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First Five-Year Review Report
Blackbird Mine Site
Lemhi County, Idaho

Prepared by

U.S. Environmental Protection Agency

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Acronyms and Abbreviations

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ARD	Acid Rock Drainage
AOC	Administrative Order on Consent
ARARs	Applicable or Relevant and Appropriate Requirements
BMSG	Blackbird Mine Site Group
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COPC	Contaminant of Potential Concern
DEIS	Draft Environmental Impact Statement
DSM	Dynamic Systems Model
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESD	Explanation of Significant Differences
FCC	Formation Capital Corporation
FS	Feasibility Study
HDPE	High density polyethylene
ICs	Institutional controls
ICP	Idaho Cobalt Project
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
MCL	Maximum Contaminant Level
mg/kg	Milligram per Kilogram
mg/L	Milligrams per Liter
MOU	Memorandum of Understanding
NCP	National Contingency Plan
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration

NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRDA	Natural Resource Damage Assessment
O&M	Operations and Maintenance
OU	Operable Unit
PRG	Preliminary Remediation Goal/Preliminary Removal Goal
PRP	Potentially Responsible Parties
RA	Remedial Action
RAO	Remedial Action Objectives
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SCNF	Salmon-Challis National Forest
SOW	Statement of Work
UAO	Unilateral Administrative Order
US	United States
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
WTP	Water Treatment Plant

Executive Summary

The remedy for the Blackbird Mine site included collection, storage and treatment of contaminated waters from mine drainage and mine wastes, diversion facilities to re-route clean and contaminated waters, relocation and capping of waste rock, removal and stabilization of contaminated overbank deposits, natural recovery of in-stream sediments, long-term operation and maintenance, and institutional controls. Construction of the remedial actions was completed in 2007, with the exception of one component which has been scheduled to be completed in the future, depending on the results of monitoring and evaluations. In addition, there are contingent actions that may be triggered if deemed necessary to meet Remedial Action Objectives (RAOs) and cleanup levels after monitoring the effectiveness of the Remedial Actions. Two of the institutional controls have yet to be implemented. The trigger for this five year review was the start of remedial action construction in August 2003.

The assessment of this five year review found that the remedy is being implemented in accordance with the Record of Decision (ROD). One Explanation of Significant Differences (ESD) was issued in 2007 to change the cobalt water quality cleanup level based on site-specific toxicity studies. The remedial actions that have been constructed to date are functioning as designed. The remedy at the Blackbird Mine Site is expected to be protective of human health and the environment upon completion of all remaining remedial actions, completion of any required contingent actions, evaluation and completion of any potential additional measures along Blackbird Creek, and implementation of all institutional controls. In the interim, exposure pathways that could result in unacceptable risks to human health are being controlled.

Human Exposure Environmental Indicator: Status for the Blackbird Mine Site is "Under Control" even though the remedy is not yet complete and not all institutional controls at the site have been implemented, because there currently are no complete exposure pathways. However, if the institutional controls are not established and implemented, the protectiveness of the remedy may be impacted.

Groundwater Migration Environmental Indicator: Status for the Blackbird Mine Site is "Insufficient Data" because there is only one year of monitoring data following construction of the completed facilities. In addition, there are copper loads, the source(s) of which cannot be determined with certainty to be from the Blackbird Mine Site. Several more years of monitoring and further evaluation is needed to determine the status for this indicator.

Five Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: **Blackbird Mine Site**		
EPA ID *(from WasteLAN)*: **IDD980725832**		
Region: 10	**State:** Idaho	**City/County:** 25 West of the city of Salmon, Lemhi County
SITE STATUS		
NPL status: □ Final □ Deleted ■ Other (specify) Site was proposed by EPA for NPL listing in May 1993 but was not listed due to lack of concurrence by the State of Idaho		
Remediation status (choose all that apply): ■ Under Construction □ Operating □ Complete		
Multiple OUs?* □ YES ■ NO	**Construction completion date:** November 2010	
Has site been put into reuse? □ YES ■ NO		
REVIEW STATUS		
Lead agency: ■ EPA □ State □ Tribe □ Other Federal Agency _____		
Author name: Fran Allans		
Author title: Remedial Project Manager	**Author affiliation:** U.S. EPA, Region 10	
Review period:** October 24, 2007 to August 25, 2008		
Date(s) of site inspection: October 24, 2007		
Type of review: ■ Post-SARA □ Pre-SARA □ NPL-Removal only □ Non-NPL Remedial Action Site □ NPL State/Tribe-lead □ Regional Discretion		
Review number: ■ 1 (first) □ 2 (second) □ 3 (third) □ Other (specify) _____		
Triggering action: ■ Actual RA Onsite Construction at OU #1 □ Actual RA Start at OU#____ □ Construction Completion □ Previous Five-Year Review Report □ Other (specify)		
Triggering action date *(from WasteLAN)*: August 25, 2003		
Due date *(five years after triggering action date)*: August 25, 2008		

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form, cont'd.

Issues:

The source of the dissolved copper loads along Big Deer Creek could not be determined with certainty.

Spring 2008 high flows in Blackbird Creek caused significant erosion of the road, berms and in-stream sediments with downstream deposition along Panther Creek.

Institutional controls have not yet been implemented at the mine site and at the Cobalt townsite.

