock piles
- Installation of two debris traps in the Bucktail Creek channel
- Construction of two temporary sediment control dams (upper and lower sediment dams) along Bucktail Creek
- Removal of contaminated debris flow material along Bucktail Creek between the upper and lower sediment dams with disposal at the Blacktail Pit

Overbank Deposit Removal Actions

Beginning in late 1998 and continuing through 2002, overbank deposit removal actions were conducted along portions of Panther Creek and Blackbird Creek. These actions were primarily focused on removal of mine-related materials containing elevated concentrations of arsenic. The removal actions were completed on both private and USFS lands along Panther Creek (Figure 3).

Response Actions

As noted above, following the initial response actions, ecological risk assessments (Golder, 2000; CH2M, 2001), and a human health risk assessment (CH2M, 2002) concluded unacceptable risks associated with contaminated media remained following implementation of the initial response actions. EPA developed remedial action objectives and selected a final remedy that incorporated the previously completed removal actions in a 2003 Record of Decision (EPA, 2003).Two Explanation of Significant Differences (ESD) to the ROD were issued by the EPA. The July 2007 ESD changed the dissolved cobalt cleanup level in Site waters from 0.038 mg/L to 0.086 mg/L based on site-specific biological risk assessment studies. The second ESD, issued in May 2012 documented the following significant changes to the ROD:

- Established cleanup levels for cobalt in overbank deposits for Blackbird, South Fork Big Deer Creek, Big Deer Creek, and Panther Creeks and lowered the cleanup level for groundwater from 1.53 mg/L to 0.009 mg/L (see 2 for all cleanup levels)
- Revised recreational-use scenario for certain USFS lands along Panther Creek raising the arsenic cleanup level from 590 mg/kg to 1,180 mg/kg and the cobalt cleanup level from 390 mg/kg to 780 mg/kg
- Cleanup levels for cobalt in Blackbird Creek for overbank deposits and in-stream sediments are: 2,700 mg/kg downstream of mine gate and 5,500 mg/kg upstream of mine gate.

The RAOs, remedy components, and status of implementation are described in the following paragraphs.

Remedial Action Objectives

Tables 1 and 2 provide the RAOs and cleanup levels established in the ROD for the Site, respectively. The cleanup levels include narrative goals. DEQ performed Use Attainability Analyses of Blackbird Creek and Bucktail Creek and determined that certain uses and water quality criteria could not be applied to these creeks. The ROD therefore did not require that numeric surface water cleanup levels for cobalt and copper be met in Blackbird Creek or Bucktail Creek. However, the ROD required that narrative goals be met. The non-numeric narrative goals established in the ROD are:

- Blackbird Creek – "The remedial goal for Blackbird Creek is to improve water and sediment quality such that cleanup levels are not exceeded downstream in Panther Creek. In addition, the remedial goal for Blackbird Creek is to support aquatic life at levels similar to that of nearby reference streams, although not necessarily to support salmonids or metals-sensitive macroinvertebrate taxa."
- Bucktail Creek – "The remedial goal for Bucktail Creek is to improve water and sediment quality such that cleanup levels are not exceeded downstream in South Fork Big Deer Creek or in Big Deer Creek*."*

Table 1. Remedial Action Objectives for Blackbird Mine Site

Media	Receptors of Concern	Remedial Action Objectives
Surface Soils	Human	Reduce direct contact (such as ingestion and dermal contact) with surface soils containing COCs in excess of the cleanup levels. Reduce migration of surface soil and overbank deposits to downstream areas that would deposit concentrations of COCs in excess of the cleanup levels established at those downstream areas.
	Aquatic	Reduce migration of metals into the water column of the streams so that the cleanup levels for the COCs established for the streams are not exceeded. Reduce migration of the surface soils to in-stream sediments so that the cleanup levels for the COCs established for in-stream sediments are not exceeded.
Groundwater	Human	Prevent use of contaminated groundwater underlying waste management areas.

Media	Receptors of Concern	Remedial Action Objectives
Surface Water	Human	Maintain water quality for protection of human health.
	Aquatic	Reduce direct contact with surface water containing COCs in excess of the cleanup levels. Restore and maintain water quality and aquatic biota conditions capable of supporting all life stages of resident salmonids and other fishes in South Fork Big Deer Creek and Big Deer Creek. Restore and maintain water quality and aquatic biota conditions capable of supporting all life stages of resident and anadromous salmonids and other fishes in Panther Creek. Reduce concentrations of COCs in Blackbird Creek to improve water quality such that cleanup levels are not exceeded in Panther Creek and to support some aquatic life in Blackbird Creek. Reduce concentrations of COCs in Bucktail Creek to improve water quality such that cleanup levels are not exceeded in South Fork of Big Deer and Big Deer Creeks.
Sediments	Aquatic	Reduce direct contact with in-stream sediments containing COCs in excess of the cleanup levels. Reduce migration of in-stream sediments to downstream areas so that the cleanup levels for the COCs established for in-stream sediments at those downstream areas are not exceeded. Restore and maintain sediment quality and aquatic biota conditions capable of supporting all life stages of resident salmonids and other fishes in South Fork Big Deer Creek and Big Deer Creek. Restore and maintain sediment quality and aquatic biota conditions capable of supporting all life stages of resident and anadromous salmonids and other fishes in Panther Creek. Reduce concentrations of COCs in Blackbird Creek to improve sediment quality such that cleanup levels are not exceeded in Panther Creek and to support some aquatic life in Blackbird Creek. Reduce concentrations of COCs in Bucktail Creek to improve sediment quality such that cleanup levels are not exceeded in South Fork of Big Deer and Big Deer Creeks.

COC = contaminant of concern

Table 2. Summary of Cleanup Levels for Blackbird Mine Site Media

Drainage	Media	Arsenic	Cobalt	Copper
Panther Creek	Overbank Deposits—Residential Use	100 mg/kg	97 mg/kg	NE[a]
	Overbank Deposits—Recreational Use (USFS Campgrounds)	280 mg/kg	180 mg/kg	NE[a]
	Overbank Deposits—Recreational Use (Other Undeveloped Camping Areas)	400 mg/kg	260 mg/kg	NE[a]
	Overbank Deposits—Recreational Day Use on Road Side	590 mg/kg	390 mg/kg	NE[a]
	Overbank Deposits—Recreational Day Use on Opposite side Road Side	1,180 mg/kg[g]	780 mg/kg[g]	NE[a]
	In-stream Sediments	35 mg/kg	80 mg/kg	149 mg/kg
	Surface Water[b]	0.010 mg/L[c]	0.086 mg/L[f]	IWQS[d]
South Fork Big Deer Creek	Overbank Deposits—Recreational Day Use	NE[a]	NE[a]	NE[a]
	In-stream Sediments	35 mg/kg	436 mg/kg	637 mg/kg
	Surface Water	0.010 mg/L[c]	0.086 mg/L[f]	IWQS[d]

Drainage	Media	Arsenic	Cobalt	Copper
Big Deer Creek	Overbank Deposits—Recreational Day Use	NE[a]	NE[a]	NE[a]
	In-stream Sediments	35 mg/kg	80 mg/kg	149 mg/kg
	Surface Water	0.010 mg/L[c]	0.086 mg/L[f]	IWQS[d]
Blackbird Creek	Overbank Deposits—Upstream from Mine Gate	8,500 mg/kg	5,500 mg/kg	NE[a]
	Overbank Deposits—Downstream from Mine Gate	4,300 mg/kg	2,700 mg/kg[g]	NE[a]
	In-stream Sediments—Upstream from Mine Gate	8,500 mg/kg	5,500 mg/kg[g]	NE[a]
	In-stream Sediments—Downstream from Mine Gate	4,300 mg/kg	2,700 mg/kg	Narrative Goal[e]
	Surface Water	0.010 mg/L[c]	Narrative Goal[e]	Narrative Goal[e]
Bucktail Creek	Overbank Deposits—Recreational Day Use	NE[a]	NE[a]	NE[a]
	In-stream Sediments	Narrative Goal[e]	Narrative Goal[e]	Narrative Goal[e]
	Surface Water	Narrative Goal[e]	Narrative Goal[e]	Narrative Goal[e]
Groundwater	Residential	0.010 mg/L	0.009 mg/L[g]	3.060 mg/L
	Mine Worker	0.010 mg/L	0.023 mg/L	3.060 mg/L

Notes:
[a] NE = Cleanup level Not Established for this contaminant because there was no unacceptable risk shown.
[b] Water Quality cleanup levels for arsenic are total and for cobalt and copper are dissolved.
[c] DEQ human health water quality standard.
[d] The Idaho Water Quality Standard is hardness-based, and the typical hardness in area creeks varies from approximately 20 mg/L to 100 mg/L.
[e] The cleanup level is a non-numeric narrative goal. See intro to RAO section for an explanation of the narrative goals.
[f] 2007 ESD changed cobalt cleanup levels from 0.038 mg/L to 0.086 mg/L
[g] 2012 ESD changed cleanup levels for groundwater, recreational-use scenario, Blackbird Creek overbank deposits, and in-stream sediments.
DEQ = Idaho Department of Environmental Quality
IWQS = Idaho Water Quality Standard
mg/L = milligram per liter
mg/kg = milligram per kilogram

Remedy Components

The remedies selected in the ROD for each of these drainages are described below and shown on Figures 2 and 3.

Blackbird Creek

The selected remedy for the Blackbird Creek drainage area included:

- Collection and treatment of Meadow Creek seeps
- Covering the West Fork Tailings impoundment and treating tailings impoundment seepage
- Removal with selective stabilization of overbank deposits along Blackbird Creek
- Continued operation of the WTP
- Natural recovery of in-stream sediments in Blackbird Creek
- Institutional controls (IC)

The selected remedy consisted primarily of removing overbank deposits along Blackbird Creek with selective physical stabilization by armoring to reduce the risks of direct human contact with the overbank deposits. The removal and selective stabilization also reduce the risk of remobilization during high-flow events in Blackbird Creek with downstream deposition at overbank areas along Panther Creek. The selected remedy also included collection and treatment of cobalt in groundwater draining from the West Fork Tailings Impoundment. Groundwater draining from the West Fork Tailings Impoundment is high in cobalt and iron and typically accounts for over 50 percent of the cobalt loads measured at the mouth of Blackbird Creek. At the time that the ROD was issued, the dissolved cobalt cleanup level for surface waters at the Site had been established at 0.038 mg/L, and concentrations of dissolved cobalt in Panther Creek were greater than the cleanup level during much of the year (typically about 0.050 to 0.060 mg/L during low-flow conditions). Subsequent to the issuance of the ROD, the BMSG conducted a study of Site-specific cobalt toxicity under EPA and Trustee oversight. Based on the results of this toxicity study, EPA revised the surface water cobalt cleanup level for the Site from 0.038 mg/L to 0.086 mg/L. Surface water monitoring in Panther Creek since 2003 has indicated that the dissolved cobalt concentrations have been consistently less than the revised cobalt cleanup level. Therefore, EPA determined that treatment of groundwater from the West Fork Tailings Impoundment to address cobalt in surface waters is no longer required.

IC objectives consist of requirements to protect the remedy, requirements to preclude uses that would result in unacceptable risks (such as residential use), and maintenance of access controls (fencing and gates) to limit unauthorized use.

Bucktail Creek

The selected remedy for the Bucktail Creek drainage area included:

- Groundwater seep collection and treatment
- Diversion of Bucktail Creek around the South Fork Big Deer Creek
- Natural recovery of sediments
- ICs

The selected remedy has groundwater seep collection and treatment as well as natural recovery for stream sediments. This alternative includes diverting Bucktail Creek in a pipeline or ditch around South Fork Big Deer Creek to discharge directly into Big Deer Creek (see Status of Implementation below).

IC objectives consist of requirements to protect the remedy, requirements to preclude uses that would result in unacceptable risks (such as residential use), and maintenance of access controls (fencing and gates) to limit unauthorized use.

Panther Creek

The selected remedy was a combination of removal of contaminated soils and ICs. The contaminated areas at Residences 5, 7, and 8 were comparatively small. Therefore, soil in overbank deposits was removed to the human health cleanup level for arsenic. The contaminated overbank deposits at Residence 4 included both small and large areas. Soil in the smaller areas was removed. However, the larger areas require ICs to preclude future residential and intensive recreational development.

The remedy included soil management ICs at some of the properties where overbank deposits were removed as part of early actions or remedial actions to preclude unacceptable future exposure if underlying soils with elevated arsenic and cobalt concentrations are brought to the surface (as a result of erosion, digging or construction activities). Six private properties require ICs for underlying soils: former Panther Creek Inn, Cobalt Townsite, Residence 1, Residence 2, Residence 3, and Residence 4. The properties under USFS control that require ICs are the Riprap Bar and Deep Creek Campground. The ICs are described in Table 3, Summary of Planned and/or Implemented Institutional Controls.

Status of Implementation

Remedial actions specified in the ROD have been constructed from 2003 through 2013. An overview of the remedial actions constructed during these years are described below. The status of the ICs component of the remedy is described in the Institutional Controls Summary section below. The Bucktail Creek diversion pipeline, the only remaining remedial action specified in the ROD not completed, is discussed following this section.

Blackbird Creek

- Optimization for the collection of Meadow Creek seeps included:
  - Construction of the 7560 Dam and collection ditch to route clean waters around the 7100 Dam. The actions also included removal of a small earth-fill dam (7350 Dam) to allow contaminated waters to flow to the 7100 Dam catchment area.
  - Construction of a new pumping well downgradient from the groundwater cutoff wall near the WTP.

- Mill Creek East channel was improved to reduce leakage at the transition between natural channel and concrete channel.
- 7100 and 7410 diversion ditches were modified to address leakage.
- The walls of the concrete channel conveying clean waters of Blackbird Creek were updated to withstand the winter freeze-thaw issues.
- A manhole over this culvert was modified to collect the contaminated waters for treatment at the WTP.

- Multiple removal actions and stabilization events occurred. These events removed approximately 152,500 cubic yards (yd^3) of elevated in-stream, tailings pipeline break materials, and overbank deposits along Blackbird Creek. In addition to the removals, stabilization structures (bendway weirs and riprap armoring) were constructed to address remobilization of elevated sediments and overbank material during higher creek flow years.

Bucktail Creek

- Construction of 4-inch- and 6-inch-diameter high-density polyethylene (HDPE) piping from the upper Bucktail Pump Station to the 6930 adit to increase conveyance capacity for contaminated groundwater collected downgradient from the 7000 Dam.
- Seep collection structures with associated piping were installed to collect contaminated seeps and direct their flow to the lower Bucktail Pump Station.
- Construction of a gravity drain line from the upper Bucktail Sediment Dam area to the lower Bucktail Pump Station with connections to seep collection structures and groundwater pumping wells.
- Construction of the lower Bucktail Pump Station and associated piping to pump contaminated waters to the upper Bucktail Pump Station.
- Modifications to the upper Bucktail Pump Station to handle increased flows.
- Lower Bucktail Sediment Dam was decommissioned and the re-establishment of lower Bucktail Creek was implemented. Accumulated sediments (approximately 260 yd^3) in the reservoir area and approximately 16,000 yd^3 of stream material were excavated during the re-establishment of the creek.

Panther Creek

- Overbank deposits were remediated along Panther Creek at multiple private and public areas (Figure 3). Contaminated soil was excavated and hauled to the West Fork Tailings Impoundment for disposal. Depending on location, clean replacement soils were spread over the excavated areas and revegetated. Because of recontamination from higher creek flow years, these removals were conducted multiple times on a property. Approximately 15, 530 yd^3 of contaminated overbank material was removed during the multiple removal actions.

Remedial Actions Not Yet Completed

One remedial action and a number of contingent actions identified in the ROD have not yet been constructed. These actions are discussed in the following sections.

Bucktail Creek Diversion Pipeline

One of the elements of the remedial actions selected in the ROD for the Bucktail Creek drainage is a pipeline to divert the waters of Bucktail Creek around the South Fork Big Deer Creek. This diversion pipeline is included in the ROD because modeling conducted during the feasibility study (Golder, 2002) indicated that remedial actions in upper Bucktail Creek may not be effective to meet water quality cleanup levels in South Fork Big Deer Creek. The diversion pipeline would extend from the vicinity of the Lower Bucktail Sediment Dam to Big Deer Creek downstream from the South Fork Big Deer Creek (Figure 2). By removing the metals loads coming from Bucktail Creek, the ROD concluded that water quality cleanup levels would be expected to be met in South Fork Big Deer Creek once the contaminated in-stream sediments in South Fork Big Deer Creek are allowed to recover naturally.

EPA originally decided to schedule the construction of the bypass pipeline to occur in 2010, 3 years after completion of the upper Bucktail Creek remedial actions to allow for monitoring the effectiveness of the upper Bucktail Creek remedial actions. The BMSG requested that monitoring continue through 2011 to better determine the rate of natural recovery. A statistical evaluation based on the monitoring data through 2011 indicated that South Fork Big Deer Creek may be able to meet water quality cleanup goals through natural recovery. Therefore, EPA decided to monitor for an additional 6 years (through 2017). EPA is currently reviewing the trends report and evaluating the need for the bypass pipeline.

Contingent Actions and Status

There was uncertainty whether some of the components of the remedial actions would be effective in meeting the RAOs and cleanup levels. Therefore, the ROD determined that monitoring and evaluations would be needed after construction of the remedial alternative. Based on the monitoring results and further evaluations, contingent actions may be necessary for some areas of the Site in the future if cleanup levels are not met. The following bullets provide an overview of the contingent actions, followed by the status (in italics).

- Run-on/runoff controls for the cover on the West Fork Tailings Impoundment, if monitoring indicates excessive erosion or water quality impacts from runoff. *Monitoring to-date does not indicate that there is significant erosion of the cover on the West Fork Tailings Impoundment, therefore run-on/runoff controls do not appear to be required.*
- Measures to reduce the water table beneath the West Fork Tailings Impoundment, if the water table begins to rise to a level that threatens dam stability. *Over the FYR period (2013 to 2018), most of the wells were relatively stable, but suggest a continued increasing trend. If increasing trends continue, this action may be warranted in the future.*
- Additional collection and treatment of Bucktail Creek seeps, if they result in unacceptable metals loading to Big Deer Creek. *No additional seeps have been identified during the Five-Year Review period.*
- Removal of Bucktail Creek sediments and/or overbank materials, or installation of a passive (or semi-passive) treatment system near the confluence of the South Fork Big Deer Creek and Big Deer Creek, if water quality goals in Big Deer Creek are not achieved because of metals leaching from sediments/overbank materials along Bucktail Creek. *If trends in sediment contaminant concentrations in drainages continue to level out above cleanups, this contingent action maybe warranted in the future.*
- Alternatives to address metals discharges to South Fork Big Deer Creek from groundwater and/or overbank materials if water quality goals in South Fork Big Deer Creek are not achieved. *If trends in surface water and sediment contaminant concentrations continue to level out above cleanup levels, this contingent action should be reviewed as a potential path forward.*
- Additional removals along Panther Creek if monitoring results following storm events indicate deposition of overbank deposits that exceed remediation goals. *Recontaminated soils were removed in 2004, and 2009 through 2012. If future high runoff events in Blackbird Creek result in recontamination of overbank areas along Panther Creek at concentrations above the cleanup levels, additional removals will be conducted.*
- Alternatives to address metals loads to Big Deer Creek downstream from South Fork Big Deer Creek if monitoring indicates that these loads result in exceedances of water quality goals in Big Deer Creek. *The potential sources of these dissolved copper loads have been studied by the BMSG, in consultation with EPA and the Natural Resource Trustees (Trustees). A review of the previous studies and identification of potential data gaps will be conducted to future studies to identify larger source areas.*

Institutional Controls Summary

Table 3. Summary of Planned and/or Implemented Institutional Controls

Media, Engineered Controls, and Areas that Do Not Support Unlimited Use and Unrestricted Exposure Based on Current Conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or Planned)
Subsurface Soils	Yes	Yes	Privately-owned lands located downgradient of the current Site boundary along Panther Creek impacted by COCs via stream transport.	Ensure property owners are aware of contaminated soils remaining under clean soil backfill, and that they are properly managed if disturbed.	*Final Work Plan, Management of Subsurface Soils*, *Panther Creek Private Properties* (BMSG, 2008) Cobalt Townsite - Unilateral Administrative Order, USEPA Docket No. CERCLA-10-2003-01.12. as amended (EPA, 2017) Panther Creek Inn Area – Environmental Covenant: 296595 (Lemhi County, 2014) BMSG must provide property owners notice of contamination; monitor quarterly for underground construction; and work with property owners to ensure safe disposal of contaminated soils and placement of clean backfill.
Soils, Groundwater	Yes	Yes	Blackbird Mine	Certain areas of the property shall be restricted to protect human health. Groundwater should not be used as a potable water source. Access should be controlled, new activities should not compromise remedy	Environmental Covenant, 2015

Media, Engineered Controls, and Areas that Do Not Support Unlimited Use and Unrestricted Exposure Based on Current Conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or Planned)
Subsurface Soils	Yes	Yes	USFS lands located downgradient of the current Site (Deep Creek Campground and Riprap Bar) boundary impacted by COCs via stream transport.	Contaminated soils were not removed below the surface of the groundwater table. In certain locations, contaminated soils remain under clean soil backfill. Disturbance of these areas could affect the remedy.	Institutional Control Implementation and Assurance Plan for Federal Lands Administered by the USFS Salmon-Challis Forest, 2015

The 2003 ROD as amended by the 2012 ESD required ICs in the Blackbird and Bucktail Creek drainages to protect the remedy, preclude uses that would result in unacceptable risks (such as residential use), and maintenance of access controls (fencing and gates) to limit unauthorized use. Along Panther Creek, the ROD provided that soil management ICs are needed at some of the properties where overbank deposits were removed to preclude unacceptable future exposure if underlying soils with elevated arsenic concentrations are brought to the surface (as a result of erosion, digging, or construction activities). The 2012 ESD added cobalt overbank cleanup levels that need to be maintained. The private properties that required ICs for underlying soils were: former Panther Creek Inn, Cobalt Townsite, Residence 1, Riprap Bar, Residence 3, Deep Creek Campground, and Residence 6. The properties under USFS control that require ICs are the Riprap Bar and Deep Creek Campground.

ICs for the downstream privately-owned properties have been put into place, where appropriate. An Idaho Uniform Environmental Covenant was recorded at Residence 4 on December 10, 2007, which effectuates restrictions consistent with the ROD and Statement of Work (SOW). Prior to recording of the covenant, a title search was conducted and confirmed that there were no prior recorded interests that could potentially eliminate or undermine the long-term effectiveness of the covenant. The O&M Manual requires that the BMSG monitor the landowner's compliance with the covenant.

On the other properties with contaminated soil in the subsurface, the UAO provided that a county ordinance containing soil management requirements be submitted to the Lemhi County Commissioners. Unfortunately, on January 14, 2008, the County Commissioners rejected adopting the ordinance. On May 5, 2008, EPA approved a work plan under which the BMSG will implement a soil management program and provide a disposal repository to the landowners if they excavate soil that cannot be placed back in the excavation location (BMSG, 2008).