Recommendations and Follow-up Actions:

Monitor the dissolved copper loads along Big Deer Creek to determine if the copper water quality cleanup level can be met by remedial actions in upper Bucktail Creek. If the Big Deer Creek loads continue to result in exceedances of the copper water quality cleanup level, and if additional investigations can be identified that can more definitively determine the source(s) of these loads, additional investigations will be conducted.

Determine if eroded materials from Blackbird Creek have been deposited at overbank areas downstream along Panther Creek at concentrations above cleanup levels. If so, perform removals of the deposited materials. Repair damaged sections of the road and other areas. Evaluate whether additional measures are required to assure protectiveness of the remedy during future high flow events in Blackbird Creek.

Continue to work with the Department of Justice, the USFS, and BMSG to have required institutional controls put into place. Consult with the US Forest Service to assure that administrative procedures for implementing necessary institutional controls are put in place on lands under the control of the USFS.

Protectiveness Statement:

The remedy at the Blackbird Mine Site is expected to be protective of human health and the environment upon completion of all remaining remedial actions, completion of any required contingent actions, evaluation and completion of any potential additional measures along Blackbird Creek, and implementation of all institutional controls. In the interim, exposure pathways that could result in unacceptable risks to human health are being controlled.

1.0

1.0 Introduction

1.1 Purpose of the Review

The U.S. Environmental Protection Agency (EPA) Region 10, the lead agency for this site, has conducted a statutory Five-Year Review of the Blackbird Mine Site located in Lemhi County, Idaho. This review was conducted from October 2007 through August 2008 and is the first Five-Year Review for this site.

Investigations, Early Actions, Remedial Designs, and Remedial Actions at this site have been conducted under EPA oversight by the Potentially Responsible Parties (PRPs) for the site. The PRPs identified for the site include: Noranda Exploration, Inc., Noranda Mining, Inc., Blackbird Mining Company Limited Partnership (by law a general partnership), M. A. Hanna Company, Hanna Services Company, and their predecessor Rojet Enterprises, now known as Polyone Corporation, and Alumet Corporation, successor to Alumax Corporation, Pechiney Corporation, and Intalco Aluminum Corporation. Certain of the PRPs have formed a group named the Blackbird Mine Site Group (BMSG) that has taken the lead in performing investigations and cleanup actions at the site.

The purpose of the Five Year Review is to evaluate the implementation and performance of the remedy in order to determine if the remedy is or will be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in the Five-Year Review report. In addition, the Five-Year Review report identifies issues found during the review, if any, and recommendations to address them.

1.2 Authority for Conducting the Review

Five Year Reviews are required whenever remedial actions result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure (UU/UE). The EPA prepared this statutory Five-Year Review pursuant to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121(c) and the National Contingency Plan (NCP). CERCLA Section 121(c) states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The USEPA interpreted this requirement further in the NCP; 40 Code of Federal Regulation (CFR) 300.430(f)(4)(ii) states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after initiation of the selected remedial action.

1.3 Who Conducted the Review

The EPA Region 10 conducted this Five-Year Review of the cleanup actions implemented at the Blackbird Mine site in Lemhi County, Idaho. This Five-Year Review was conducted from October 2007 through August 2008. This report documents the results of the Five Year Review.

1.4 Lead and Support Agencies

The U.S. Environmental Protection Agency (EPA), Region 10 is the lead agency and the U.S. Department of Agriculture, Forest Service (USFS) and Idaho Department of Environmental Quality (IDEQ) are the support agencies at this site. EPA and the USFS entered into a Memorandum of Understanding (MOU) in November, 1995 regarding oversight and management of the site, given that releases from the Blackbird Mine have impacted land under the management of the USFS. In the MOU, it was agreed that EPA would be lead agency with USFS serving as support agency and exercising certain consultative and concurrence roles with respect to certain major decisions. The National Oceanic and Atmospheric Administration (NOAA) has provided extensive input and guidance. The USFS, IDEQ, and NOAA are collectively referred to as the Natural Resource Trustees (Trustees). Several other resource agencies have also been actively involved at the site and have provided extensive input and guidance. These agencies include the National Marine Fisheries Service (NMFS), the U.S. Fish and Wildlife Service (USFWS) and the Idaho Department of Fish and Game (IDFG). The Shoshone-Bannock Tribe and the Nez Perce Tribe have represented Native American interests at the site.

1.5 Other Review Components

This is the first Five-Year Review for the Blackbird Mine site. The triggering action for this review was the initiation of the Remedial Actions (RAs) in August 2003. This Five-Year Review is required because hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

2.0

2.0 Site Chronology

Shown in Table 2-1 is a chronology of cleanup actions and regulatory events that have occurred at the Blackbird Mine site.

TABLE 2-1
Chronology of Blackbird Mine Site Events

Cleanup Actions or Regulatory Events	Date
U.S. Forest Service removed and deposited outside of the Blackbird channel bed tailings, sediments and debris from approximately 5,000 linear feet of the Blackbird Creek Channel.	1975
State of Idaho initiated a Natural Resource Damage Assessment (NRDA) lawsuit for the Blackbird Mine clean-up and natural resource damages restoration pursuant to CERCLA. Subsequently, the United States joined the lawsuit in 1993.	December 1983-June 1992
EPA proposed to add the Blackbird Mine site to the National Priorities List (NPL), pursuant to Section 105(a)(8) of CERCLA, 42 U.S.C. 9605(a)(8). The site was not added to the NPL because of lack of concurrence by the State of Idaho.	May 1993
Administrative Order on Consent (AOC) issued by EPA to BMSG (EPA Docket No. 1093-07-04-106). Emergency Response Actions at the West Fork Tailing Impoundment to minimize the potential for release of tailings into Blackbird and Panther Creeks.	July 1993
Emergency Response design and construction at the West Fork Tailing Impoundment	1993-1994
AOC issued by EPA to the BMSG (U.S. EPA Docket No. 10-94-0222) requiring the BMSG to conduct a Remedial Investigation/Feasibility Study (RI/FS).	November 1994
NRDA Consent Decree entered by federal district court (No. 83-4179 *State of Idaho, et al. v. The M.S. Hanna Company et al.*) committing the Settling Defendants to, among other things, restore water quality in Panther Creek and Big Deer Creek to a level that will support all life stages of salmonids, implement a Natural Resource Restoration Plan for returning Snake River Chinook salmon to Panther Creek, and implement the future remedial actions under separate order or consent decree.	September 1995
AOC issued by EPA to the BMSG (EPA Docket No. 10-95-0083) requiring non time-critical removal actions to control sources of acid rock drainage, overbank deposit removal actions, and collect waters in the Bucktail Creek and Meadow Creek drainage basins for treatment. These actions are referred to as the Early Actions.	June 1995
Early Action designs and construction (multiple designs were completed for the Early Actions and these designs were generally completed during the spring of each year for that year's construction season).	1995-2002
Remedial Investigation completed.	November 2001
Feasibility Study completed.	June 2002
Proposed Plan issued by EPA	August 2002
Record of Decision (ROD) issued by EPA	March 2003
Unilateral Administrative Order (UAO) issued by EPA to the BMSG (EPA Docket No. CERCLA-10-2003-0112) requiring the BMSG to implement Remedial Designs and Remedial Actions consistent with the ROD.	August 2003
Remedial Action designs and construction (multiple designs were completed for the Remedial Actions and these designs were generally completed during the spring of each year for that year's construction season).	August 2003 to November 2007
Explanation of Significant Differences to the ROD was issued by EPA to change the cobalt water quality cleanup level from 0.038 mg/L to 0.086 mg/L.	July 2007

3.0

3.0 Background

3.1 General Site Description

Discovered in 1893, the Blackbird Mine Site is located within one of the largest of North America's cobalt deposits. The mine sits within the Salmon-Challis National Forest (SCNF), 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 (see Figure 3-1). The River of No Return Wilderness area is located approximately 5 miles north of the mine site. The Blackbird mine consists of approximately 830 acres of private patented mining claims and 10,000 acres of unpatented claims.

The Blackbird Mine site is located within the Northern Rocky Mountain physiographic province and exhibits topography characterized by deep stream cut canyons having steep and rocky slopes. Regional elevations range from 3,000 feet at the confluence of Panther Creek and the Salmon River, to approximately 9,000 feet near the site.

The mine site lies within two primary drainages: Bucktail Creek, and Meadow/Blackbird Creek (see Figure 3-2). The northern portion of the mine site includeses 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.

Mining at the Blackbird Mine first began in 1893 by the Blackbird Copper-Gold Mining Company until 1907. From 1917 until 1920, the Haynes-Stellite Company mined and milled approximately 4,000 tons of ore from a site located along the east side of Blackbird Creek approximately 1.2 miles downstream of the present Blackbird Mine site. Mining activities slowed until 1938 when the Uncle Sam Mining Company reopened two old adits and built a 75 ton/day flotation mill at the present Blackbird Mine Site.

The Calera Mining Company purchased the site in 1943 and began full scale mining activities in 1949. Calera Mining Company expanded the mill to accommodate 1000 tons per day. In 1954, Calera initiated open-pit activities in the Blacktail Pit resulting in the deposition of approximately 3.8 million tons of waste rock in the headwaters of the Blackbird and Bucktail Creeks. Starting around 1950, mine tailings from milling operations were deposited in the West Fork Tailings Impoundment. The impoundment dam is approximately 150 feet high and 600 feet long. The tailing deposit covers an area of about 9 acres and is 1,250 feet long. During the 1950s, Calera continued the underground mining operations at the site resulting in the formation of a number of waste piles outside mine adits, totaling approximately 1 million tons.

Calera continued to operate the Blackbird Mine site until 1963 when they sold their interest in the Blackbird Mine to Machinery Center Company. The Machinery Center Company operated the mine site for four years producing copper. However, the mine site was sold in 1967 to the Idaho Mining Company, a subsidiary of the Hanna Mining Company, who

engaged in an exploration program on the property for the next few years and sought to re-open the mine.

In 1977, Noranda Exploration entered into an option agreement with the Idaho Mining Company, allowing Noranda to explore and acquire interest in the mine property. In December 1979, Noranda Mining, Inc. and Hanna Services Company created the Blackbird Mining Company, wherein Noranda Mining became the general partner responsible for re-opening the mine. By 1982, all exploratory activities were suspended at the Blackbird Mine due to poor market conditions.

The 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 Forest Service roads provide access to the site.