Under the work plan, the BMSG is required to:

- Conduct quarterly monitoring of properties where contamination has been left at depth to determine if underground construction is planned. If underground construction is planned, the BMSG will provide information about the requirements to avoid recontamination during construction.
- Provide transportation of contaminated soils to the repository if all contaminated soils cannot be replaced in excavations, and provide clean replacement soils to the landowner if necessary.
- Provide testing of excavated soils as needed and testing of adjacent soils after construction to assure that recontamination has not occurred.
- Provide annual notice to the landowners about the potential presence and location of contaminated subsurface soils, specific information on notification, handling, transport, and disposal practices, and offers of technical assistance from the BMSG.

EPA will oversee and enforce the BMSG's obligations under the UAO and Soils Management Work Plan (BMSG, 2008) and address private property owners' compliance with procedures and directions for managing contaminated subsurface soils along Panther Creek. The soils management plan is currently meeting project RAOs. The Forest Service has established ICs for lands administered by USFS (see Table 3).

Systems Operation/Operation and Maintenance

The BMSG performs operation and maintenance (O&M) and regular monitoring at the Site. The sediment, surface water, and groundwater monitoring are conducted annually and described in detail in the Data Review section. The O&M is conducted in accordance with a series of O&M plans that during this FYR period were consolidated into a sitewide O&M manual (Golder, 2015b). In addition to ongoing O&M, the BMSG conducts regular inspections of the various facilities as required by the O&M manual. Golder Associates, on behalf of the BMSG, conducts dam safety inspections of the 7000 Dam, the 7100 Dam, and the West Fork Tailings Impoundment every 5 years. In addition, the Idaho Department of Water Resources conducts dam safety inspections, typically every other year.

During the BMSG's 2011 inspection, drain pipes from the West Fork Storage Facility culvert were identified as clogged, and cleaned. The roto-rooter cleaning process caused an apparent breach in the pipes with significant water and pea gravel discharging (Golder, 2014). A newly designed culvert was constructed in 2014 to prevent the migration of tailings while continuing to use the West Fork conduit as a gravity water drain form the tailings facility (Golder, 2014).

EPA, DEQ, and USFS also conduct annual inspections of the aboveground facilities. Previously the underground mine facilities were also inspected to observe the condition of the adit for use to convey water from the Bucktail pump back station over to the Blackbird side for treatment in the WTP, but inspection and stabilization efforts ceased in 2016 because of safety concerns. The BMSG has designed a contingency pipeline through the currently adit. If the adit were to collapse, the pipeline could continue conveying extracted water from the Bucktail seep collections system to the WTP on the Blackbird Creek side of the mine. The work on the pipeline is currently ongoing and expected to be completed summer of 2018. The adit will continue to be used to convey the extracted water until a collapse prevents it from conveying water to the WTP.

III. PROGRESS SINCE THE LAST REVIEW

The 2013 FYR protectiveness statement is shown in Table 4.

Table 4. 2013 FYR Protectiveness Statement

OU #	Protectiveness Determination	Protectiveness Statement
N/A	Will be Protective	The Site remedy is expected to be protective of human health and the environment upon completion of all remaining remedial actions; completion of any relevant contingent actions; evaluation and optimization of in-stream stabilization and any potential additional measures along Blackbird Creek; and implementation of all ICs. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in those areas.

Table 5 provides the status of the recommendations from the 2013 FYR.

Table 5. Status of Recommendations from the 2013 FYR

Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
Concentrations of COCs in sediments remain above current cleanup levels at certain times and places in area creeks downstream from the mine.	Continue to implement the sediment monitoring program to determine if further action is warranted.	Ongoing	Sediment monitoring program continued through 2017 and will continue as part of the ongoing monitoring program.	
Concentrations of COCs in certain overbank area soils exceed cleanup levels.	Implement remedial actions. Conduct removal of soils at Residence 1 Pasture.	Completed	Sampling conducted at Silling Pasture in 2017 indicated that the overbank soils were below the residential cleanup levels to a depth of 2 inches. Contamination remains at depth. To ensure the property owner is aware of contaminated soils remaining under the surface, and that they are properly managed if disturbed, this area will be included in the approved Subsurface Soils Management Plan.	8/1/2018
Surface water cleanup levels are not currently met in South Fork Big Deer Creek.	Monitor in South Fork Big Deer Creek through 2014 to determine if the diversion pipeline is warranted.	Ongoing	Monitoring of South Fork Big Deer Creek and Big Deer Creek continued through 2017. BMSG provided a statistical evaluation of the data which is currently under review by EPA.	
Surface water cleanup levels are not currently met in the lower reaches of Big Deer Creek.	Continue monitoring in Big Deer Creek, and identify if any additional actions are necessary if water quality goals are not achieved and exceedances are because of the Blackbird Mine.	Ongoing	Monitoring of South Fork Big Deer Creek and Big Deer Creek continued through 2017. BMSG provided a statistical evaluation of the data which is currently under review by EPA.	
ICs have not been implemented at the Cobalt Townsite, former Panther Creek Inn area, and the Blackbird Mine.	Continue efforts with BMSG and Department of Justice to implement ICs.	Completed	The Cobalt Townsite, former Panther Creek Inn area, and Blackbird Mine ICs were implemented.	September 2015 (Blackbird Mine) April 2017 (Cobalt Townsite) October 2016 (former PCI area)
The full nature and extent of cobalt contamination in the Panther Creek shallow alluvium aquifer has not been fully defined.	Conduct a study to characterize the nature and extent of contamination.	Completed	BMSG conducted a groundwater characterization study to determine the nature and extent of all COCs (copper, cobalt, and arsenic). Results indicate that residual contamination primarily attenuates in the alluvium aquifer within 50 feet of the stream.	January 2015 (Golder, *Groundwater Characterization Report*)

Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
Bucktail Creek groundwater concentration of cobalt exceeds cleanup level. Nature and extent of groundwater contamination in Bucktail Creek and South Fork Big Deer Creek drainage have not been characterized.	Conduct a study to characterize the nature and extent of contamination.	Completed	BMSG conducted a groundwater characterization study to determine the nature and extent of all COCs (copper, cobalt, and arsenic). Results indicate that residual contamination primarily attenuates in the alluvium aquifer within 50 feet of the stream.	January 2015 (Golder, *Groundwater Characterization Report*)
The effectiveness of the Blackbird Creek stabilization structures is unknown.	Continue to monitor the effectiveness of stabilization structures, and conduct future contingent action removals along Panther Creek in overbank areas if they become recontaminated at concentrations above cleanup levels.	Completed	BMSG has continued to monitor the effectiveness of stabilization structures through 2017. Data from structure sampling and overbanks indicates that the structures are performing as designed including during high streams flows.	May 2018 (Golder, 2017 In-stream Monitoring Report)
The significance of floc as a recontamination source is unknown.	Continue to monitor arsenic concentrations in oxyhydroxide floc deposits in Blackbird Creek.	Completed	BMSG has continued to monitor Blackbird Creek for arsenic as required in the UAO SOW and approved Performance Monitoring Plan. The floc does not appear to be a significant source of arsenic. Monitoring in the area will continue to observe any changes.	February 2018 (Golder, 2017 Monitoring Report)

UAO = Unilateral Administrative Order

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

The community members and stakeholders on EPA's mailing list were notified that EPA would be conducting the next Five-Year Review of the Blackbird Mine Site. The post cards were mailed by EPA to the mailing list on May 16, 2018. The post card invited feedback on the Site and provided an email address and phone number for providing input. On June 11, 2018, the Idaho Conservation League (ICL) submitted to EPA comments regarding the Five Year Review and the cleanup efforts at the Blackbird Mine. This was the only feedback received in response to the mailed post card.

The following bullets provide an overview of the subject of the ICL comments and where information related to each can be found in this FYR report (if applicable). A full copy of the comments under cover of letter sent by ICL to EPA is attached to this FYR report as Appendix B.

- IC Implementation within Panther Creek and Bucktail Creeks (see Technical Assessment, Question A)
- Idaho Cobalt Project encroaching on Blackbird Remedies (see Technical Assessment, Question C)
- Soils management monitoring (see Data Review – Over Banks Deposits and Soils Management Panther Creek)
- Panther Creek shallow alluvium contamination (see Table 5, Technical Assessment Question A, and Appendix A for technical document reference)
- Sediment and surface water concentrations in South Fork Big Deer Creek and Big Deer Creek (see Data Review, Technical Assessment, and Contingent Actions)
- West Fork Tailings Impoundment (see Data Review and Technical Assessment)
- UAA (commented is noted by EPA and will inform Idaho Department of Environment Quality of the concern).

- Recreational Use Panther Creek (see Table 2)
- Foreseeable activities and Cumulative Effects (EPA understands the concern and future FYRs will look at any changes in land use with the remedy modified accordingly).
- Wild and Scenic Outstandingly Remarkable Values (EPA understands the concern and future FYRs will look at any changes in land use with the remedy modified accordingly).

On June 20, 2018, Matt Wilkening of EPA, Julie Hopkins of USFS, and Allan Erickson of CH2M HILL interviewed the owner of Residence 1 at his cabin along Panther Creek, at the request of the EPA. The discussion was related to residual material potentially present in subsurface soils in his Lower Pasture from high flows contaminating the overbanks. The 2017 surface soil results indicating that the surface soils were below residential cleanup levels was discussed. No specific action items or concerns were identified in the interview.

Data Review

The following sections described the data that were collected per the approved *Performance Monitoring Plan* (Golder, 2015a). Monitoring locations that are discussed in the following sections can be reviewed on Figure 4.

Surface Water Quality Data

The ROD requires that surface water cleanup levels be met in three area streams impacted by the Blackbird Mine. These include Panther Creek downstream from Blackbird Creek, Big Deer Creek downstream from South Fork Big Deer Creek, and South Fork Big Deer Creek downstream from Bucktail Creek. The COCs in surface waters for the identified streams are arsenic, cobalt, and copper.

The UAO SOW established a rigorous sampling methodology for determining whether surface water cleanup levels are being met in area streams. The SOW required that this sampling begin as determined by EPA following completion of the remedial actions. The rigorous sampling methodology requires four 96-hour sampling events per year at each monitoring station for copper, cobalt, and arsenic. Typically, three sampling events are conducted in the spring, and one sampling event is conducted during the fall. In 2014, however, the fall 96-hour event in Panther Creek was determined to be no longer necessary by the EPA. The last fall exceedance of any COC (copper) in Panther Creek occurred in 2002.

During each sampling event, 12 samples are collected at each station for copper and cobalt, and then the 12 samples are analyzed statistically by the Wilcoxon Signed Rank Test (WSRT) to determine if an exceedance of the water quality cleanup levels has occurred. Arsenic is sampled once daily during the 96-hour event. Sampling locations SFSW-01 and SFSW-04 are sampled only once per 96-hour event, thus no WSRT at these locations are available.

To evaluate changes in concentrations and potential metal loading along the drainages, synoptic surface water sampling are conducted on the Blackbird, Panther Creek, Bucktail, South Fork, and Big Deer Creek drainages in spring of each year.

In addition to the 96-hour sampling events and synoptic sampling, weekly surface water sampling is conducted in spring at Blackbird, Panther, and Big Deer Creeks. These data are primarily used to determine when significant increasing copper trends occur, compared to the 96-hour sampling events.

Water quality data from 2013 through 2017 for surface waters and concentration trends are summarized below.

Panther Creek 96-Hour and Weekly Sampling Results

Water quality concentrations are measured at four stations along Panther Creek from above Blackbird Creek to below Big Deer Creek (Stations PASW-11, -09, -05, and -04X) during the four 96-hour sampling events and at PASW-04X and PASW-09 during the weekly events, each year. As shown in Table 6, peak concentrations observed in Panther Creek continue to exceed the chronic criteria for copper and in some cases the acute criteria. The only WSRT exceedance for copper identified during the last FYR review period was at PASW-09 in 2017. Arsenic exceed the criteria twice at PASW-09 during the review period, in 2014 and 2017. Cobalt concentrations have remained below the cleanup level of 0.086 mg/L for the last 5 years at all sampling stations.

In 2017, the highest concentration of dissolved copper was 0.0051 mg/L at PASW-04X, which slightly exceeded the acute (and thus the chronic criteria) of 0.0049 mg/L (Table 6). The historical median concentrations of dissolved copper at the measured stations PASW-09 and PASW-04X are shown on Figures 5 and 6, respectively.

The general trend for copper at PASW-09 and PASW-04X over the last 5 years has been increasing but lower than the peak median concentration in 2014. In general, the weekly sampling has shown that the 96-hour sampling events have occurred within approximately 3 weeks or less of the peak concentrations for the past 5 years.

South Fork Big Deer Creek and Big Deer Creek 96-Hour and Weekly Sampling Results

Water quality concentrations are measured at five stations along South Fork Big Deer Creek and Big Deer Creek (SFSW-01, SFSW-04, BDSW-01, BDSW-03, and BDSW-04) during the four 96-hour sampling events, and at BDSW-03 during the weekly events.

SFSW-01 has been the sampling station with the highest observed concentration of copper, exceeding the chronic criteria for the last 5 years (Table 6) in South Fork Big Deer Creek. Exceedance of copper has also occurred at other sampling stations during the last 5 sampling event years. South Fork Big Deer Creek has been below the criteria for cobalt and arsenic over the review period. Figure 7 exhibits the median historical copper concentrations at SFSW-01, which indicates a variable trend over the review period and consistently above criteria. Median concentrations of copper in 2017 were higher than the last couple of years, likely because of higher streamflows.

In Big Deer Creek, BDSW-01 has most frequently had highest concentrations, exceeding the criteria. As shown in Table 6, BDSW-01 has exceeded the WSRT each year and during multiple 96-hour events during the review period. BDSW-03 has shown individual exceedances, but did not fail the WSRT. Cobalt and arsenic have remained below the established criteria at all stations in Big Deer Creek. The median copper concentration at BDSW-01 has shown variable trend over the FYR period, but consistently remains above criteria (Figure 8).

Like Panther Creek, weekly sampling data and observations of flow measurements suggest that in general, the sampling events have occurred within weeks of the peak flows and thus peak concentrations.

Table 6. 96-Hour and Weekly Peak Concentration Sampling Results From 2013 to 2017 at Panther Creek and Big Deer Creek

Year	Panther Creek Station Location Copper (mg/L)	Panther Creek Station Location Cobalt (mg/L)	Panther Creek Station Location Arsenic (mg/L)	Panther Creek WSREL	South Fork Big Deer Creek Station Location Copper (mg/L)	South Fork Big Deer Creek Station Location Cobalt (mg/L)	South Fork Big Deer Creek Station Location Arsenic (mg/L)	Big Deer Creek Station Location Copper (mg/L)	Big Deer Creek Station Location Cobalt (mg/L)	Big Deer Creek Station Location Arsenic (mg/L)	Big Deer Creek WSREL
2013	PASW -05 0.0048 CMC: 0.0046 CCC: 0.0035	PASW-09 0.061	PASW-09 0.005	None	SFSW-01 0.0168 CMC: 0.0136 CCC: 0.0093	SFSW-01 0.019	SFSW-01 0.001	BDSW-01 0.0108 CMC: 0.0046 CCC: 0.0035	BDSW-03 0.0033	Non-detection	**BDSW-01 (first and second 96-hour events)**
2014	PASW-09 0.0064 CMC: 0.0054 CCC: 0.0040	PASW-09 0.0259	PASW-09 **0.044**	None	SFSW-01 0.0154 CMC: 0.0126 CCC: 0.0087	SFSW-01 0.019	SFSW-01 0.001	BDSW-01 0.0057 CMC: 0.0046 CCC: 0.0035	BDSW-03 0.0035	Non-detection	**BDSW-01 (first and second 96-hour events)**
2015	ASW-05 0.0037 CMC: 0.0046 CCC: 0.0035	PASW-09 0.018	PASW-04X 0.0096	None	SFSW-01 0.0125 CMC: 0.0112 CCC: 0.0078	SFSW-01 0.015	SFSW-01 0.001	BDSW-01 0.0057 CMC: 0.0046 CCC: 0.0035	BDSW-03 0.0035	Non-detection	**BDSW-01 (first 96-hour event)**
2016	PASW-09 0.0034 CMC: 0.0064 CCC: 0.005	PASW-09 0.023	PASW-09 0.005	None	SFSW-01 0.0146 CMC: 0.0141 CCC: 0.009	SFSW-01 and SFSW-02 0.016	SFSW-01 0.002	BDSW-01 0.0041 CMC: 0.0046 CCC: 0.0035	BDSW-03 0.0034	Non-detection	**BDSW-01 (first and second 96-hour events)**
2017	PASW -04X 0.0051 CMC: 0.0046 CCC: 0.0035	PASW-09 0.0286	PASW-09 **0.013**	**PASW-09 (second 96-hour event)**	SFSW-01 0.0142 CMC: 0.0130 CCC: 0.0089	SFSW-01 0.0193	SFSW-01 0.001	BDSW-01 0.0065 CMC: 0.0049 CCC: 0.0037	BDSW-03 0.0034	Non-detection	**BDSW-01 (first and second 96-hour events)**

Notes:
Cobalt cleanup level is 0.086 mg/L for all stations.
Arsenic cleanup level is 0.010 mg/L for all stations.
CCC = Chronic Criteria (criteria continuous concentration)
CMC = Acute Criteria (criteria maximum concentration)
WSREL = Wilcoxon Signed Rank Test Exceedance Location

<u>Blackbird Creek and Panther Creek Synoptic Sampling</u>

The loading in Blackbird and Panther Creek has remained generally consistent over the review period. Dissolved copper loading has typically increased until BBSW-07 and then flattens with slight decrease to station PASW-09. Arsenic and cobalt loads tend to increase moving downstream at each location all the way out to PASW-09. The maximum loading observed at station PASW-09 is a function of streamflow. The concentrations at PASW-09 typically are below most of the Blackbird Creek stations and respective COC criteria. Figure 9 depicts 2017 data with the typical loading trend observed in Blackbird Creek and Panther Creek (see Figure 4 for sample station locations). At least one station in Blackbird Creek exceeded the criteria for arsenic during the sampling event in 2013, 2014, and 2017 (Golder, Monitoring Reports 2013-2017).

<u>Bucktail Creek, South Fork Big Deer Creek, and Big Deer Creek Synoptic Sampling</u>

Loading of copper and cobalt (arsenic concentrations in these drainages are well below criteria) at Bucktail Creek, South Fork Big Deer Creek, and Big Deer Creek were mostly consistent from 2013 to 2017. The largest loading increase is observed between stations BTSW-01.6 and BTSW-01 (see 2017 data on Figure 10). The loading continues to increase at a consistent trend throughout Southfork Big Deer Creek until the confluence of Big Deer Creek (BDSW-03) and then the loading trend often slows. However, the loading continues to increase throughout the remaining stream to BDSW-01.

Groundwater Quality Data

Groundwater quality is measured in 11 monitoring wells within the Blackbird Creek drainage. Five monitoring wells are located near the WTP and the cutoff wall (Figure 11). In addition to the WTP wells, sampling continued at some West Fork Impoundment monitoring wells since 2009 (Figure 12).

The following wells are sampled during the annual WTP sampling event: BBMW-03A, BBMW-05A, BBMW-06A, BBMW-07A, and BBMW-08A. These wells are located upstream and downstream of the cutoff wall to monitor changes in source areas. Copper trends in these wells vary, with BBMW-05A and BBMW-08A exhibiting similar concentrations, slight increasing trend, and remaining above cleanup level over the last 5 years (Figure 13). Well BBMW-06A has shown an increasing trend since 2014 and is currently above the cleanup level while BBMW-03A and BBMW-07A have been variable and remain below the cleanup level. Similar to copper, BBMW-05A and BBMW-08A have similar concentrations and trend in cobalt over the review period (Figure 14). The remaining wells show variable trend, but in general increasing since 2013. All wells were above the cleanup level over the last 5 years. As shown on Figure 15, arsenic trends in BBMW-03A, BBMW-05A, BBMW-06A, and BBMW-07A have been relatively stable over the last 5 years. BBMW-08A showed a sharp decrease in 2013 and 2014, but has been steadily increasing since then. BBMW-08A remained below the clean-up level for arsenic while BBMW-05A has only exceeded a couple of times. The remaining three wells were above cleanup levels all 5 years. The water levels have remained stable and react to higher streamflow years (Figures 13 through 15)

The following wells are sampled for water quality during the annual West Fork Impoundment sampling event: WFMW-01D, WFMW-01S, WFMW-02, and WFMW-15 (Figure 12). In addition, 11 wells are monitored monthly for water levels and another 16 wells are monitored quarterly for water levels. Copper concentrations have been declining overall in the wells since 2013 and have remained below cleanup levels (Figure 16). Figure 17 shows the cobalt concentrations for the West Fork wells. WFWM-15 showed a decline in cobalt from 2014 to 2016, but has become steady over the last few years, similar to the other wells sampled. WFMW-01D and WFMW-02 exceeded the cleanup level during the Five-Year Review period. Arsenic has been stable over the review period for WFMW-1D and WFMW-09, but has been increasing in MFMW-2 (sharply) and MFMW-15 (Figure 18). All wells remained above the arsenic cleanup level. Water levels in the tailings area continues to increase with an increase of approximately 5 feet in most wells (Figure 19). The groundwater increase at the face of the West Fork have also continued to increase since 2013 (Figure 20).

Sediment Data

In-stream sediment data during the FYR period for Panther Creek, Big Deer Creek, Blackbird Creek, and South Fork Big Deer Creek are summarized below. In addition to the Performance Monitoring Plan sediment sampling requirements, sediment sampling occurred in the in-stream stabilization areas for Blackbird Creek to assess the stabilization effectiveness.

Blackbird Creek

The four stations collected along Blackbird Creek continue to be well below cleanup levels for arsenic (8,500 mg/kg above mine gate and 4,300 mg/kg below mine gate) and cobalt (5,500 mg/kg above gate and 2,700 below gate). There are no established cleanup levels for copper. Concentrations for arsenic ranged from 9 mg/kg to 413 mg/kg while the cobalt ranged from 10 mg/kg to 278 mg/kg. Concentrations at these stations have been below the peak concentrations observed prior to the stabilization structure implementation.

Panther Creek

Sediment data were collected from seven sampling stations along Panther Creek downstream from the mouth of Blackbird Creek. The average arsenic concentrations in 2017 ranged from 3 mg/kg at PASED-11 to 174 mg/kg at PASED-08 (cleanup level of 35 mg/kg). Cobalt 2017 concentrations ranged from 3 mg/kg (PASED-11) to 115 mg/kg (PASED-07) with a cleanup level of 80 mg/kg. Copper concentrations in 2017 ranged from 31 to 79 mg/kg (cleanup level of 149 mg/kg). During the review period, arsenic trends have been variable, but overall concentrations are lower than the peak prior to the construction of the instream stabilization structures (Figure 21). Similar to arsenic, cobalt trends in sediments have been somewhat variable, but overall appear to be trending down over the last few years (Figure 22). Finally, copper trends along Panther Creek have been trending down with a bump up during 2014, and have been lower than the peak concentrations prior to stabilization structure installation (Figure 23).

South Fork Big Deer Creek

Sediment data were collected from three stations located downstream of the mouth of Bucktail Creek. The 2017 arsenic concentration downstream from Bucktail Creek ranged from 7 mg/kg at SFSED-04 to 42 mg/kg at SFSED-02 (cleanup level of 35 mg/kg). Cobalt concentrations in 2017 ranged from 5 mg/kg to 187 mg/kg (cleanup level of 436 mg/kg) and has remained significantly below the cleanup level throughout the review period. Copper concentrations ranged from 9 mg/kg at SFSED-04 to 894 mg/kg at SFSED-01 (cleanup level of 637 mg/kg). Arsenic concentrations have seen a decreasing trend at SFSED-04 during the review period, except in 2017 (Figure 24). In contrast, SFSED-01 has shown an increasing trend in arsenic over the entire review period, while copper has remained relatively stable. As expected because the sampling location is located upstream from the confluence of Bucktail Creek, SFSED-04 remained relatively stable and well below the copper criteria during the FYR period (Figure 25). Copper concentrations have shown a decreasing trend over the last 4 years, but remains above criteria.

Big Deer Creek

Sediment data were collected from four stations located downstream of the mouth of South Fork Big Deer Creek. The arsenic concentrations downstream from South Fork Big Deer Creek were 1 mg/kg at BDSED-04 and 6 mg/kg at BDSED-03(cleanup level of 35 mg/kg). Cobalt concentrations ranged from 25 mg/kg at BDSED-03 to 39 mg/kg at BDSED-02 (cleanup level of 80 mg /kg). Copper concentrations ranged from 12 mg/kg and 209 mg/kg (cleanup level of 149 mg/kg). Concentrations of arsenic and cobalt have been somewhat variable, but remained below criteria throughout the review period. Copper trends in the Big Deer Creek stations have been stable from BDSED-02 and BDSED-01, but BDSED-03 and BDSED-04 exhibit an increasing trend (Figure 26).

Blackbird Creek In-stream Stabilization Sampling

Total arsenic and cobalt concentrations in Blackbird sediments upstream and downstream of the West Fork Tailings Impoundment were tracked to evaluate trends for in-stream stabilization performance and evaluate the effect of the tailings in sediment quality. Two in-stream fine-grained sediment samples were collected at each of the eight in-stream stabilization areas. In addition, a baseline pebble count/grain size distribution sampling occurred where characterization of finer-grained sediments occurred at multiple depths (0 to 6 inches and 6 to 12 inches) at each stabilization area.

Concentrations observed from the in-stream sediment sampling were generally lower than those samples collected upstream of the West Fork Impoundment. The trends of arsenic are stable in both in-stream and fresh deposits and well below cleanup levels. The trends of cobalt concentrations are down from a peak in 2016. Despite high runoff in 2017, geomorphic changes appeared minimal and concentrations were within historic ranges. The catch basin ponds in Area 8, the last of the stabilization structures and just before the confluence of Panther Creek, grew 50% indicating sediment transport still occurs, but the ponds are performing as designed.

Overbank Deposits and Soils Management at Panther Creek

When overbank areas along Panther Creek are inundated from snowmelt runoff, BMSG is required to sample the identified overbank areas. During the review period, the snowmelt runoff of 2014 and 2017 were identified as having inundated overbanks. BMSG sampled the overbanks and determined none of the banks exceeded the criteria, except for Residence 1 Lower Pasture, in 2014, which has known contamination exceeding criteria (see Table 5). The soils management plan has been implemented throughout the five-year review period. There have been no observed activities that would impact the effectiveness of current remedies.

Biomonitoring

Several RAOs (see Table 1) indicate the need to improve surface water and sediment conditions to restore aquatic biota populations. Several biomonitoring studies of the Panther Creek watershed have been conducted since the last FYR to evaluate the recovery of the benthic invertebrate and fish populations. The purpose of the biomonitoring studies is to "evaluate spatial and temporal biological trends within the Panther Creek watershed relative to the Blackbird Mine site sources and remedial progress at the site. The purpose is also to collect biological and environmental data relevant to the distribution and relative abundance of resident and anadromous salmonids in Panther Creek and resident salmonids in Big Deer Creek" (EcoMetrix, 2006). The current conditions and trends summarized in the latest Biomonitoring Study – Panther Creek Watershed September 2015 (EcoMetrix 2016) are as follows:

- Panther Creek scores very well in comparison with Idaho norms for "least impacted" streams and rivers with the highest condition rating. Fish community conditions in Panther Creek have fully recovered, and Panther Creek
- Consistently supports all life stages of resident and anadromous salmonids, both upstream and downstream of mine drainages.
- Habitat conditions in Blackbird Creek remain poor.
- Conditions in Lower South Fork Big Deer Creek are improving. Upstream and downstream of Bucktail Creek have been scored with the highest condition rating. Although South Fork Big Deer Creeks represents limited fish habitat, the presence of multiple age classes of trout, including fry, as well as fish occurring upstream of the logjam barrier are encouraging signs. Fish remain absent upstream of Bucktail Creek; and
- Recovery within Big Deer Creek continues, as evidenced by increasing fish and benthic invertebrate densities, the presence of all life stages of trout.

Site Inspection

EPA conducts regular site inspections at the Site to inspect remedial action construction activities and to review ongoing O&M. These inspections are typically conducted in the autumn of each year, and the most recent inspection was conducted in October 2017. EPA also regularly reviews the annual monitoring reports for the Site. Because of these regular inspections and reviews, EPA considered the site inspection conducted in October 2017 to be sufficient for the purposes of the FYR. There were no specific issues identified during the inspection (CH2M, 2018). The monitoring wells, dams, surface water control ditches, WTP, West Fork Tailings Impoundments, caps, and sludge drying ponds were all in good condition. Details of this inspection can be found in the inspection memorandum (CH2M, 2018).

V. TECHNICAL ASSESSMENT

This section presents a technical assessment of the remedy performance as implemented at the Site.

QUESTION A: Is the remedy functioning as intended?

Question A Summary

No. The remedy is not yet performing as intended. Although there have been significant improvements in media quality since the implementation of remedial actions and multiple components of the remedy appear to be functioning as designed; concentrations of COCs in surface waters and sediments remain above cleanup levels in certain streams, with little change in concentrations; and in some cases, an increasing trend has been found over the last 5 years likely due to the increase frequency of higher flow years during the review period. It is anticipated that the remedy can function as intended upon identifying the need for and completion of relevant contingent actions and following natural recovery of sediments. The discussion of remedy function is separated into discussions of surface water, groundwater, in-stream sediments, overbank deposits, and institutional controls.

Panther Creek Surface Water

In Panther Creek, water quality has improved substantially from peak dissolved copper concentrations downstream from Blackbird Creek at 0.218 mg/L in 1995 to 0.00518 mg/L in 2017. This represents a 98 percent reduction in peak concentrations. While concentrations over the last 5 years have indicated an increasing trend at some locations, there was only one WSRT exceedance at one station (PASW-09). Peak dissolved cobalt concentrations in Panther Creek have been reduced from 0.273 mg/L in 1995 to 0.029 mg/L in 2017, a 90 percent reduction. During the review period, Panther Creek surface water concentrations for cobalt were below the cleanup levels, meeting water quality standards during all 96-hour sampling events. Arsenic has exceeded cleanup levels in Panther Creek at the same location (PASW-09) in two separate years during the review period, demonstrating that the remedy is not yet performing as designed.

Big Deer Creek and South Fork Big Deer Creek Surface Water

In Big Deer Creek, water quality also has improved substantially since implementation of the remedy. The creeks consistently meet the cleanup levels for arsenic and cobalt. The first station just downstream from the mouth of South Fork Big Deer Creek (Station BDSW-03A), peak copper concentrations have been reduced from 0.342 mg/L in 1995 to 0.0065 mg/L in 2017. Peak cobalt concentrations have been reduced at this location from 0.110 mg/L in 1995 to 0.0027 mg/L in 2017, a 98 percent reduction. However, multiple station locations during the review period continue to exhibit copper concentrations that exceeded the cleanup levels in Big Deer Creek (BDSW-01 and South Fork Big Deer Creek (SFSW-01). The remedy is not yet performing as intended due to the copper continuing to exceed risk based cleanup levels.

Blackbird Creek and Bucktail Creek Surface Water

Monitoring in Blackbird Creek through 2017 indicated that there were multiple exceedances of the surface water cleanup level for arsenic (0.010 mg/L). Except for arsenic in Blackbird Creek, the ROD does not require numeric surface water cleanup levels to be met in Blackbird Creek and Bucktail Creek, because use attainability analyses performed by the State of Idaho have determined that certain uses and water quality criteria cannot be attained on these creeks (Table 2). The ROD includes non-numeric cleanup goals for Blackbird Creek and Bucktail Creek, which are to improve water and sediment quality such that cleanup levels can be met in the downstream creeks that have numeric water quality cleanup levels. In addition, the remedial goal for Blackbird Creek is to support aquatic life at levels similar to nearby reference streams, although not necessarily to support salmonids or metals-sensitive macroinvertebrate taxa. With the exception of one sampling event, Panther Creek met the water quality cleanup levels for the review period in copper and cobalt; therefore, the non-numeric goal for water quality is nearly being met in Blackbird Creek and the remedy is anticipated to function as intended. The water quality cleanup levels were not met at all stations in South Fork Big Deer Creek and Big Deer Creek during the review period; therefore, the non-numeric goal for water quality has not yet been met in Bucktail Creek, and the remedy is not yet functioning as intended.

Groundwater

Monitoring wells at the mine indicate that groundwater at the mine does not consistently meet MCLs or risk-based levels for arsenic, cobalt, and copper. The groundwater at the mine is not currently used for drinking water. The current mine ICs that run with the land are enforceable against future landowners or users and restrict the use of groundwater as a domestic water source. Therefore, the remedy is functioning as intended.

In-stream Sediments

Blackbird Creek in-stream sediments have meet the cleanup levels for arsenic and cobalt over the review period. In addition, Bucktail Creek has meet the non-numeric cleanup goal for cobalt and arsenic as South Fork Big Deer Creek and Big Deer Creek have remained below respective cleanup levels during the review period, except in 2014 when SFSED-01 exceeded in arsenic. Concentrations of copper in the sediments remained above cleanup levels in South Fork Big Deer and Big Deer Creek. Additional contingent actions may be necessary to allow for future natural recovery.

Concentrations during the last five sampling events at Panther Creek station have shown variability, but have decreased since the peak concentrations before the construction of the Blackbird Creek stabilization structures.

During the review period the sediments have consistently exceeded arsenic CULs in some stations, and have had exceedances of copper and cobalt CULs. Once the sediments are cleaned up through natural recovery, it is anticipated that the remedy will function as intended.

Institutional Controls

All of the required ICs have been implemented.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) still valid?

Question B Summary

Yes. The exposure assumptions and RAOs are still valid.

Changes in Applicable or Relevant and Appropriate Requirements (ARARs)

During the review of the applicable or relevant and appropriate requirements established in the ROD, the following changes to ARARs were found:

- The dissolved copper surface water cleanup levels established for Blackbird Creek, Panther Creek, South Fork Big Deer Creek, and Big Deer Creek were based on the state of Idaho's IWQS, which is hardness dependent, and remains applicable or relevant and appropriate. However, in 2007, EPA began using a biotic ligand model (BLM), rather than the hardness-based equations, for developing WQC values for copper. The state of Idaho's IWQS recognize this approach, however it currently is not effective for CWA purposes until the date EPA issues written notification that the pending revision has been approved. Aquatic toxicity decreases and associated BLM-based criteria values increase with increasing pH or dissolved organic carbon (DOC). For example, a plot in the revised WQC (EPA, 2007b) for copper indicates that when DOC is ≥2 mg/L, the BLM-based criterion is actually less stringent than the hardness-based criterion. As the changes to IWQS are not currently finalized, the existing copper CUL remains valid. If approved, the potential effect of the proposed change will be evaluated during the 2023 FYR.

Changes in Exposure Pathways or Land Use

No changes.

New Contaminants or Contaminant Sources

No new contaminants have been identified at the Site.

Changes in Toxicity or Contaminant Characteristics

The toxicity values published by EPA have not changed for arsenic and cobalt since the new cobalt values in 2008.

Changes in Risk Assessment Methods

EPA has published many new risk assessment guidance documents since the ROD (2003). However, the methodology used during the risk assessment was overall sufficient to evaluate risk to those areas of the Site that were evaluated at that time. Methodology changes provided in new or updated guidance documents are not anticipated to be significant enough to result in changes to CULs or to affect the validity of previous remedial action decisions at the Site.

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?

Yes. The Idaho Cobalt project located adjacent to the Blackbird Mine has developed some road improvement plans that could encroach on the Site remedies. EPA will be reviewing the proposed improvement plans and providing oversight as necessary to ensure the construction activities do not impact current remedies.

VI. ISSUES/RECOMMENDATIONS

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): N/A	**Issue Category:** Remedy Performance			
	Issue: Surface water in Panther Creek and Blackbird Creek continues to exceed cleanup level values for arsenic at some stations typically during higher stream flow years.			
	Recommendation: Review surface water monitoring data and trends and take actions as needed.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	BMSG	EPA	8/23/2020

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): N/A	**Issue Category:** Remedy Performance			
	Issue: Surface water in South Fork Big Deer Creek consistently exceeds cleanup level values for copper.			
	Recommendation: Review historical in-stream investigations to determine data gaps in conceptual site model, revise monitoring plans, and take actions as needed.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	BMSG	EPA	10/1/2019

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): N/A	**Issue Category:** Remedy Performance			
	Issue: Surface water in Big Deer Creek (BDSW-01) consistently exceeds cleanup level values for copper.			
	Recommendation: Review historical in-stream investigations to determine data gaps in conceptual site model, revise monitoring plans, and take actions as needed.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	BMSG	EPA	10/1/2019

<table>
<tr><th colspan="5">Issues and Recommendations Identified in the Five-Year Review:</th></tr>
<tr><td rowspan="3">OU(s): N/A</td><td colspan="4">Issue Category: Remedy Performance</td></tr>
<tr><td colspan="4">Issue: In-stream sediments in Panther Creek continues to exceed cleanup level values for arsenic, cobalt, and copper at some stations typically during higher stream flow years.</td></tr>
<tr><td colspan="4">Recommendation: Continue to implement the in-stream monitoring program to identify if arsenic trends begin to increase and with frequency to determine if further action is necessary.</td></tr>
<tr><th>Affect Current Protectiveness</th><th>Affect Future Protectiveness</th><th>Party Responsible</th><th>Oversight Party</th><th>Milestone Date</th></tr>
<tr><td>Yes</td><td>Yes</td><td>BMSG</td><td>EPA</td><td>8/23/2023</td></tr>
</table>

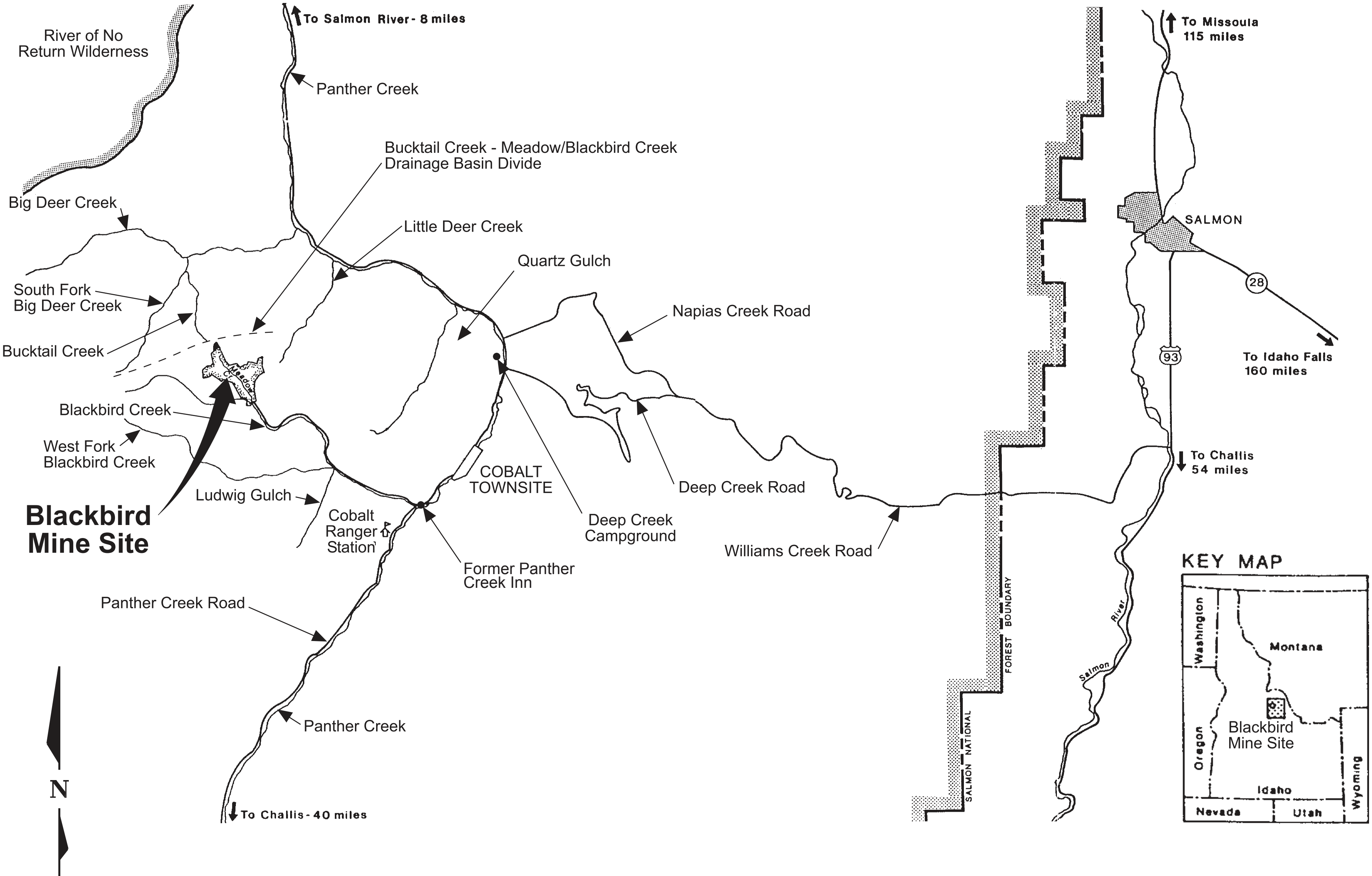
<table>
<tr><th colspan="5">Issues and Recommendations Identified in the Five-Year Review:</th></tr>
<tr><td rowspan="3">OU(s): N/A</td><td colspan="4">Issue Category: Remedy Performance</td></tr>
<tr><td colspan="4">Issue: In-stream sediments in South Fork Big Deer Creek and Big Deer Creek continues to exceed cleanup level values in copper and a single exceedance in arsenic at one station at South Fork Big Deer Creek.</td></tr>
<tr><td colspan="4">Recommendation: Review historical in-stream investigations to determine data gaps in conceptual site model, revise monitoring plans, and take actions as needed.</td></tr>
<tr><th>Affect Current Protectiveness</th><th>Affect Future Protectiveness</th><th>Party Responsible</th><th>Oversight Party</th><th>Milestone Date</th></tr>
<tr><td>Yes</td><td>Yes</td><td>BMSG</td><td>EPA</td><td>10/1/2019</td></tr>
</table>

Protectiveness Statement
Protectiveness Determination: Will be Protective
Protectiveness Statement: *The remedy for the Blackbird Mine Site will be protective upon completion of the remaining remedial action and relevant contingent actions, as determined as necessary. Remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in those areas.*

VIII. NEXT REVIEW

The next five-year review report for the Blackbird Mine is required 5 years from the completion date of this review.

Figures



Not to Scale

FIGURE 1
Regional Overview Map
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho

SOURCE: ERT 1982

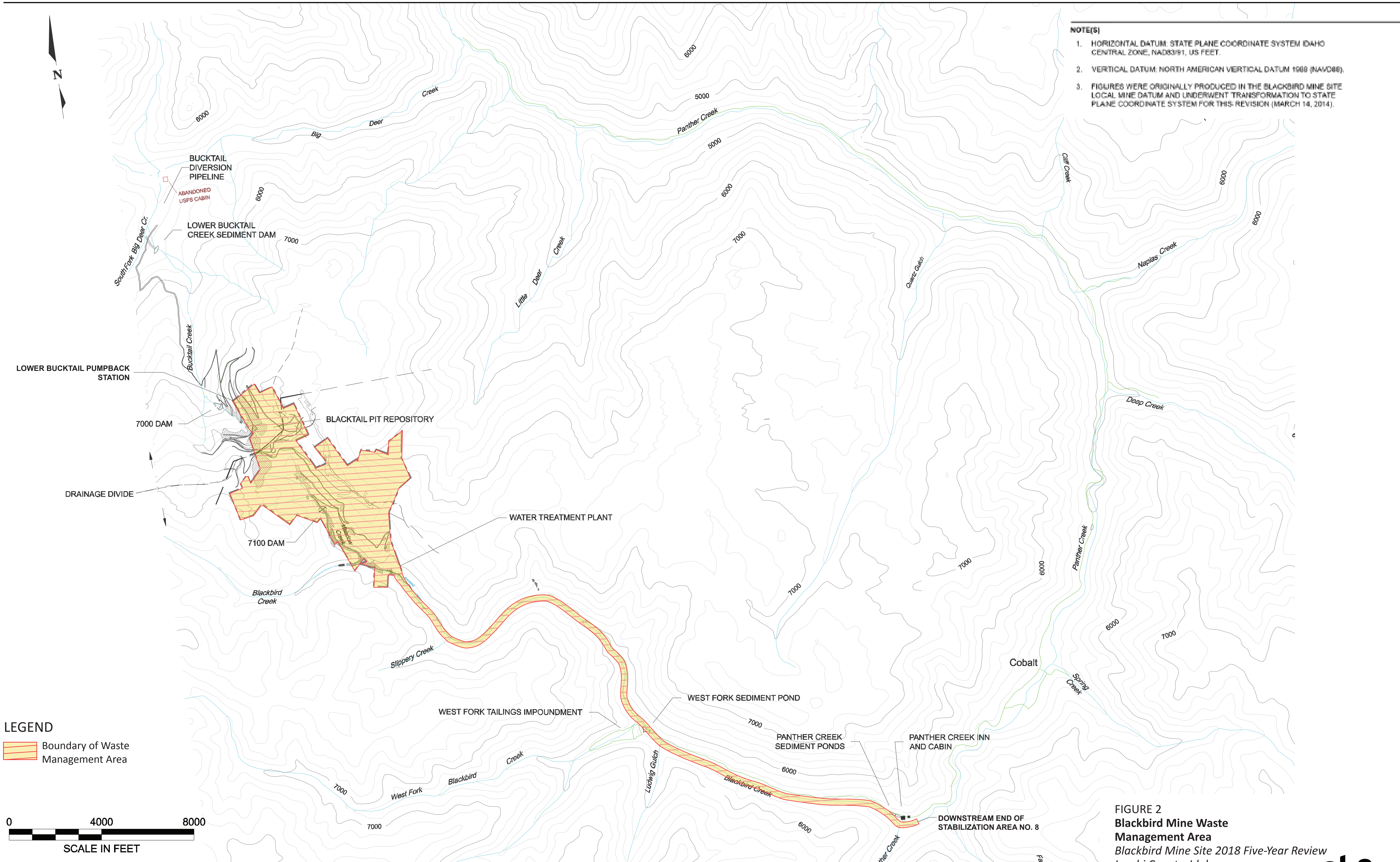


FIGURE 2
Blackbird Mine Waste Management Area
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho

ch2m

AX0619181203BOI

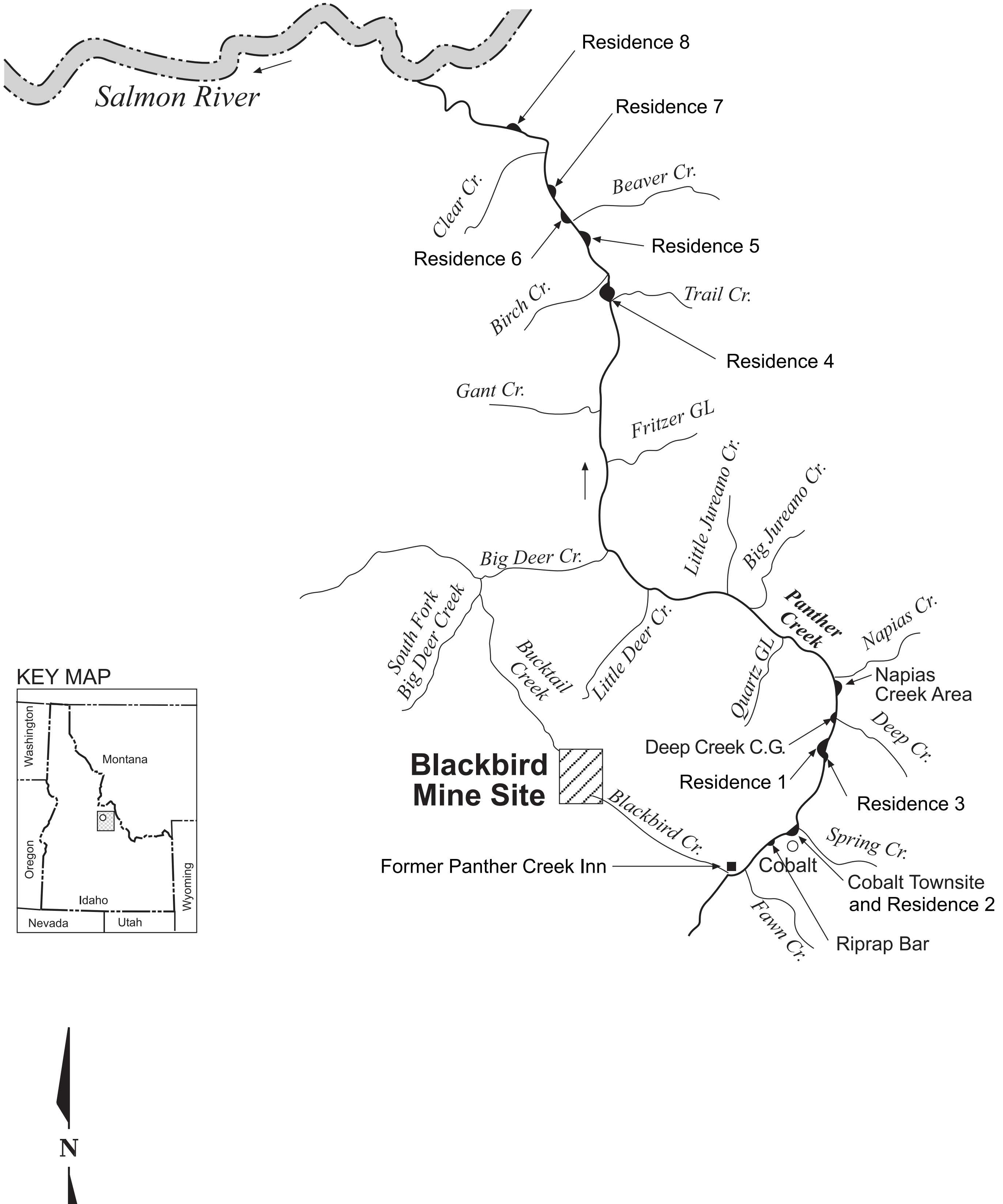
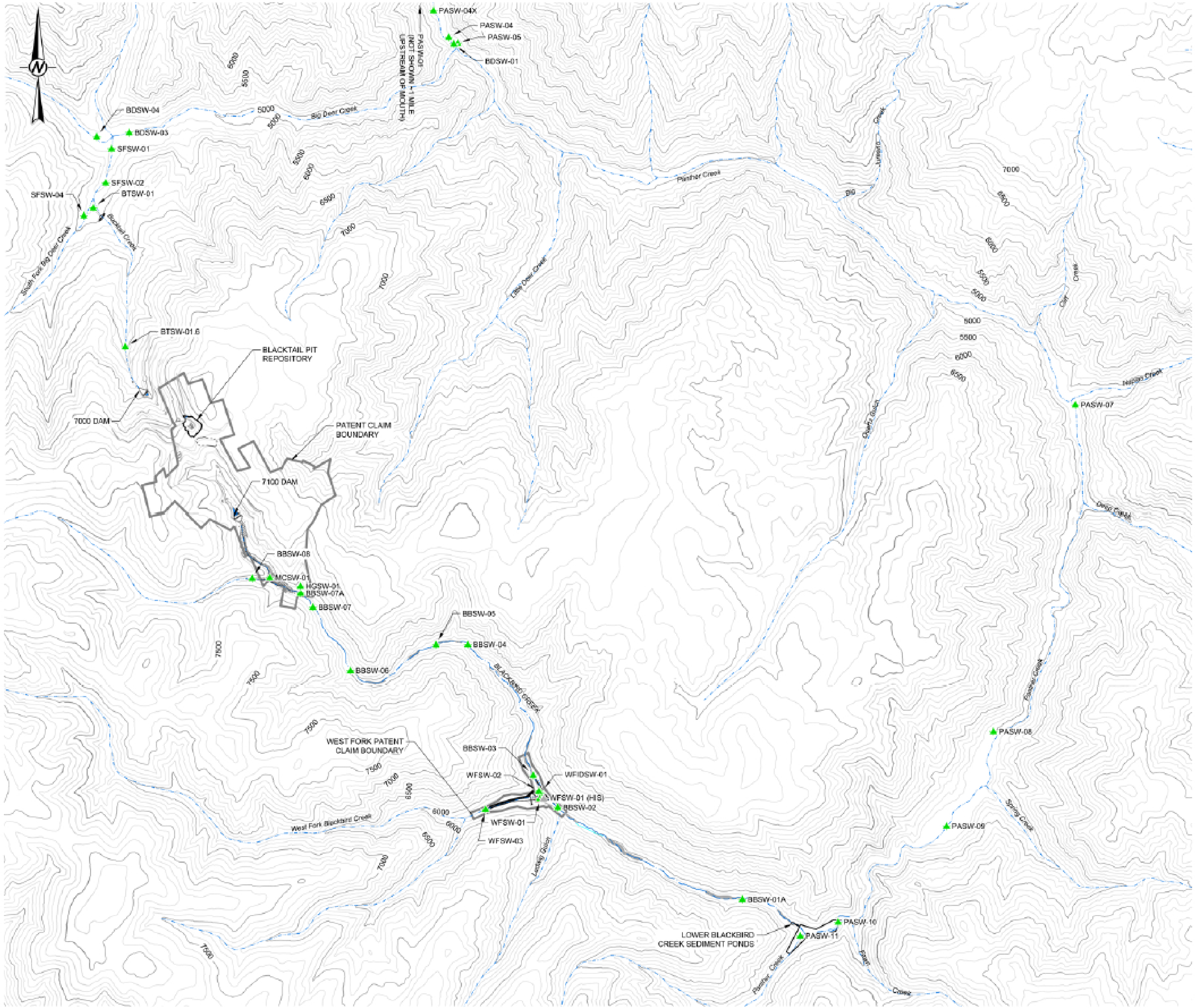


FIGURE 3
Properties Cleaned Up
Along Panther Creek
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho



LEGEND

- SURFACE WATER SAMPLE LOCATION
- HISTORIC SURFACE WATER SAMPLE LOCATION

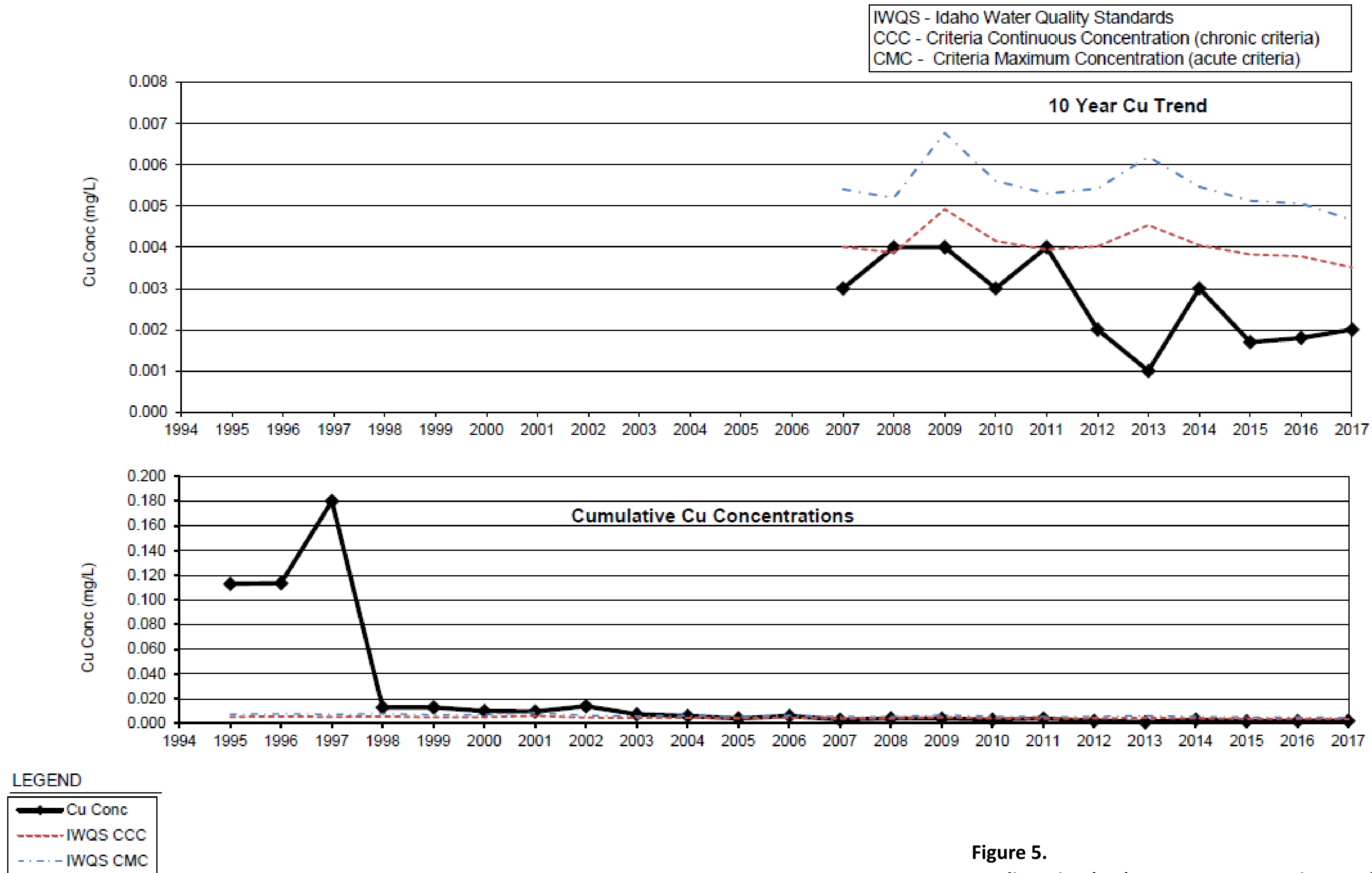
NOTE(S)

1. HORIZONTAL DATUM: STATE PLANE COORDINATE SYSTEM IDAHO CENTRAL ZONE, NAD83/91, US FEET.
2. VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM 1988 (NAVD88).
3. FIGURES WERE ORIGINALLY PRODUCED IN THE BLACKBIRD MINE SITE LOCAL MINE DATUM AND UNDERWENT TRANSFORMATION TO STATE PLANE COORDINATE SYSTEM FOR THIS REVISION (MARCH 14, 2014).

0 2000 4000
1" = 2000' FEET

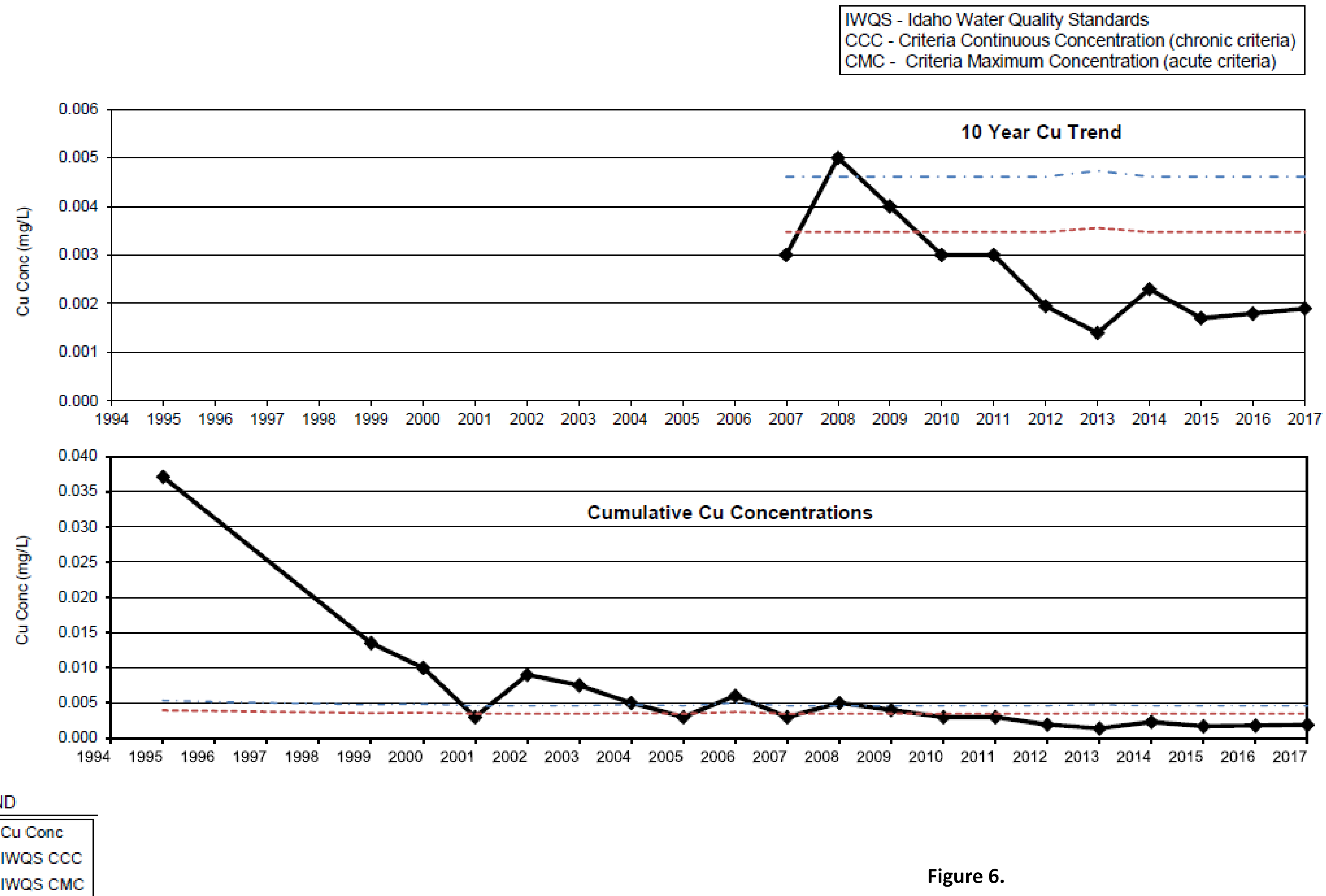
Figure 4.
Blackbird Mine Monitoring Locations
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho

Source: Golder Associates Inc. 2018. *Draft for EPA Review, 2017 Monitoring Report, Blackbird Mine Site, Lemhi County, Idaho.* Prepared for Blackbird Mine Site Group. January 31.



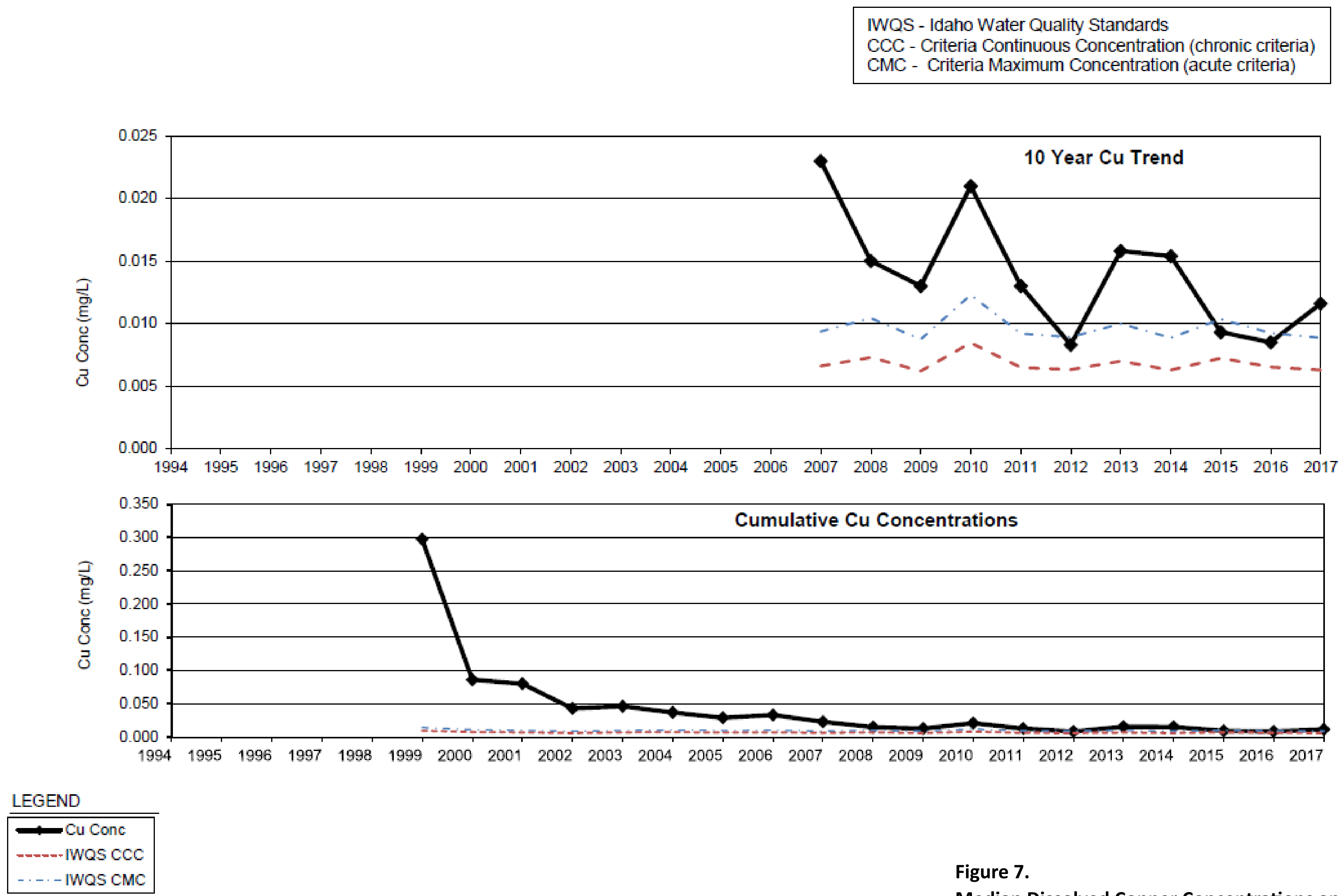
Source: Golder Associates Inc. 2018. *Draft for EPA Review, 2017 Monitoring Report, Blackbird Mine Site, Lemhi County, Idaho.* Prepared for Blackbird Mine Site Group. January 31.

Figure 5.
Median Dissolved Copper Concentrations and IWQS at PASW-09 and PASW-10, 1995-2017, High Flow
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho



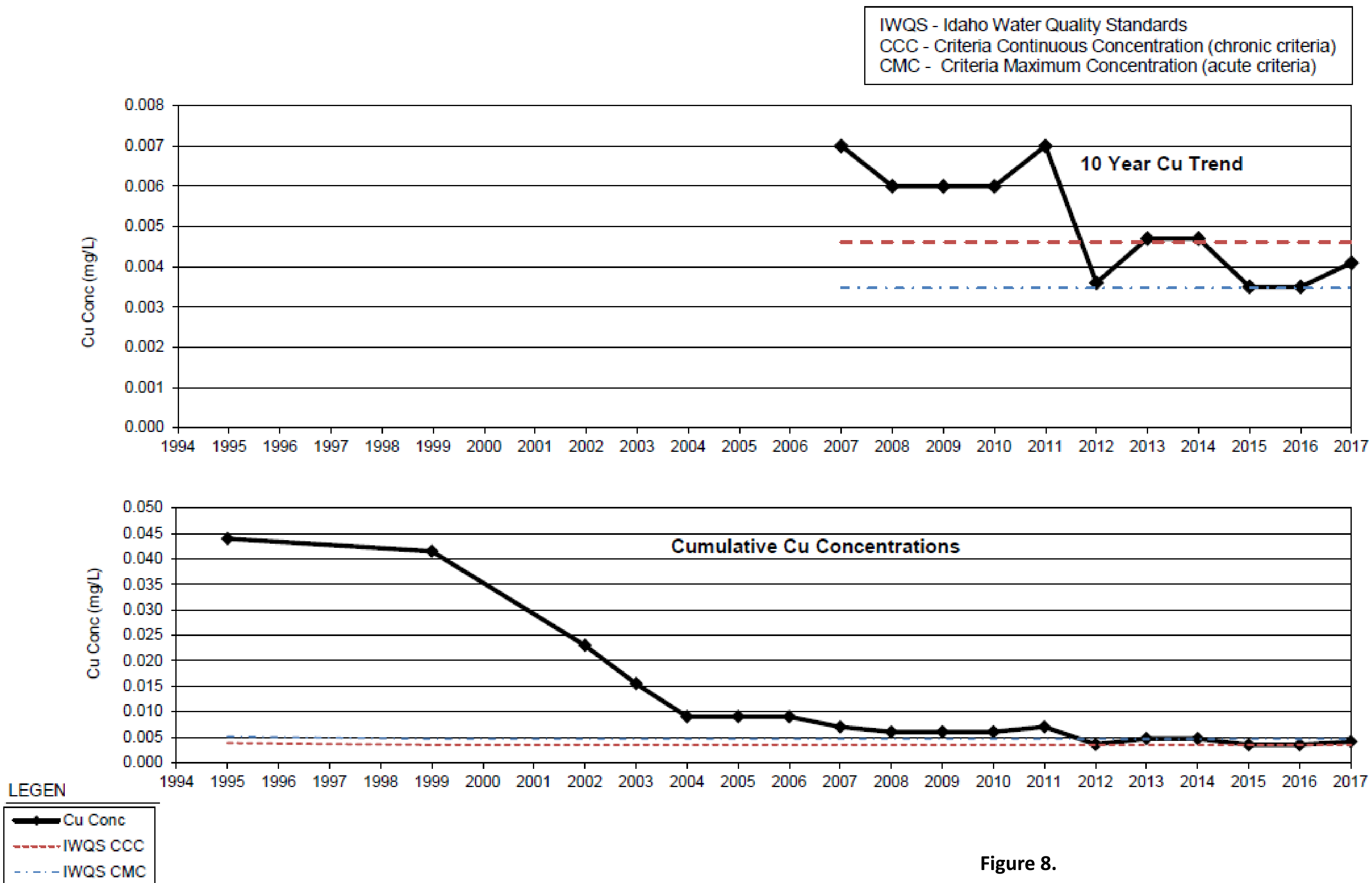
Source: Golder Associates Inc. 2018. *Draft for EPA Review, 2017 Monitoring Report, Blackbird Mine Site, Lemhi County, Idaho.* Prepared for Blackbird Mine Site Group. January 31.