A water treatment plant (WTP) was placed in service in 19811 to treat acid mine drainage from the 6850 adit. Discharges from the treatment plant to Blackbird Creek are permitted under National Pollutant Discharge Elimination System (NPDES) permit no. ID-002525-9.

Subsequent to mining operations, debris flows, erosion, and acid rock drainage (ARD) 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.

3.2 Land Uses of the Site and Surrounding Areas

The Blackbird mine consists of approximately 830 acres of private patented mining claims and 10,000 acres of unpatented claims. The Blackbird Mine is surrounded by the Salmon-Challlis 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, which is located approximately 25 miles east of the mine site. The Lemhi County seat is located in Salmon. The Panther Creek drainage basin downstream of the mine is rural and sparsely populated with seasonal and year-round residences. The closest permanent residence, the Panther Creek Inn, is located 2 miles east of the mine gate at the confluence of Blackbird Creek and Panther Creek. The following sections describe in more detail the land use of the Blackbird Mine Site and the surrounding areas impacted by the mine.

3.2.1 Blackbird Mine Site

The Blackbird Mine is currently inactive. Workers at the mine operate the WTP and perform long-term operations and maintenance (O&M) of the remedial actions and facilities. For safety reasons, vehicular access by the public to the mine site is restricted by a gate near the West Fork Tailing Impoundment; however, the mine area can be accessed by the public on foot or by horseback. The groundwater at the mine is not currently used for domestic water supply. The O&M workers at the site use bottled water for drinking water.

Residences along the Panther Creek drainage, including the Panther Creek Inn, use private wells or springs to obtain water.

3.2.2 Panther Creek Properties and Forest Lands

Panther Creek from Blackbird Creek to the confluence with the Salmon River is a steeply incised creek valley interspersed with flatter areas (see Figure 3-3). Most of the land along the creek is public land under the jurisdiction of the United States Forest Service (USFS). The public lands are used for recreational activities, including fishing, hunting, sightseeing and camping. There are a number of undeveloped campsites along the creek and one developed campground at Deep Creek. There are a number of private properties along the creek, especially at the flatter areas. Most of the private properties include residences (full-time and part-time) and some agricultural uses (primarily pasture). Residences along the Panther Creek drainage, including the Panther Creek Inn, use private wells or springs to obtain water.

3.2.3 Idaho Cobalt Project

In June 2008 the U.S. Forest Service completed an environmental impact statement and has provided approval of the Idaho Cobalt Project (ICP) in a Record of Decision (ROD). The ICP is a proposed cobalt and copper mine that will include two underground mine areas, a mill, a waste disposal site, and associated facilities on National Forest and private lands within and adjacent to the Blackbird Mine site (see Figure 3-4). The area affected by the proposed mineral development project will consist of surface disturbance on approximately 115 acres (USFS 2008). The Formation Capital Corporation (FCC) is the proposed developer of the ICP. The ICP consists of 146 unpatented mining claims for a total of 2,529 acres of mineral rights.

Surface and groundwater drain from the ICP into Bucktail Creek, South Fork Big Deer Creek, Big Deer Creek and Panther Creek, all of which are being cleaned up under the Blackbird Mine remedial actions. In addition, a portion of the ICP (the Sunshine Mine) will be located within the Blackbird Mine site near the upper end of the Bucktail Creek drainage.

3.3 History of Contamination

The following sections discuss the history of contamination at the site for both the mine site itself and for the areas downstream from the mine site.

3.3.1 Blackbird Mine Site

Remedial investigations were conducted from 1995 through 2001 and are described in detail in the Remedial Investigation Report (RI) and an Addendum (Golder 2001a and Golder 2001b). Remedial investigations included studies to determine the nature and extent of contamination in waste rock deposits, tailings deposits, surface waters, in-stream sediments, overbank soil deposits, and groundwater at the Blackbird Mine site and surrounding area. The RI was completed after construction of most of the Early Actions at the mine site. The Early Actions (see Section 3.4 for a description of the Early Actions) resulted in reduction in dissolved metals transported in surface water from the mine area and in removal of contaminated overbank deposits along Panther Creek. A major focus of the RI

investigations was to determine the metals loading from residuals and remaining sources following implementation of the Early Actions. Information developed during the RI was also used to complete both human health and ecological risk assessments.

The initial list of contaminants of potential concern (COPCs) at the site included arsenic, cobalt, copper, manganese, nickel, and zinc. This list was narrowed down through the risk assessment process and the final contaminants of concern include arsenic, cobalt, and copper. Sampling results for each of the contaminated media at the site are summarized below:

- Waste Rock Deposits - Waste rock piles were sampled for arsenic, copper, and cobalt. Among the waste rock piles sampled, maximum concentrations of arsenic, cobalt, and copper were 5,900 mg/kg, 3,210 mg/kg, and 20,200 mg/kg, respectively.
- Tailings Deposits – Approximately two-million tons of tailings were deposited in the West Fork Tailings Impoundment during the active mining operations. Maximum concentrations of arsenic and copper (cobalt was not measured) in the tailings impoundment were 554 mg/kg and 650 mg/kg, respectively.
- Overbank Deposits - Maximum concentrations of arsenic, cobalt, and copper in the overbank areas along Blackbird Creek were 138,000 mg/kg, 97,700 mg/kg, and 41,000 mg/kg, respectively.
- In-Stream Sediments – Following completion of the Early Actions, sampling was conducted during 2000 and 2001. Stream bottom sediments were sampled in Blackbird Creek. Maximum concentrations for arsenic, cobalt, and copper were 717 mg/kg, 4,250 mg/kg, and 1,330 mg/kg, respectively.
- Groundwater – Groundwater samples were collected from nine monitoring wells at the site. Maximum concentrations of arsenic, cobalt, and copper in the monitoring wells were 0.048 mg/L, 6.83 mg/L, and 19.8 mg/L, respectively.
- Surface Waters – The surface waters at the Site were sampled at different times of the year. The primary purpose of the surface water sampling was to determine the remaining sources of metals loading that needed to be addressed through remedial actions. Results of the surface water sampling indicated that the water quality cleanup levels were being exceeded in Panther Creek, South Fork Big Deer Creek and Big Deer Creek downstream from the mine influences. During periodic sampling in 2000, maximum concentrations of arsenic, cobalt, and copper in Panther Creek were 0.006 mg/L, 0.075 mg/L, and 0.012 mg/L, respectively. Maximum concentrations of arsenic, cobalt, and copper in South Fork Big Deer Creek were 0.002 mg/L, 0.089 mg/L, and 0.155 mg/L, respectively. Maximum concentrations of arsenic, cobalt, and copper in Big Deer Creek were 0.003 mg/L, 0.011 mg/L, and 0.021 mg/L, respectively.

3.3.2 Downstream Contamination

Contaminated sediments, tailings, waste rock, and soils (deposits) from the Blackbird Mine site were transported down Blackbird Creek and Bucktail Creek during high flow events and were deposited at overbank areas and in-stream areas along Panther Creek, South Fork Big Deer Creek, and Big Deer Creek. There is also evidence of transport and deposition of

contaminated materials at several areas along Panther Creek by irrigation waters diverted from Panther Creek.

- Overbank Deposits Along Panther Creek – A number of overbank areas along Panther Creek were contaminated with sediments containing elevated concentrations of arsenic (arsenic was determined to be the primary risk driver from a human health standpoint). The contaminated areas on Forest Service lands included an area called Riprap Bar, the Deep Creek Campground, and an area near the confluence with Napias Creek (see Figure 3-3). The contaminated areas on private lands included the Panther Creek Inn, Cobalt Townsite, Noranda Pastures, George Fernandez property, Sillings property, Chuck Fernandez property, Rogers property, Shook property (formerly the Strawn property), Bevan property, Rufe property, and Hade property. Maximum concentrations of arsenic, cobalt, and copper in the overbank sediments along Panther Creek were 1,940 mg/kg, 391 mg/kg, and 928 mg/kg, respectively..

- Other Overbank Deposits – Along South Fork Big Deer Creek and Big Deer Creek, arsenic and metals were of concern in the overbank deposits. Maximum concentrations of arsenic, cobalt, and copper in the overbank sediments along South Fork Big Deer Creek were 820 mg/kg, 1,600 mg/kg, and 42,000 mg/kg, respectively. Maximum concentrations of arsenic, cobalt, and copper in the overbank sediments along Big Deer Creek were 268 mg/kg, 619 mg/kg, and 17,200 mg/kg, respectively.

- Instream Sediments – Arsenic and metals were of concern in the in-stream sediments. Maximum concentrations of arsenic, cobalt, and copper in the in-stream sediments in Panther Creek were 203 mg/kg, 246 mg/kg, and 313 mg/kg, respectively. Maximum concentrations of arsenic, cobalt, and copper in the in-stream sediments in South Fork Big Deer Creek were 176 mg/kg, 397 mg/kg, and 7410 mg/kg, respectively. Maximum concentrations of arsenic, cobalt, and copper in the in-stream sediments in Big Deer Creek were 13 mg/kg, 70 mg/kg, and 385 mg/kg, respectively.

The properties along Panther Creek obtain their drinking water from wells or springs. The wells and springs were sampled during the RI and three of these drinking water sources had arsenic concentrations above the maximum contaminant level of 0.010 mg/L. These included: George Fernandez spring (0.078 mg/L), Warburton well (0.023 mg/L) and Panther Creek Inn well no. 2 (0.016 mg/L). EPA conducted an evaluation of these wells, examining their hydrogeology and geochemistry, and determined that the elevated arsenic concentrations were not the result of contamination from the Blackbird Mine (EPA 2003).

3.4 Initial Response Actions

Initial response actions at the Blackbird Mine site were conducted under EPA's removal authority and included both time-critical removals (Emergency Removal Actions) and non time-critical removals (Early Actions). The locations of the initial response actions are shown on Figures 3-2, 3-3, and 3-5.

3.4.1 Time-Critical Removal (1993-1994)

Emergency Removal Actions were 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. These actions were taken pursuant to an Administrative Order on Consent (AOC) issued by the EPA to the BMSG in July 1993 (EPA Docket No. 1093-07-04-106). Prior to these actions, West Fork Blackbird Creek flowed through a buried concrete culvert beneath the tailings pile and there was concern that mass failure of the tailings storage facility was possible if the culvert became plugged.

The Emergency Removal Actions included (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-feet 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.