Figure 6.
Median Dissolved Copper Concentrations and IWQS at PASW-04 and PASW-04X, 1995-2017, High Flow
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho



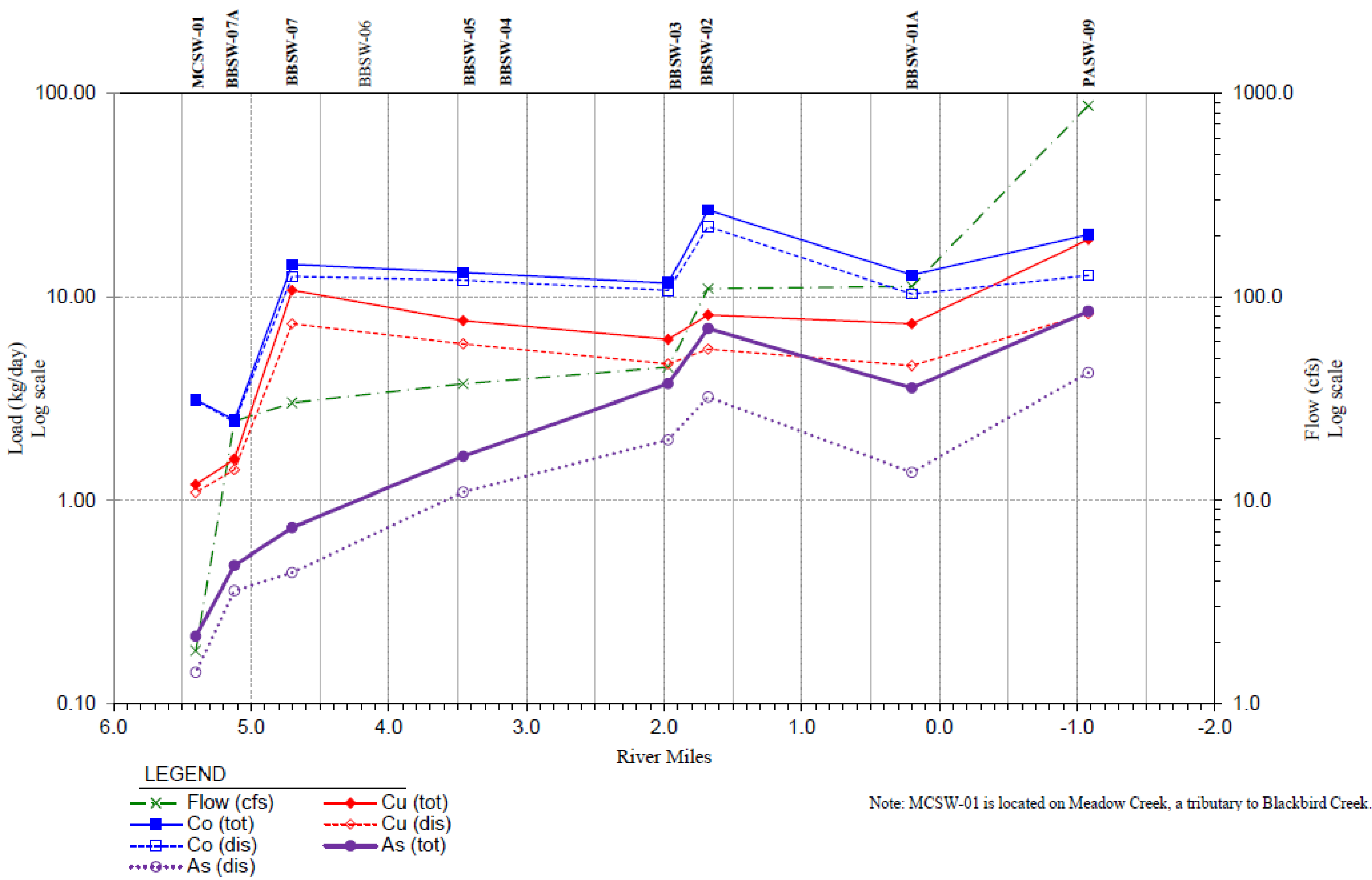
Source: Golder Associates Inc. 2018. *Draft for EPA Review, 2017 Monitoring Report, Blackbird Mine Site, Lemhi County, Idaho.* Prepared for Blackbird Mine Site Group. January 31.

Figure 7.
Median Dissolved Copper Concentrations and IWQS at SFSW-01, 1995-2017, High Flow
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho



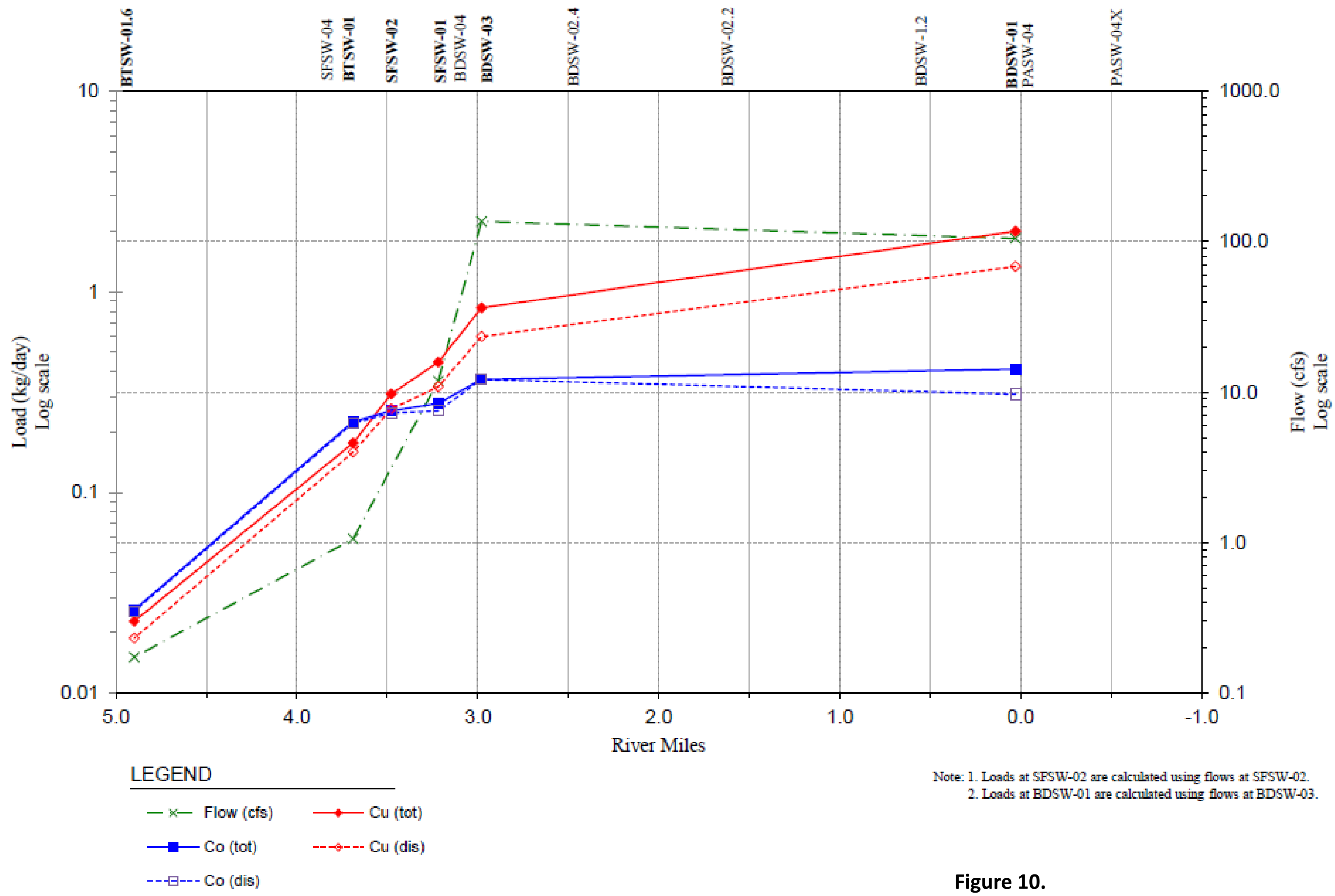
Source: Golder Associates Inc. 2018. *Draft for EPA Review, 2017 Monitoring Report, Blackbird Mine Site, Lemhi County, Idaho.* Prepared for Blackbird Mine Site Group. January 31.

Figure 8.
Median Dissolved Copper Concentrations and IWQS at BDSW-01, 1995-2017, High Flow
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho



Source: Golder Associates Inc. 2018. *Draft for EPA Review, 2017 Monitoring Report, Blackbird Mine Site, Lemhi County, Idaho.* Prepared for Blackbird Mine Site Group. January 31.

Figure 9.
May 8, 2017 Blackbird/Panther Creek Synoptic, Copper, Cobalt, and Arsenic Loading
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho



Source: Golder Associates Inc. 2018. *Draft for EPA Review, 2017 Monitoring Report, Blackbird Mine Site, Lemhi County, Idaho.* Prepared for Blackbird Mine Site Group. January 31.

Figure 10.
May 15, 2017 Bucktail/South Fork Big Deer/Big Deer Creek Synoptic, Copper, and Cobalt Loading
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho

ch2m

LEGEND

- GROUNDWATER MONITORING WELL LOCATIONS (APPROXIMATE)
- GROUNDWATER EXTRACTION WELL LOCATIONS
- SURFACE WATER SAMPLING LOCATIONS (APPROXIMATE)
- GROUNDWATER MONITORING (HISTORIC) WELL LOCATIONS (APPROXIMATE)

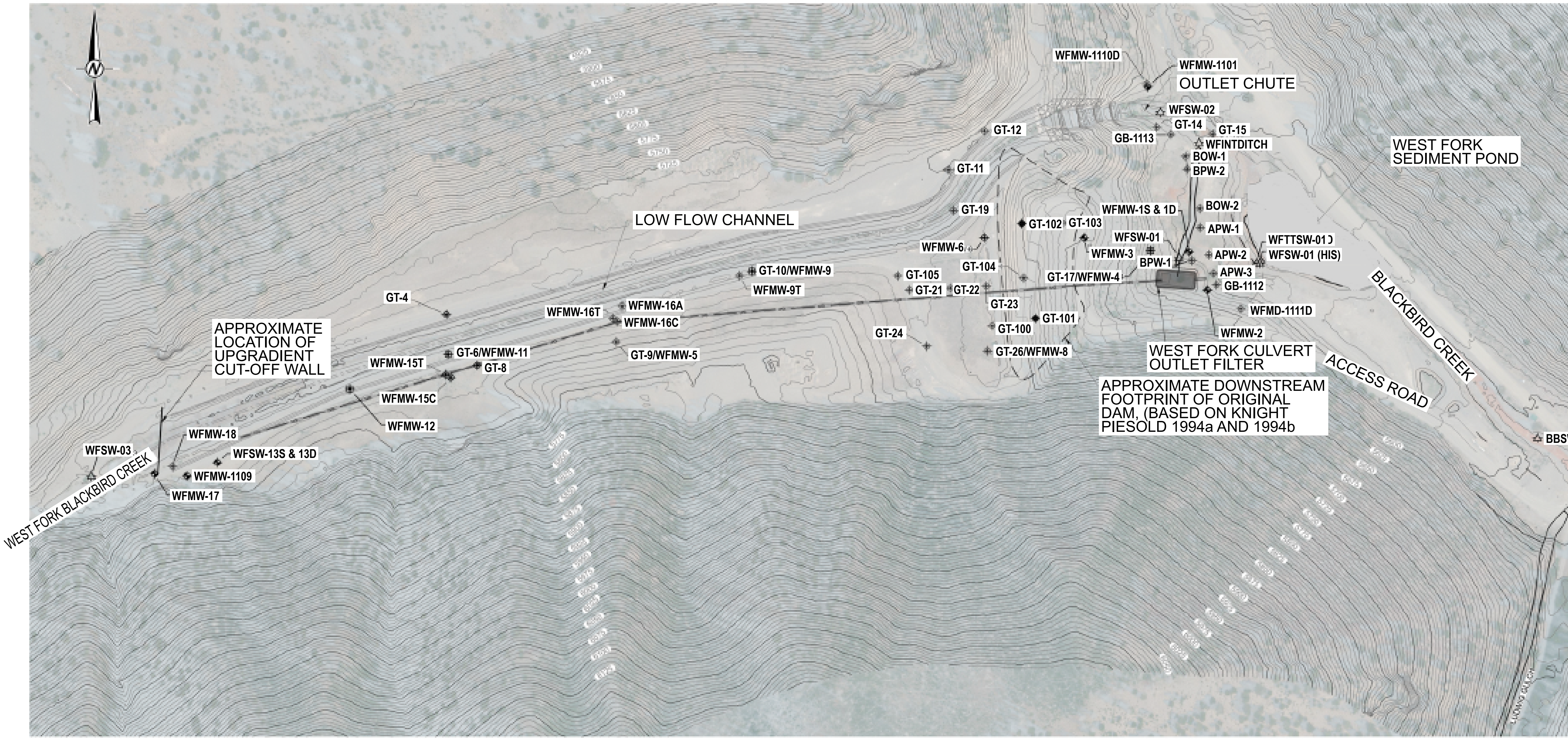
NOTE(S)

1. HORIZONTAL DATUM: STATE PLANE COORDINATE SYSTEM IDAHO CENTRAL ZONE, NAD83/91, US FEET.
2. VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM 1988 (NAVD88).
3. FIGURES WERE ORIGINALLY PRODUCED IN THE BLACKBIRD MINE SITE LOCAL MINE DATUM AND UNDERWENT TRANSFORMATION TO STATE PLANE COORDINATE SYSTEM FOR THIS REVISION).
4. AERIAL IMAGERY WAS GATHERED IN CONJUNCTION WITH LIDAR AND IS DATED 2012-08-05.
5. HGSW-03 IS LOCATED ABOVE THE PORTAL IN THE HAWKEYE GULCH NORTH OF HGSW-02.

0 50 100
1" = 50' FEET

Figure 11.
Monitoring Well Sampling Locations in Upper Blackbird Creek
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho

Source: Golder Associates Inc. 2018. *Draft for EPA Review, 2017 Monitoring Report, Blackbird Mine Site, Lemhi County, Idaho.* Prepared for Blackbird Mine Site Group. January 31.



LEGEND

◆	GEOTECHNICAL MONITORING WELLS
△	SURFACE WATER SAMPLING LOCATIONS
✦	GROUNDWATER MONITORING WELL
✱	GEOTECHNICAL BORING CONVERTED TO MONITORING WELL
✛	2011 AND 2012 BORE HOLE AND MONITORING WELL LOCATIONS
— UG —	UNDERGROUND CULVERT

NOTE(S)

1. CONTOUR ARE BASED ON LIDAR DATA COLLECTED BY AEROMETRICS 2012-08-05
2. SURVEY CONTROL PROVIDED BY WADE SURVEY
3. AERIAL IMAGERY WAS GATHERED IN CONJUNCTION WITH THE LIDAR AND IS DATED 2012-08-05.

REFERENCE(S)

1. HORIZONTAL DATUM: STATE PLANE COORDINATE SYSTEM IDAHO CENTRAL ZONE, NAD83/91, US FEET.
2. VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM 1988 (NAVD88)

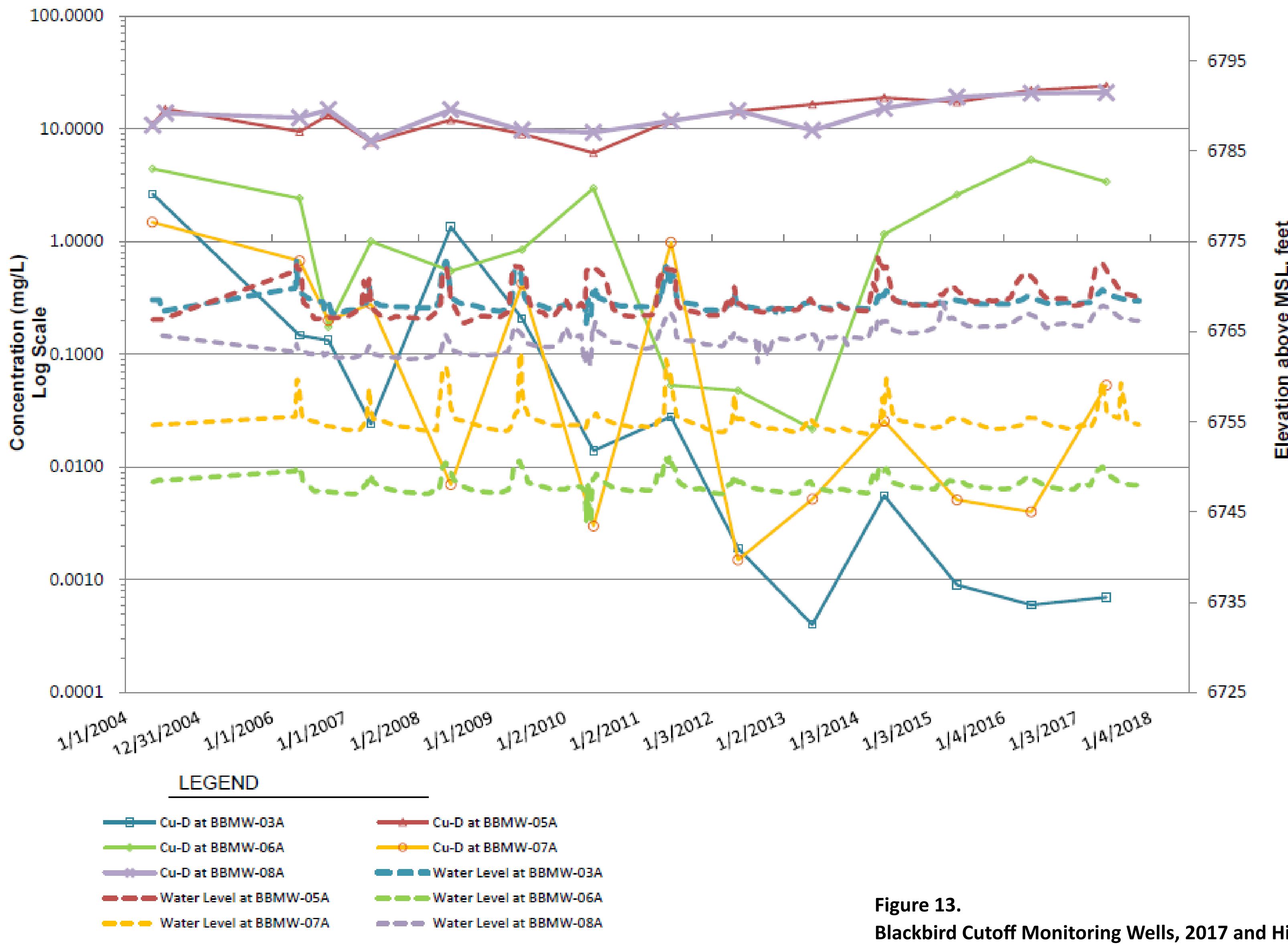
OVERALL SITE
SCALE 1" = 100'

0 100 200
1" = 100' FEET

Source: Golder Associates Inc. 2018. *Draft for EPA Review, 2017 Monitoring Report, Blackbird Mine Site, Lemhi County, Idaho.* Prepared for Blackbird Mine Site Group. January 31.

Figure 12.
Monitoring Well Sampling Locations in West Fork Tailings Storage Facility
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho

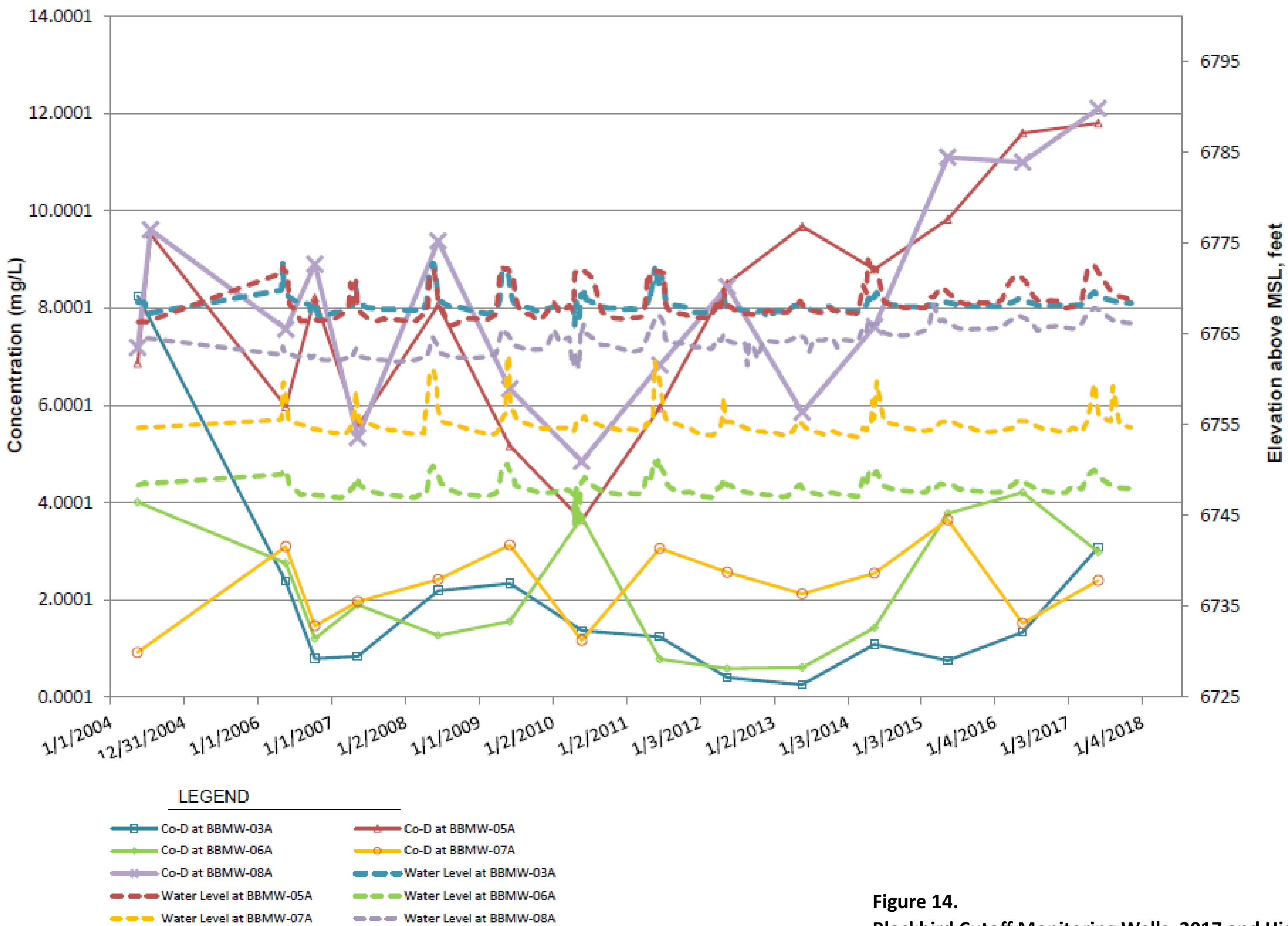
ch2m.