3.4.2 Non Time-Critical Removals (1995–2002)

Non time-critical removal actions (Early Actions) were initially implemented to address releases of dissolved cobalt and copper into area streams downstream from the mine site. 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. Subsequent to initiation of the Early Actions, it was discovered that overbank sediments along Panther Creek were significantly elevated in arsenic. Human health risk assessments (CH2M HILL 1998 and CH2M HILL 1999) established that there were unacceptable risks associated with the arsenic in the overbank deposits at many of the properties along Panther Creek. The Early Actions therefore included cleanup of contaminated overbank deposits at both private properties and USFS properties along Panther Creek.

The Early Actions were initiated during the summer of 1995 and were continued each year through 2002. These actions were conducted pursuant to an AOC issued by EPA to the BMSG in June 1995 (EPA Docket No. 10-95-0083, as amended). The Early Actions were conducted in five phases, with the initial phases focused on controlling sources of acid rock drainage that were impacting water quality. Generally, Phase I facilities were built during the 1995 construction season, Phase II facilities were built during the 1996 and 1997 construction seasons, and Phase III facilities were initiated during the 1997 construction season and completed during the summer of 1998.

Subsequent to the initiation of Early 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 of the Early Actions therefore focused on overbank deposit removal actions, which were conducted along Panther Creek and Blackbird Creek to mitigate 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 Early Actions were performed under the 1995 AOC to collect contaminated waters in the Bucktail Creek and Meadow Creek drainage basins that were not intercepted during previous actions.

3.4.2.1 Meadow/Blackbird Creek

Early Actions in Meadow and Blackbird Creeks 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 (WTP).
- Upgrading and expansion of the existing WTP to increase flow capacity to 800 gallons per minute 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.

3.4.2.2 Bucktail Creek Drainage

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.

3.4.2.3 Overbank Deposit Removal Actions

Beginning in late 1998 and continuing through 2001, overbank deposit removal actions were conducted along portions of Panther Creek. These actions were primarily focused on removal of mine-related materials containing elevated concentrations of arsenic. The overbank deposit removal actions included:

- Removal of the contaminated materials until testing indicated that the underlying soils were below the cleanup levels, or until the water table was reached.
- Disposal of removed materials at the West Fork Tailings Impoundment.
- Backfilling of excavated areas with clean soils and re-vegetation with native species or pasture grasses as appropriate.

Removal actions were completed at the following sites on private properties (see Figure 3-3):

- At the Panther Creek Inn and the Panther Creek Inn campground.
- Cobalt Townsite and the adjacent pasture area (Noranda Pastures) immediately downstream of the Cobalt Townsite.
- Sillings/Fernandez area located approximately 2-miles downstream from the Cobalt Townsite.
- Bevan property located about 5.5 miles upstream from the confluence of Panther Creek and the Salmon River.

Removal actions were completed at the following sites on U.S. Forest Lands:

- The Riprap Bar area approximately 1-mile downstream from the Cobalt Townsite.

- Deep Creek Campground located just upstream of the confluence of Deep Creek and Panther Creek.
- Napias Creek area just upstream from the confluence of Napias and Panther Creeks.

3.5 Basis for Taking Remedial Actions

The ecological risk assessments (Golder 2000 and CH2M HILL 2001), and an additional human health risk assessment (CH2M HILL 2002) determined that there were still unacceptable risks associated with contamination remaining following implementation of the Early Actions. The remaining contamination that needed to be addressed through remedial actions included:

- Water Quality – 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 (MCLs) for potable water. The groundwater would pose unacceptable risks to human health if it were to be used as a drinking water source.
- Overbank Deposits – concentrations of arsenic in overbank deposits not addressed during the Early 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.

4.0

4.0 Remedial Actions

4.1 Regulatory Actions

Remedial Actions at the Blackbird Mine site were conducted subsequent to the Early Actions and have been governed by several regulatory actions. These include the following:

- EPA issued a Record of Decision (ROD) for the Blackbird Mine site in February 2003 that specified the preferred alternative for Remedial Actions at the site.
- EPA issued a Unilateral Administrative Order (UAO) to the BMSG in July 2003 and amended it in August 2003 for Remedial Design and Remedial Actions at the Blackbird Mine site (EPA Docket No. 10-2003-0112).
- EPA issued an Explanation of Significant Differences (ESD) to the ROD in July 2007. This 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 studies.

4.2 Remedial Action Objectives and Cleanup Levels

4.2.1 Remedial Action Objectives

Remedial action objectives (RAOs) were developed during the Feasibility Study (FS) and provided a general description of what the cleanup action was to accomplish. The RAOs for this site are provided in Table 4-1.

TABLE 4-1
Remedial Action Objectives for Blackbird Site

Media	Receptors of Concern	Remedial Action Objectives
Surface Soils	Human	Reduce direct contact (i.e., ingestion and dermal contact) with surface soils containing contaminants of concern in excess of the cleanup levels.
		Reduce migration of surface soils and overbank deposits to downstream areas that would deposit concentrations of contaminants of concern 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 contaminants of concern established for the streams are not exceeded.
		Reduce migration of the surface soils to in-stream sediments so that the cleanup levels for the contaminants of concern established for in-stream sediments are not exceeded.
Groundwater	Human	Prevent use of contaminated groundwater underlying waste management areas.