Source: Golder Associates Inc. 2018. *Draft for EPA Review, 2017 Monitoring Report, Blackbird Mine Site, Lemhi County, Idaho.* Prepared for Blackbird Mine Site Group. January 31.

Figure 13.
Blackbird Cutoff Monitoring Wells, 2017 and Historical Dissolved Copper Groundwater Quality and Elevations
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho

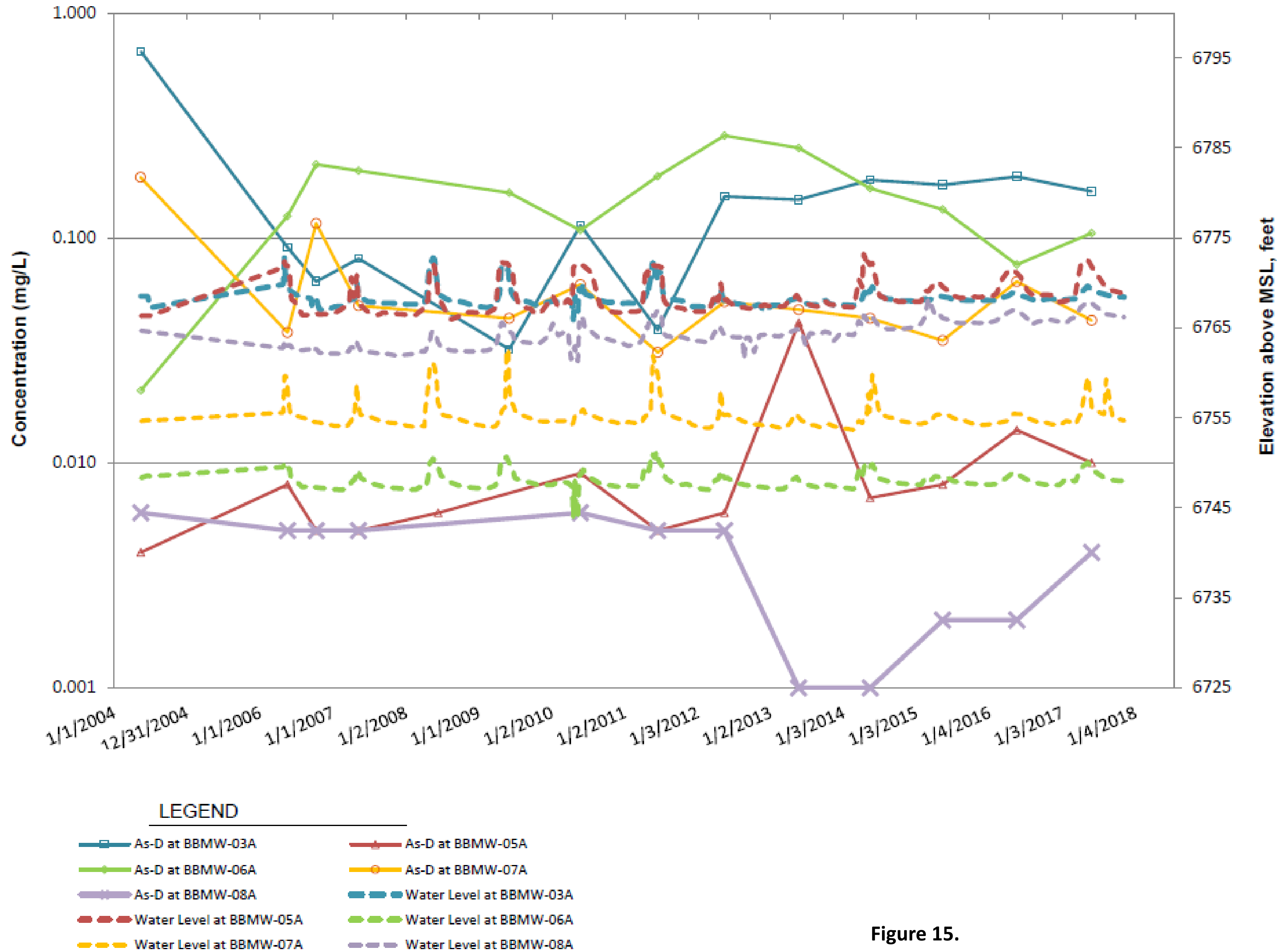
ch2m



Source: Golder Associates Inc. 2018. *Draft for EPA Review, 2017 Monitoring Report, Blackbird Mine Site, Lemhi County, Idaho.* Prepared for Blackbird Mine Site Group. January 31.

Figure 14.
Blackbird Cutoff Monitoring Wells, 2017 and Historical Dissolved Cobalt Groundwater Quality and Elevations
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho

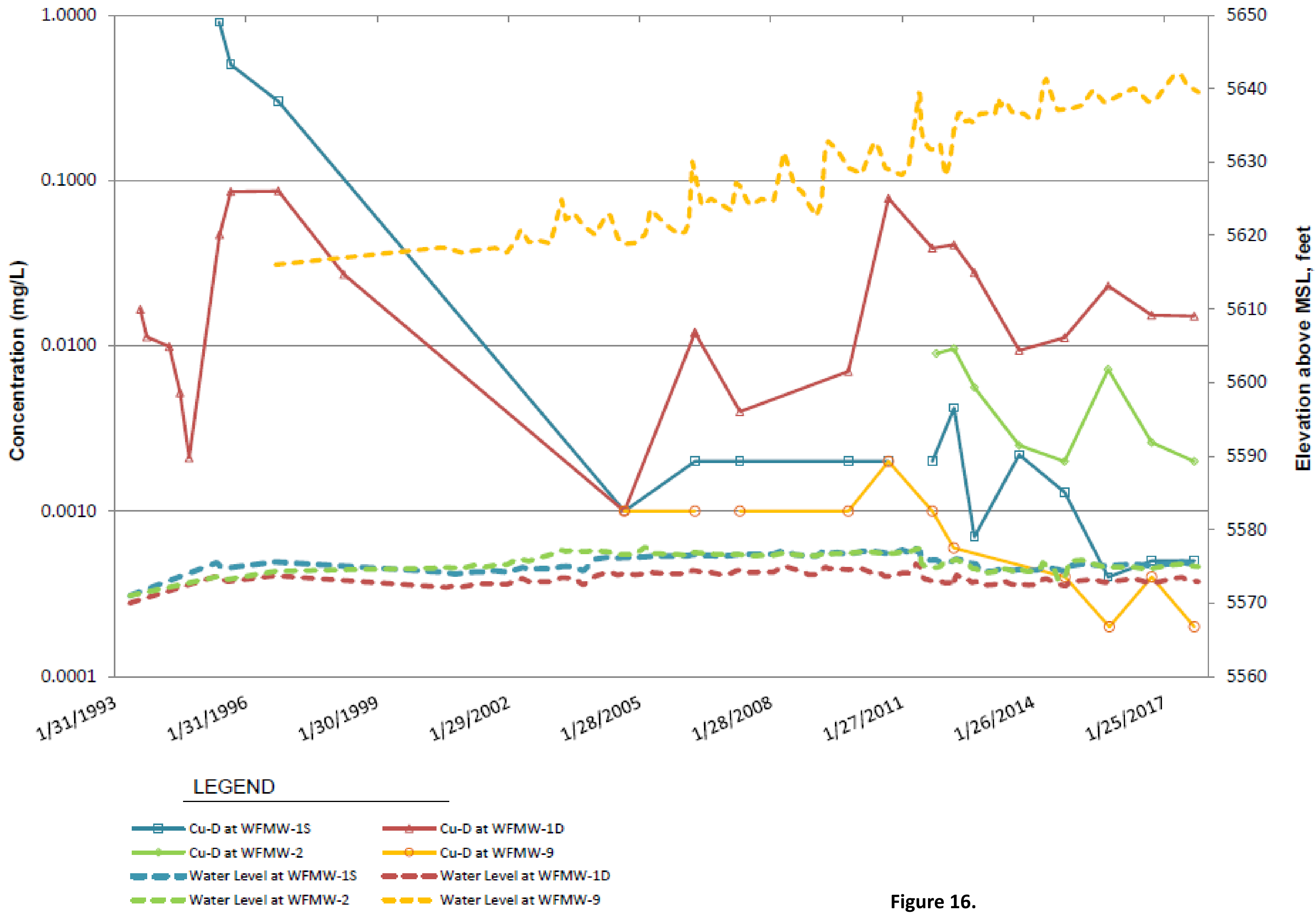
ch2m:



Source: Golder Associates Inc. 2018. *Draft for EPA Review, 2017 Monitoring Report, Blackbird Mine Site, Lemhi County, Idaho.* Prepared for Blackbird Mine Site Group. January 31.

Figure 15.
Blackbird Cutoff Monitoring Wells, 2017 and Historical Dissolved Arsenic Groundwater Quality and Elevations
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho

ch2m:

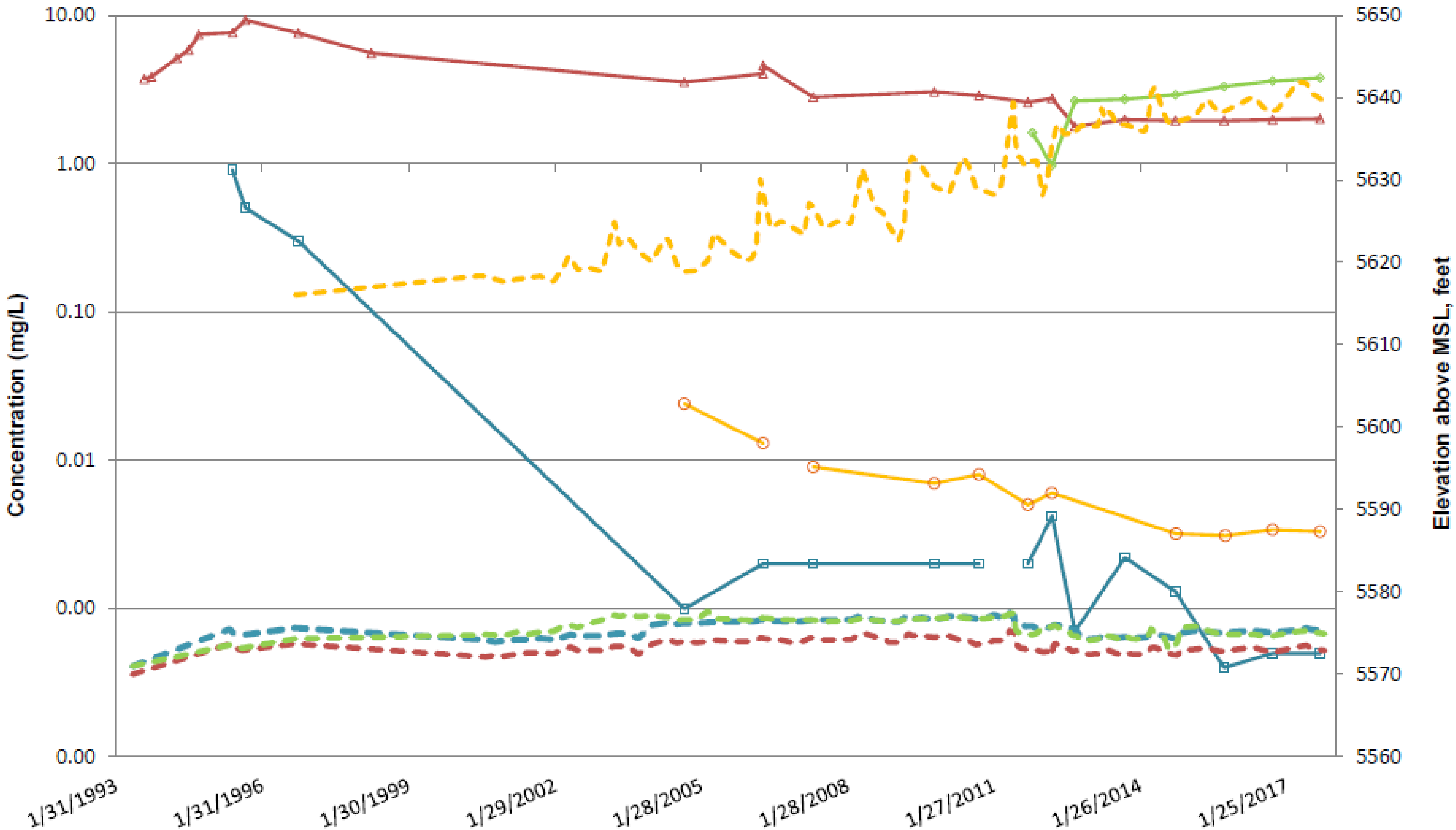


Source: Golder Associates Inc. 2018. *Draft for EPA Review, 2017 Monitoring Report, Blackbird Mine Site, Lemhi County, Idaho.* Prepared for Blackbird Mine Site Group. January 31.

Figure 16.
West Fork Monitoring Wells, 2017 and Historical Dissolved Copper Groundwater Quality and Elevations
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho

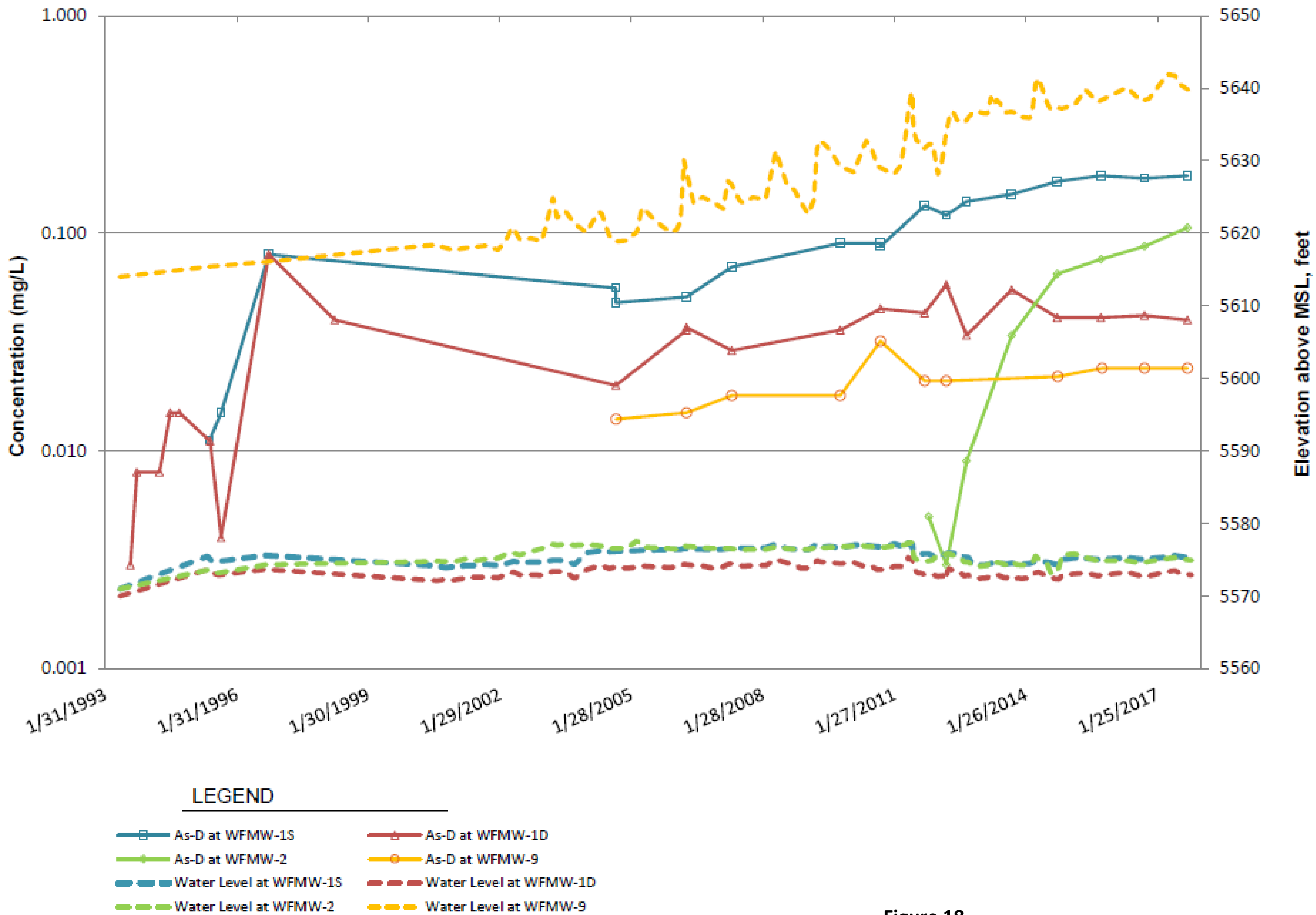
ch2m

AX0619181203BOI



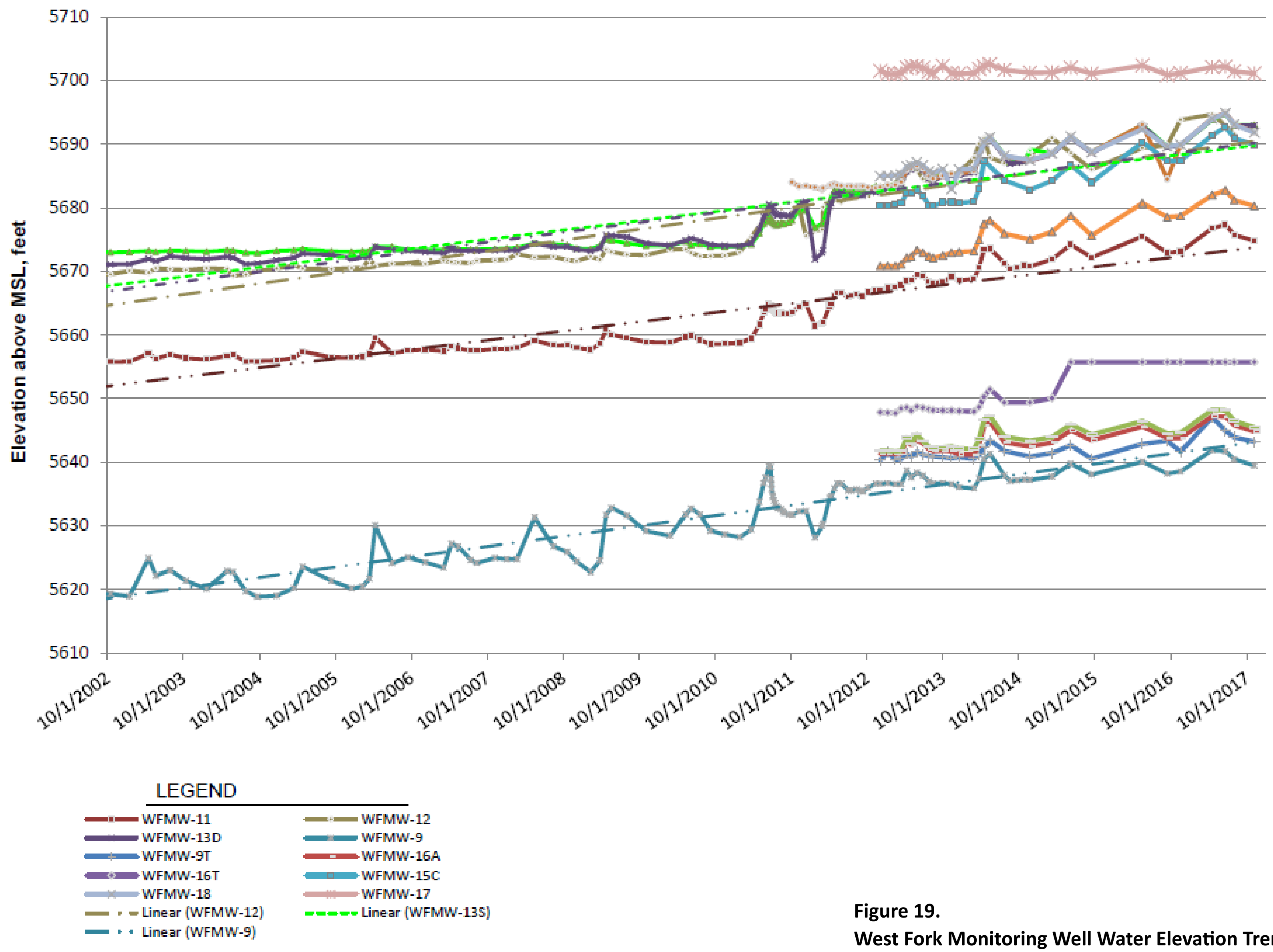
Source: Golder Associates Inc. 2018. *Draft for EPA Review, 2017 Monitoring Report, Blackbird Mine Site, Lemhi County, Idaho.* Prepared for Blackbird Mine Site Group. January 31.