TABLE 4-1
Remedial Action Objectives for Blackbird Site

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 contaminants of concern 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 of 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 contaminants of concern 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 contaminants of concern 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 contaminants of concern in excess of the cleanup levels.
		Reduce migration of in-stream sediments to downstream areas so that the cleanup levels for the contaminants of concern 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 of 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 contaminants of concern 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 contaminants of concern in Bucktail Creek to improve sediment quality such that cleanup levels are not exceeded in South Fork of Big Deer and Big Deer Creeks.

Source: *Blackbird Mine Superfund Site Record of Decision*, Office of Environmental Cleanup EPA Region 10, February 2003

4.2.2 Cleanup Levels

Cleanup levels for overbank deposits, in-stream sediments, surface waters, and groundwaters at the site were established for arsenic, cobalt, and copper in the ROD and ESD for the various drainages. These cleanup levels were based on promulgated standards, site-specific risk assessments, and biological studies. The cleanup levels are summarized in Table 4-2.

TABLE 4-2
Summary of Cleanup Levels for Blackbird Site Media

Drainage	Media	Arsenic	Cobalt	Copper
Panther Creek	Overbank Deposits—Residential Use	100 mg/kg	NE[a]	NE[a]
	Overbank Deposits—Recreational Use (USFS Campgrounds)	400 mg/kg	NE[a]	NE[a]
	Overbank Deposits—Recreational Use (Other Camping Areas)	280 mg/kg	NE[a]	NE[a]
	Overbank Deposits—Recreational Day Use	590 mg/kg	NE[a]	NE[a]
	In-stream Sediments	35 mg/kg	80 mg/kg	149 mg/kg
	Surface Water[b]	0.014 mg/L	0.086 mg/L	IWQS[c]
South Fork Big Deer Creek	Overbank Deposits—Recreational Day Use	590 mg/kg	NE[a]	NE[a]
	In-stream Sediments	35 mg/kg	436 mg/kg	637 mg/kg
	Surface Water	0.014 mg/L	0.086 mg/L	IWQS[c]
Big Deer Creek	Overbank Deposits—Recreational Day Use	590 mg/kg	NE[a]	NE[a]
	In-stream Sediments	35 mg/kg	80 mg/kg	149 mg/kg
	Surface Water	0.014 mg/L	0.086 mg/L	IWQS[c]
Blackbird Creek	Overbank Deposits—Upstream from Mine Gate	9,500 mg/kg	NE[a]	NE[a]
	Overbank Deposits—Downstream from Mine Gate	4,700 mg/kg	NE[a]	NE[a]
	In-stream Sediments—Downstream from Panther Creek Road	490 mg/kg	NE[a]	NE[a]
	In-stream Sediments—Upstream from Panther Creek Road	Narrative Goal[d]	Narrative Goal[d]	Narrative Goal[d]
	Surface Water	0.050 mg/L	Narrative Goal[d]	Narrative Goal[d]
	Groundwater	0.010 mg/L	1,530 mg/L	3,060 mg/L
Bucktail Creek	Overbank Deposits—Recreational Day Use	590 mg/kg	NE[a]	NE[a]
	In-stream Sediments	Narrative Goal[d]	Narrative Goal[d]	Narrative Goal[d]
	Surface Water	Narrative Goal[d]	Narrative Goal[d]	Narrative Goal[d]
	Groundwater	0.010 mg/L	1,530 mg/L	3,060 mg/L

[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] Idaho Water Quality Standard. The standard is hardness-based and at the typical hardness in area creeks varies from about 0.035 mg/L to 10 mg/L.

[d] The cleanup level is a non-numeric narrative goal. See text below for an explanation of the narrative goals.

The Idaho Department of Environmental Quality (IDEQ) 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 (IDEQ 1997 and IDEQ 2002). 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 in Blackbird Creek and Bucktail Creek. 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."

4.3 Remedy Description

The Record of Decision (EPA 2003) selected site-specific remedial actions to take place at the Blackbird Mine site subsequent to the Early Actions. The Early Actions were incorporated as part of the remedial actions by the ROD. Because the Blackbird Mine affects three different drainages, the Remedial Actions for the Blackbird Mine site were divided into three remediation areas: 1) Blackbird Creek, 2) Bucktail Creek, and 3) Panther Creek. The remedies selected in the ROD for each of these drainages are described below and are shown on Figures 3-2, 3-3, and 3-5. The actual implementation of the Remedial Actions, including the schedule of construction activities, is described in Section 4.4.

4.3.1 Blackbird Creek

The selected remedy for the Blackbird Creek drainage area included:

- Collection 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
- Natural recovery of in-stream sediments in Blackbird Creek
- Institutional controls (ICs)

The selected remedy consisted of primarily 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 re-mobilization 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 Tailing Impoundment. Groundwater draining from the West Fork Tailings Impoundment is high in cobalt and iron and typically accounts for over half 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 since 2003 in Panther Creek 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 is no longer required.

Institutional control 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 (see Section 6.1.3 for details of the institutional controls).

4.3.2 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
- Institutional controls

The selected alternative 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. The groundwater seep collection cannot intercept all of the groundwater and Bucktail Creek still has elevated metals which would prevent water quality goals from being met in South Fork of Big Deer Creek. By diverting Bucktail Creek around South Fork of Big Deer Creek in a pipeline or ditch, water quality goals in both South Fork of Big Deer and Big Deer Creeks can be met with this alternative. Institutional control objectives are similar to those required for Blackbird Creek.