Figure 17.
West Fork Monitoring Wells, 2017 and Historical Dissolved Cobalt Groundwater Quality and Elevations
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho



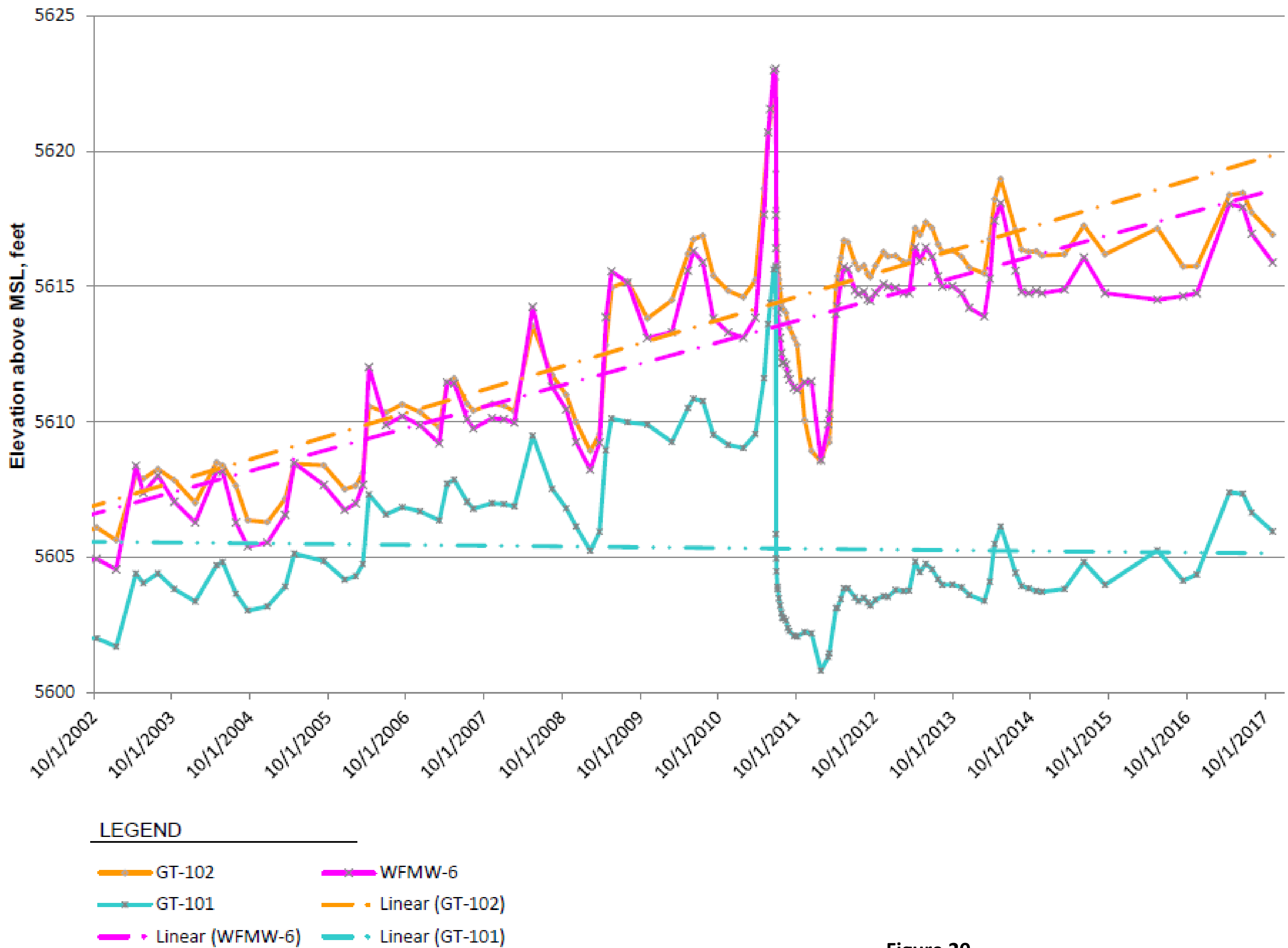
Source: Golder Associates Inc. 2018. *Draft for EPA Review, 2017 Monitoring Report, Blackbird Mine Site, Lemhi County, Idaho.* Prepared for Blackbird Mine Site Group. January 31.

Figure 18.
West Fork Monitoring Wells, 2017 and Historical Dissolved Arsenic Groundwater Quality and Elevations
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho



Source: Golder Associates Inc. 2018. *Draft for EPA Review, 2017 Monitoring Report, Blackbird Mine Site, Lemhi County, Idaho.* Prepared for Blackbird Mine Site Group. January 31.

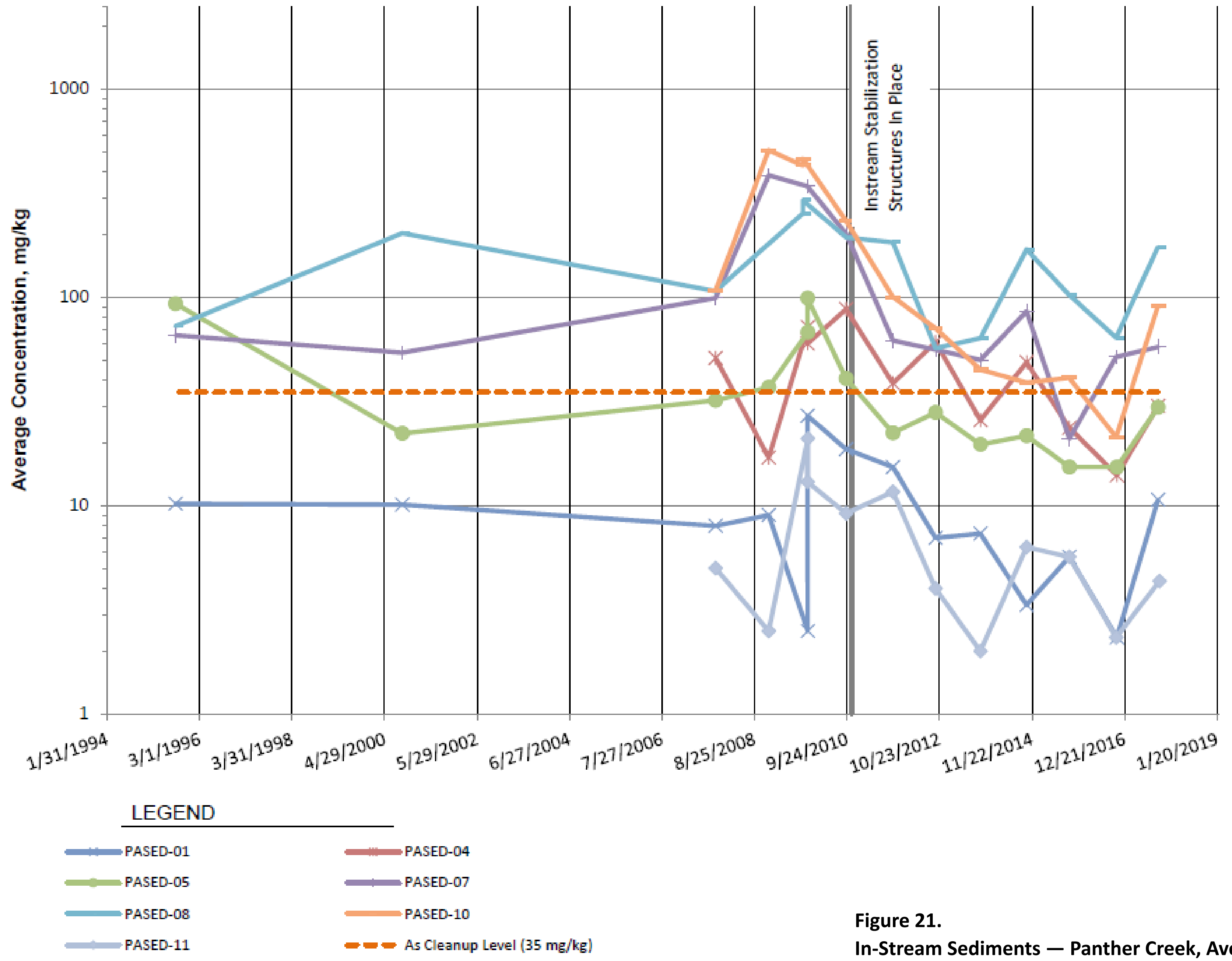
Figure 19.
West Fork Monitoring Well Water Elevation Trends — Tailings Areas
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho



Source: Golder Associates Inc. 2018. *Draft for EPA Review, 2017 Monitoring Report, Blackbird Mine Site, Lemhi County, Idaho.* Prepared for Blackbird Mine Site Group. January 31.

Figure 20.
West Fork Monitoring Well Water Elevation Trends — Face of Dam
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho

ch2m

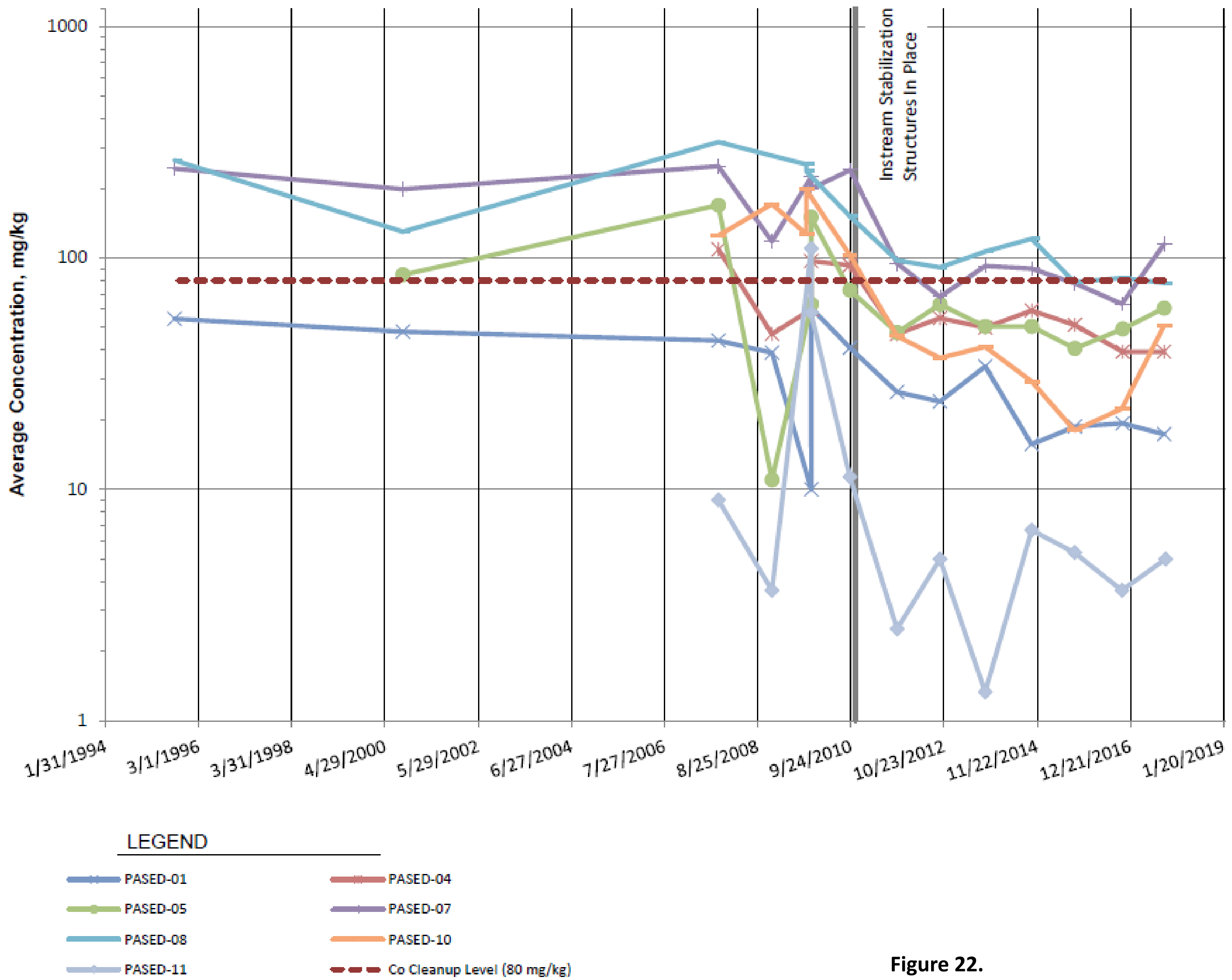


Source: Golder Associates Inc. 2018. *Draft for EPA Review, 2017 Monitoring Report, Blackbird Mine Site, Lemhi County, Idaho.* Prepared for Blackbird Mine Site Group. January 31.

Figure 21.
In-Stream Sediments — Panther Creek, Average Total Arsenic Concentration
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho

ch2m.

AX0619181203BOI



Source: Golder Associates Inc. 2018. *Draft for EPA Review, 2017 Monitoring Report, Blackbird Mine Site, Lemhi County, Idaho.* Prepared for Blackbird Mine Site Group. January 31.

Figure 22.
In-Stream Sediments — Panther Creek, Average Total Cobalt Concentration
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho

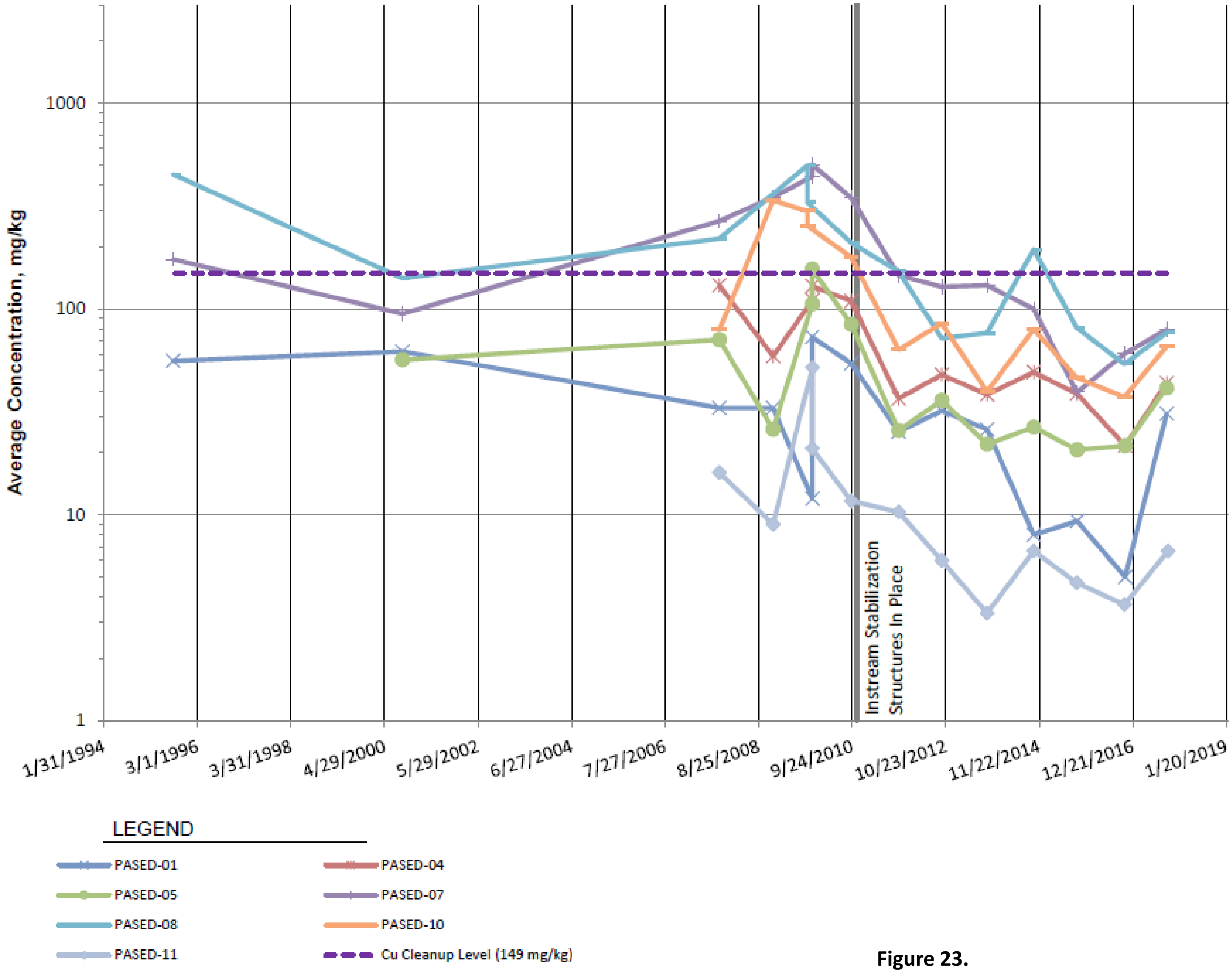
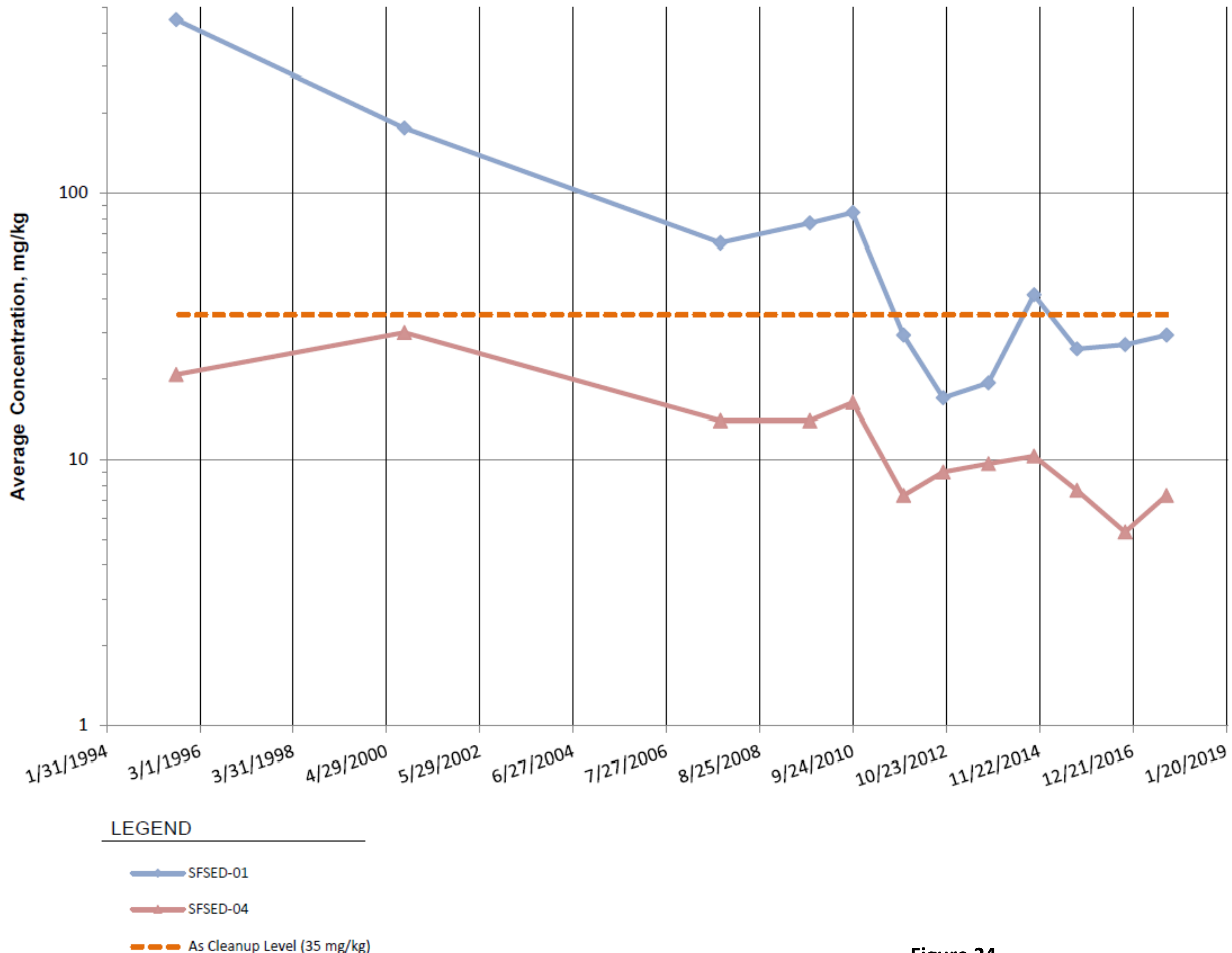


Figure 23.
In-Stream Sediments — Panther Creek, Average Total Copper Concentration
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho

Source: Golder Associates Inc. 2018. *Draft for EPA Review, 2017 Monitoring Report, Blackbird Mine Site, Lemhi County, Idaho.* Prepared for Blackbird Mine Site Group. January 31.



Source: Golder Associates Inc. 2018. *Draft for EPA Review, 2017 Monitoring Report, Blackbird Mine Site, Lemhi County, Idaho.* Prepared for Blackbird Mine Site Group. January 31.

Figure 24.
In-Stream Sediments — South Fork Big Deer Creek, Average Total Arsenic Concentration
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho

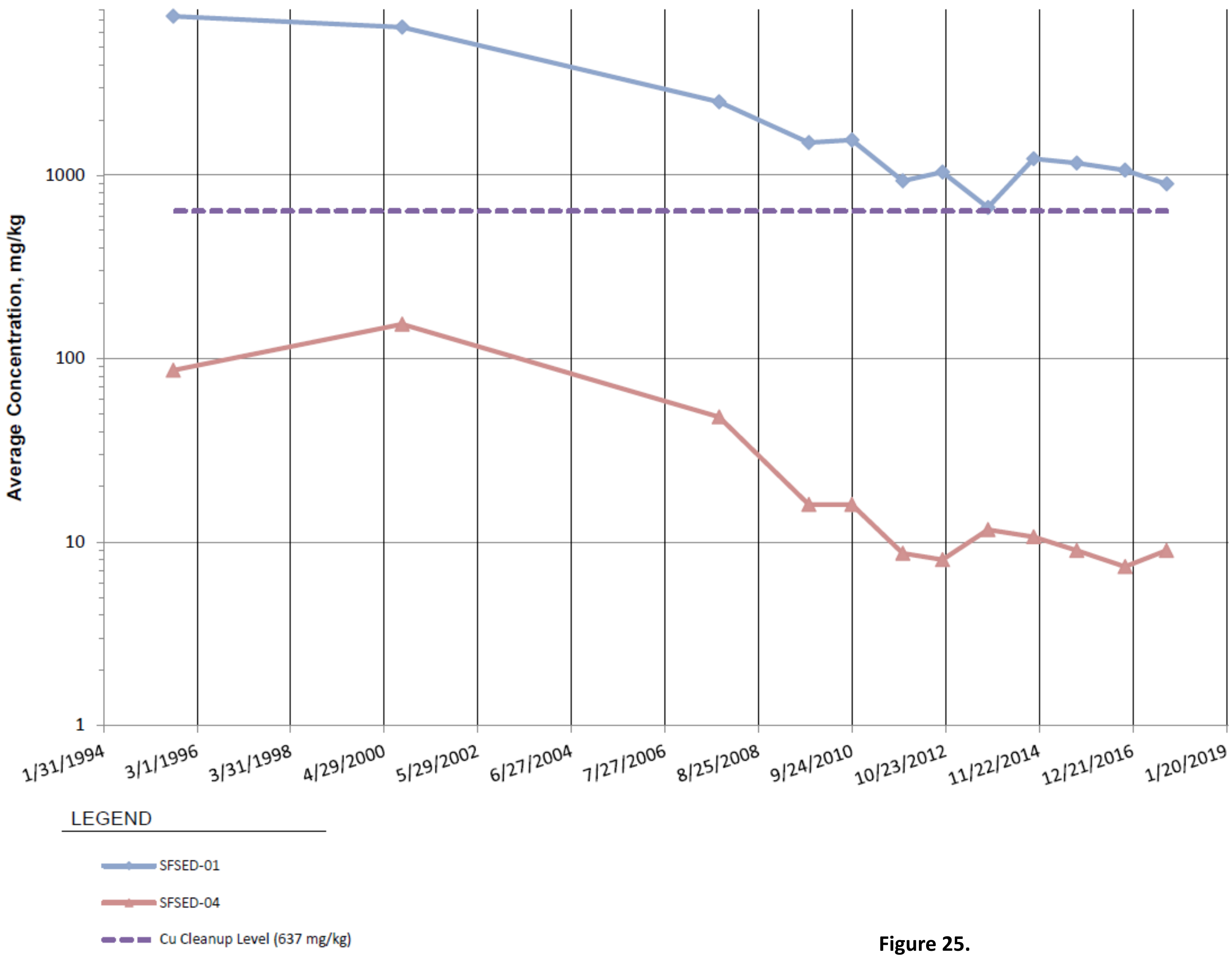
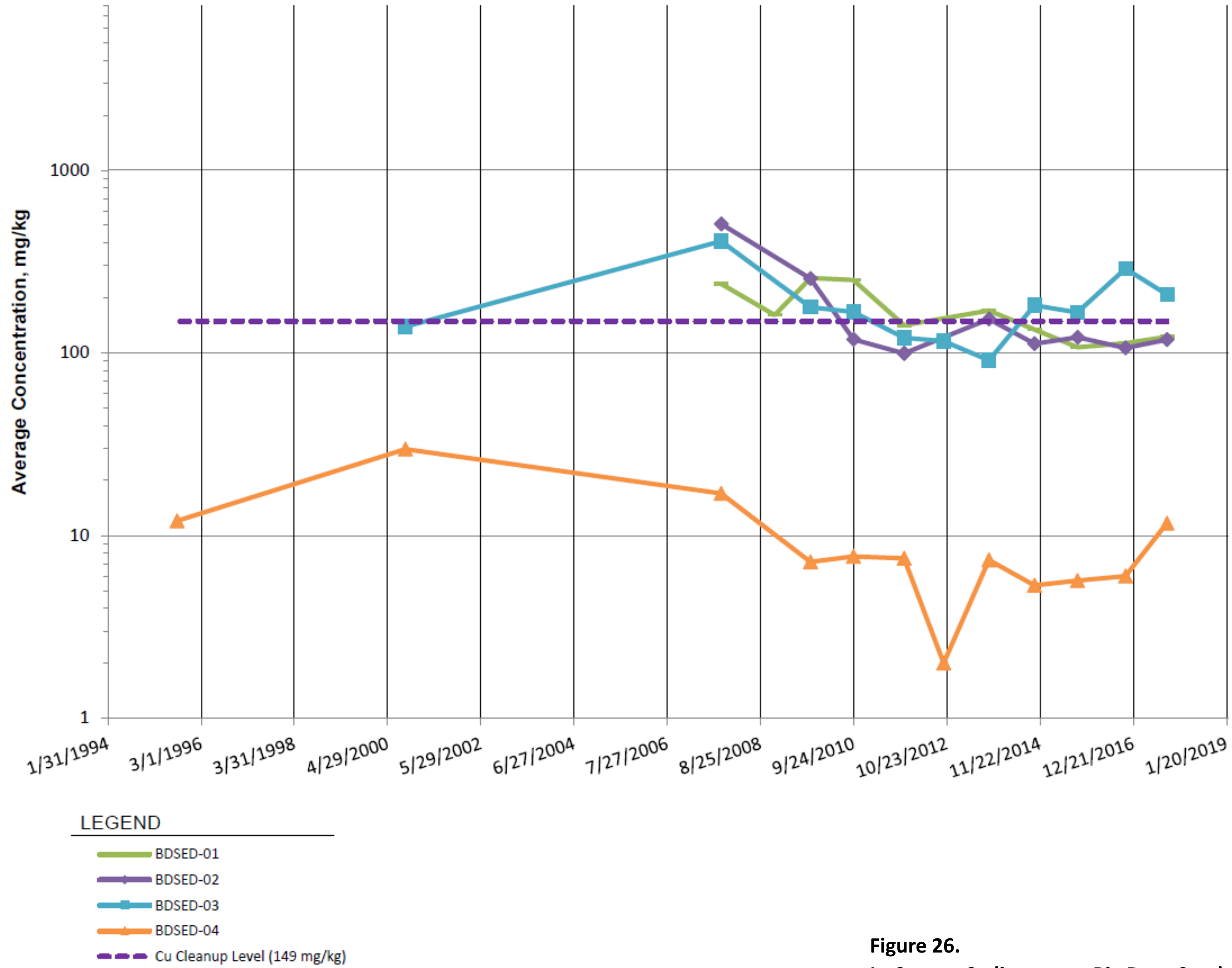


Figure 25.
In-Stream Sediments — South Fork Big Deer Creek, Average Total Copper Concentration
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho

Source: Golder Associates Inc. 2018. *Draft for EPA Review, 2017 Monitoring Report, Blackbird Mine Site, Lemhi County, Idaho.* Prepared for Blackbird Mine Site Group. January 31.



Source: Golder Associates Inc. 2018. *Draft for EPA Review, 2017 Monitoring Report, Blackbird Mine Site, Lemhi County, Idaho.* Prepared for Blackbird Mine Site Group. January 31.

Figure 26.
In-Stream Sediments — Big Deer Creek, Average Total Copper Concentration
Blackbird Mine Site 2018 Five-Year Review
Lemhi County, Idaho

Appendix A: References

APPENDIX A – REFERENCES

Blackbird Mine Site Group (BMSG). 2008. *Final Work Plan, Management of Subsurface Soils, Panther Creek Private Properties*. Prepared by the Blackbird Mine Site Group. April 15.

Blackbird Mine Site Group (BMSG). 2018. 2017 *Management of Subsurface Soils.* Prepared by the Blackbird Mine Site Group. February 1.

CH2M HILL, Inc. (CH2M). 2001. *Aquatic Ecological Risk Assessment, Blackbird Mine Site*. Prepared for the U.S. Environmental Protection Agency, Region 10. July 17.

CH2M HILL, Inc. (CH2M). 2002. *Final Site-Wide Baseline Human Health Risk Assessment for the Blackbird Mine Site*. Prepared for the U.S. Environmental Protection Agency, Region 10. March 13.

CH2M HILL, Inc. (CH2M). 2018. *Technical Memorandum – Above Ground Operation and Maintenance Inspection at the Blackbird Mine Site, September 2017.* Prepared for the U.S. Environmental Protection Agency, Region 10. January 9,2018.

Ecometrix. 2006. *Biomonitoring Study: Panther Creek Watershed, September 2005*. Prepared for the BMSG. September.

Ecometrix. 2016. *Biomonitoring Study: Panther Creek Watershed, September 2015*. Prepared for the BMSG. June.

Golder Associates Inc. (Golder). 1995. *Analysis of Early Action Alternatives*. Prepared for the BMSG. April 19.

Golder Associates Inc. (Golder). 2000. *Terrestrial Ecological Risk Assessment*. Prepared for the BMSG. September 1.

Golder Associates Inc. (Golder). 2002. *Focused Feasibility Study for the Blackbird Mine Site*. Prepared for the BMSG. June 21.

Golder Associates Inc. (Golder). 2008. *Final Addendum, West Fork Tailings Impoundment Stability Analyses*.

Golder Associates Inc. (Golder). 2011. *2009 Post-Removal Characterization and Construction Completion Report.* Prepared for the BMSG. April 29.

Golder Associates Inc. (Golder). 2012a. *2011 Post-Construction Completion Report.* Draft for EPA Review. Prepared for the BMSG. April 6.

Golder Associates Inc. (Golder). 2013a. *2012 Post-Construction Completion Report.* Draft for EPA Review. Prepared for the BMSG. March 19.

Golder Associates Inc. (Golder). 2013b. *Data Summary Report for the 2011 Characterization of Panther Creek and Blackbird Creek and Blackbird Creek Overbank Areas.* Prepared for the BMSG. January 15.

Golder Associates Inc. (Golder). 2014. *2013 Monitoring Report.* Prepared for the BMSG. January 28.

Golder Associates Inc. (Golder). 2015. *2014 Monitoring Report.* Prepared for the BMSG. January 30.

Golder Associates Inc. (Golder). 2016. *2015 Monitoring Report.* Prepared for the BMSG. January 28.

Golder Associates Inc. (Golder). 2017a. *2016 Monitoring Report.* Prepared for the BMSG. January 31.

Golder Associates Inc. (Golder). 2017b. *Blackbird Creek In-stream Stabilization Preliminary Performance Review – 2017 Summary.* Draft for EPA Review. Prepared for the BMSG. May 17.

Golder Associates Inc. (Golder). 2018. *2017 Monitoring Report.* Prepared for the BMSG. May 9.

Golder Associates Inc. (Golder). 2014. *2013 Post-Construction Completion Report.* Draft for EPA Review. Prepared for the BMSG. March 27.

Golder Associates Inc. (Golder). 2015a. *Performance Monitoring Plan.* Prepared for the BMSG. August.

Golder Associates Inc. (Golder). 2015b. *Blackbird Mine Site Operation and Maintenance Manual*. June.

Lemhi County, Idaho. 2014. *Environmental Covenant Former Panther Creek Inn Area.* May.

Lemhi County, Idaho. 2015. *Environmental Covenant Blackbird Mine Site.* May.

Knight Piesold. 1994. *West Fork Tailing Facility Diversion, Final Construction and Quality Assurance Certification Report*. Prepared for Noranda Mining, Inc. by Knight Piesold and Company. February 10.

Tetra Tech. 2015. *Institutional Control Implementation and Assurance Plan for Federal Lands Administered by the U.S. Forest Service Salon-Challis Forest, Blackbird Mine Superfund Site.* Prepared for Salmon-Challis National Forest. June.

U.S. Environmental Protection Agency (EPA). 2001. *Comprehensive Five-Year Review Guidance.* OSWER Directive 9355.7-03B-P. June.

U.S. Environmental Protection Agency (EPA). 2003. *Blackbird Mine Superfund Site Record of Decision*. Prepared by Office of Environmental Cleanup, EPA Region 10. February.

U.S. Environmental Protection Agency (EPA). 2007a. *Explanation of Significant Differences – Explanation of Significant Differences for the Record of Decision for the Blackbird Mine Lemhi County, Idaho.*

U.S. Environmental Protection Agency (EPA). 2007b. *Aquatic Life Ambient Freshwater Water Quality Criteria – Copper, 2007 Revision.* EPA Office of Water. EPA-822-R-07-001. February.

U.S. Environmental Protection Agency (EPA). 2017. *Unilateral Administrative Order for Remedial Design and Remedial Action – Amendment 4.* CERCLA-10-2003-0112. April

Appendix B: Idaho Conservation League Comments

IDAHO
CONSERVATION
LEAGUE

208.726.7485 • PO Box 2671, Ketchum, ID 83340 • www.idahoconservation.org

Matt Wilkening
Remedial Project Manager
Environmental Protection Agency
1200 Sixth Avenue, Suite 155, RAD-202-3
Seattle, WA 98101

Monday, June 11th, 2018

RE: Blackbird Mine Superfund Site Cleanup Review

Dear Mr. Wilkening,

We are submitting these comments associated with EPA's third five-year review and ask that our comments and concerns be considered during this process. We request that the E.P.A release a draft version of the third five-year report and associated documentation for public review and comment prior to finalizing the review.

While we appreciate the significant and ongoing remedial efforts at this site, we continue to have concerns about the future of this site and downstream affected environments. Our specific comments are included below. Please don't hesitate to contact me if you have any questions about our comments.

Again, we thank the EPA for your efforts to clean up the Blackbird Mine site.

Sincerely,

Dani Mazzotta, Central Idaho Director
Idaho Conservation League
dmazzotta@idahoconservation.org
(208) 726-7485

Institutional Controls (IC)

We understand that land use restrictions have been implemented for Blackbird Mine, the Panther Creek Inn area, and the Cobalt Townsite. However, the ROD references the need for IC at additional locations including Bucktail Creek and associated tributaries (ROD, at Section 12). It remains unclear from existing documentation if IC have been implemented to the degree necessary within the Panther Creek and Bucktail Creek drainages. The ROD requires that EPA:

> *"preclude activities at the mine site that would interfere with the remedy or that could lead to unacceptable risk exposure"*
>
> *and*
>
> *"Restrict construction and related activities that may impact the integrity of the remedy and/or attainment and maintenance of Performance Standards."*

The Idaho Conservation League believes that the proposed operation of the Idaho Cobalt Project (eCobalt) in this area could interfere with the remedy and ultimately lead to failures of one or more of the remediation activities. The Idaho Cobalt Project is slated to resume activities in 2018.

We are concerned that actions associated with the Idaho Cobalt Project could interfere with, undermine or delay the remedies in place for the Blackbird Mine site. The EPA should review the Plan of Operations and Reclamation Plan for the Idaho Cobalt Project and assess whether or not Cobalt Project activities will interfere with the implementation of or effectiveness of the IC measures. Some IC measures may need to be implemented in advance of Idaho Cobalt Project activities. As such, the third five-year review should establish a timeline for implementing remaining IC measures in advance of the Idaho Cobalt Project's operations. The third five-year review also needs to ascertain if and how Idaho Cobalt Project activities need to be modified to avoid undermining planned IC measures. Lastly, the third five-year review also needs to ascertain if and how IC activities need to be modified to avoid being impacted by Idaho Cobalt Project activities. It needs to be demonstrated that the Idaho Cobalt Project will not exacerbate water quality or soil contamination problems in and around the Blackbird Mine site, including in area surface waters and groundwater.

The final EIS for the Idaho Cobalt Project requires that EPA approve all final road designs, excavation, and construction that has the potential to disturb historic mine waste and remedial infrastructure. The third five-year review should document this review process by EPA including listing and providing status updates on additional institutional controls that may be necessary on properties controlled by the USFS to protect the remedy. Any activities that occur in the Blackbird Mine cleanup area need to be performed in a manner that is consistent with the selected remedy and not compromise the cleanup levels associated in the ROD.

We ask that the third five-year review include a status report on quarterly monitoring of properties where contamination has been left at depth and of testing reports of excavated soils (where applicable) from these locations. The EPA should also report the status of annual notices letters to landowners about the potential presence and location of contaminated subsurface soils and relevant information on handling, transport, and disposal practices. While we understand that Lemhi County rejected an ordinance on January 14th, 2008 that contained soil management requirements for the area, we encourage the EPA to again attempt to get the county to adopt an updated version of this ordinance.

Groundwater Contamination and the Panther Creek Shallow Alluvium Aquifer

We understand that post 2013, a study was conducted to assess the full nature and extent of cobalt contamination issues in the Panther Creek Aquifer. EPA concluded that there are no "*mine related impacts*" within the Panther Creek and South Fork Big Deer Creek drainages. However, groundwater-monitoring results from previous five-year reports indicate that groundwater quality has historically exceeded the maximum contaminant levels for arsenic, cobalt and copper.

The second five-year report also indicated that ground water sampling at the former PCI property occurred in 2009 and was not scheduled beyond that. We are concerned that unless a multi-year effort that included groundwater sampling at various times of the year and at various locations across the site, including at the former PCI, it is extremely difficult, if not impossible, to detect fluctuations in contamination levels. Fluctuations can be an indicator of leaching issues associated with high water events.

We ask that the groundwater study, including methods and models that were used, be included on the project website as a resource that is available for public review prior to the finalization of the third five-year review document. A comprehensive and accurate understanding of the current groundwater conditions as it relates to existing and potential contaminant pathways is crucial for understanding how future area disturbances, such as mine development, may impact groundwater.

Bucktail Creek, South Fork of Big Deer Creek and Big Deer Creek

We remained concerned about EPA's intent to rely on "natural recovery" of Bucktail Creek, South Fork of Big Deer Creek, and Big Deer Creek as a means to meet sediment cleanup levels. To date, it appears that this approach has not been successful. We encourage the EPA to use this review process as an opportunity to re-evaluate the narrative goals set for these specific stream reaches and instead develop numeric goals for sediment cleanup. Recommended remedial actions should also be developed at this time.

Similarly, surface water clean up levels are not being met in this area. EPA needs to develop numerically based goals to reduce surface water contamination levels consistent with national standards and remedial activities that are designed to achieve these goals. We note that the ROD cleanup level of .014 mg/L total arsenic (as listed as a standard) is not consistent with state or national levels for maximum surface water dissolved arsenic levels (.010 mg/L). We continue to encourage EPA to consider the construction of a water treatment facility and take the diverted Bucktail Creek water, run it through the treatment plant and then release it to Big Deer Creek. This approach is being taken with Bucktail Creek area groundwater – it should be extended to surface water.

The EPA should also evaluate whether the streams in question are also meeting Watershed Condition Indicators established by the Salmon-Challis National Forest. Some factors such as riparian vegetation, pool and riffle ratios, sinuosity, cobble embeddedness, etc. may influence bioremediation efforts.

West Fork Tailings Impoundment

The ROD (12.2.3) references the construction of a soil cover over the West Fork tailing impoundment that consists of material removed from overbank areas along Blackbird creek and Panther creek. In 2002, we expressed concern over the use of this material and encouraged EPA to explore the use of a material that was free of contamination and provided an impermeable layer to the impoundment. We remained concerned that absent an impermeable cover for the tailings impoundment, leaching and seepage issues will continue to result. We are also concerned about fugitive dust originating from the impoundment area. This review period should include water quality monitoring upstream and downstream of the impoundment and a report of fugitive dust probability and mitigation measures.

We ask that the five-year report also provide specific information on all monitoring efforts for the water table under the West Fork tailings impoundment. We encourage the EPA to look closely at past stability analyses and if necessary update or conduct a new analysis that looks at factors, including anticipated water table depth, that could impact the stability of the dam itself. Previous documentation indicates that the water table has raised approximately 10-15 feed in the last 15 years.

Use Attainability Analysis (UAA)

Idaho's Department of Environmental Quality (DEQ) has removed designated uses from Blackbird Creek and Bucktail Creek due to the significant impact of past mining activities on these water bodies. Given EPA's goal of reclaiming these water bodies to the point where they support aquatic life, we encourage EPA to provide data that demonstrates progress toward this goal for consideration by DEQ during the mandated three-year reviews of designed uses and UAA. EPA should allocate funding to the three year review process.

Recreational Use Along Panther Creek

Following a request by the USFS, we understand that EPA has increased the 2003 ROD arsenic soil cleanup levels for Panther Creek from 590 mg/kg to 1180 mg/kg for day-use recreational scenarios because the original clean up level did not consider the differences in accessibility to the two sides of the river. We ask that the EPA use this five year review period to assess whether or not fugitive dust is a factor that needs to be taken into account for locations along Panther Creek and other areas that are being used recreationally in and around the Blackbird Mine site.

Reasonably Foreseeable activities and Cumulative Effects

The EPA should also evaluate whether the IC will be adequately protective given reasonably foreseeable activities on the Salmon-Challis National Forest and the cumulative effects of these activities. The Bonneville Power Administration and Shoshone Bannock Tribes are proposing to construct and operate of Chinook Salmon hatchery program with Panther Creek as the target stream. The Trustees of the Blackbird Mine Settlement Agreement is one of entities involved.[1] The Crystal Springs Hatchery facility would be located in Bingham County, Idaho and the capture and release facility would be located along Panther Creek. The goal of the program is to release one million Chinook salmon smolts for later harvest by Tribal members. Tribal members plan to install a fish weir and supporting facilities at the USFS Cobalt District Administrative Site on Panther Creek just upstream of Blackbird Creek to capture returning salmon. The Panther Creek weir facility would include a bridge picket weir, fish ladder, holding ponds, acclimation ponds, pump station, and areas for staff housing. Construction activities would include earth moving, stripping and stockpiling topsoil and fill, and diversion of Panther Creek stream, among others. There is the potential for contaminated materials to be located in this area.

One important factor in hatchery operations is understanding and accurately replicating the water chemistry of Panther Creek. Chinook salmon egg outplants and smolts will later be released in Panther Creek. In addition, water quality in Panther Creek is critical for the survival of both smolts and adult Chinook salmon outgoing smolts and returning adults:

> Water quality relative to fish needs in the Panther Creek Drainage is generally good, with the exception of streams affected by historical mining (see Section 3.5, Groundwater and Surface Water Quality and Quantity, Section 3.5.1.3, Panther Creek Weir Facility). However, Blackbird Creek, which flows into Panther Creek approximately 1 mile downstream of the proposed weir and acclimation facility, has historically been, and will likely continue to be, impacted by releases of acidity and dissolved heavy metals from the historical Blackbird Mine site. Discharges of dissolved copper and cobalt in 1995 led the Idaho Department of Environmental Quality (IDEQ) to conclude that Blackbird Creek

---

[1] Blackbird Mine Site Consent Decree, 1995, Consolidated Case No. 83-4179(R), U.S. District Court, District of Idaho

could not be remedied to the point of meeting water quality standards in the near future (Salmon-Challis National Forest 2008). Water quality has improved through time, though, and IDEQ reported in 2004/2005 that "water quality in Panther Creek downstream of Big Deer Creek met water quality criteria for copper most of the year with the exception of the spring high flow period of approximately March–June" (Salmon-Challis National Forest 2008).[2]

Wild and Scenic Outstandingly Remarkable Values

The full length of Panther Creek has been determined to be eligible under the "Recreational" category under the Wild and Scenic Rivers Act. Under the Wild and Scenic Rivers Act, the Forest Service assesses streams for a number of Outstandingly Remarkable Values (ORV) and, if a river is eligible, the area must be managed to protect and preserve these values until a suitability assessment is completed. The ORVs identified in the 2004 Salmon-Challis Forest Plan are scenery, recreation, geology, fish and wildlife.

Although contamination of Panther Creek from the Blackbird Mine resulted in the extirpation of Chinook salmon, subsequent remediation efforts have resulted in recolonization of Panther Creek by Chinook salmon:

> Without mining damages, it is estimated that there would have been a population of approximately 200 adult spring/summer Chinook salmon spawning in Panther Creek each year (Ando and Khanna 2004). The cost of initial compensatory actions to restore this salmon run was estimated at $9 million, and the case ultimately settled for a total amount of $60 million (Chapman et. al. 1998; NMFS 1995).[3]

Because fish have been identified as an ORV, management activities must maintain water quality and other physical characteristics that fish need:

> The Middle Panther Creek Watershed is designated as a PACFISH9 priority watershed, emphasizing restoration of its fisheries resources and aquatic habitats as a primary management direction. All perennial waters within the watershed have additionally been designated as critical habitat for federally threatened Snake River spring/summer Chinook salmon. The mainstem of Panther Creek and seven of its tributary streams have been designated as critical habitat for federally threatened Snake River Basin steelhead (IDEQ 2001). A significant amount of effort by Idaho Department of Fish and Game has been applied to reintroduce salmon runs to Panther Creek since the late 1970's (USFS 2008) and while occurrences of adult spawning have been observed in recent years, Chinook salmon and steelhead 9 PACFISH is a 1995 Management Strategy for anadromous fish-producing watersheds on federal lands in eastern Oregon and

[2] Crystal Springs Hatchery Program Draft Environmental Impact Statement, p. 3.7-7

[3] Crystal Springs Hatchery Program, DEID, p. 3.10-28.

> Washington, Idaho, and portions of California. Panther Creek Wild and Scenic River, Section 7 Analysis 9 have been largely extirpated from the drainage. Although fish populations have increased along main Panther Creek in recent years, they are still categorized as depressed. The Fish ORV for these river segments is significant, and actions that enhance or support this ORV are desired.[4]

Recreation is also listed as an ORV. Recreational opportunities include water contact activities such as fishing and advanced whitewater kayaking and rafting. The IC should ensure that the quality of recreational opportunities are also maintained.

[4] Panther Creek Wild and Scenic River, Section 7 Analysis, p. 8-9.