4.3.3 Panther Creek

The selected remedy was a combination of removal of contaminated soils and institutional controls. The contaminated areas at the Rufe, Shook, and Hade properties were comparatively small. Therefore, soil in overbank deposits was removed to the human health cleanup level for arsenic. The contaminated overbank deposits at the Rogers property included both small and large areas. The soils in the smaller areas were removed. However, the larger areas require institutional controls to preclude future residential and intensive recreational development. The institutional controls are described in Section 6.1.3.

Institutional controls regarding soil management are also needed 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 concentrations are brought to the surface (as a result of erosion, digging or construction activities). The private properties that require institutional controls for underlying soils are: Panther Creek Inn, Cobalt Townsite, Noranda Pasture, Riprap Bar, Sillings, Fernandez,

Deep Creek Campground and Bevan. The properties under the control of the U.S. Forest Service that require institutional controls are the Riprap Bar and Deep Creek Campground. The institutional controls are described in Section 6.1.3.

4.3.4 Groundwater

Some of the groundwater monitoring wells at the mine have concentrations of arsenic, copper, and cobalt above the maximum contaminant levels (MCLs) or risk-based levels (see Section 5.3.2 for recent groundwater monitoring results). There are currently no drinking water wells at the mine. Potential ingestion of contaminants in groundwater in drinking water wells at the mine will be addressed through institutional controls. Containment alternatives to address migration of contaminants in groundwater off the mine and potential ingestion of contaminants in groundwater through drinking water wells downgradient of the mine were not part of the remedy in the ROD because:

- There are not any drinking water wells downgradient from the mine that are impacted by mine sources. In the Blackbird Creek drainage, the nearest drinking water well is at the Panther Creek Inn, located approximately 2 ½ miles downgradient from the nearest significant contaminant source (the West Fork Tailings Impoundment). Water quality monitoring at this well has indicated that concentrations of arsenic, cobalt and copper are significantly lower than the MCLs or risk-based levels. In the Big Deer Creek drainage, there are currently no drinking water wells downgradient from the mine.

- Any potential future drinking water wells in the vicinity of the mine would have to be permitted through the Idaho Department of Water Resources (IDWR). The IDWR regulations include requirements that the groundwater at the well be tested to assure that it is acceptable as a drinking water source.

4.3.5 Contingent Actions

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 ROD identified contingent actions that include, but would not necessarily be limited to:

- Actions to reduce the hydraulic head upstream of the cutoff wall on upper Blackbird Creek to reduce seepage through the wall and metals loading from groundwater discharging to Blackbird Creek. As an alternative, groundwater could be intercepted downgradient from the cutoff wall and pumped to the existing WTP for treatment.

- Increases to the water storage and/or treatment capacity, and/or revisions to the treatment schedule, if there is insufficient capacity to meet water storage and treatment needs.

- Additional removal of overbank deposits along Blackbird Creek.

- Run-on/run-off controls for the cover on the West Fork Tailings Impoundment, if monitoring indicates excessive erosion or water quality impacts from runoff.

- Measures to reduce the water table beneath the West Fork Tailings Impoundment, if the water table begins to rise to a level that threatens the stability of the dam.

- Additional collection and treatment of Bucktail Creek seeps, if they result in unacceptable metals loading to Big Deer Creek.

- 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.

- 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.

- Additional removals along Panther Creek if monitoring following storm events result in deposition of overbank deposits that exceed remediation goals.

- Monitoring the selected response actions to determine if the mixing zone for the copper water quality standard and cobalt cleanup level is protective of cold water biota to meet the substantive NPDES requirements for both Panther Creek and Big Deer Creek. If monitoring indicates that the mixing zones are not protective of cold water biota, alternatives will be evaluated to meet the substantive NPDES mixing zone requirements.

- 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.

4.4 Remedy Implementation

Most of the Remedial Actions specified in the ROD were constructed from 2003 through 2007. The remedial actions constructed during each of these years are described below. Several of the Remedial Actions specified in the ROD have not yet been completed and are discussed in Section 4.4.6. Remedial designs for each year's remedial action construction were generally completed during the spring and early summer of that year's construction.

4.4.1 2003 Construction

- Upper and Lower Blackbird Creek—Overbank construction activities on Upper and Lower Blackbird Creek began in late August 2003 and were completed by early November 2003. Remedial activities included excavation of overbank materials to arsenic cleanup levels (8,500 mg/kg arsenic in the Upper Blackbird Creek, and 4,300 mg/kg arsenic in the Lower Blackbird Creek) with disposal at the West Fork tailings

facility. In selected areas, overbank deposits were stabilized with riprap to avoid mobilization during high flow events.

- Meadow Creek—Construction of the 7650 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.

- Bucktail Creek—Construction of 4-inch and 6-inch diameter high density polyethylene (HDPE) piping from the upper Bucktail Pumpback Station to the 6930 adit to increase conveyance capacity for contaminated groundwater collected downgradient from the 7000 Dam.

4.4.2 Summer 2004 Construction

- Overbank Deposits—Overbank deposits were remediated along Panther Creek from mid-August through September, 2004. Contaminated soils were excavated and hauled to the West Fork Tailings Impoundment for disposal. Depending on location, clean replacement soils were spread over the excavated areas and re-vegetated. Overbank deposits were remediated along lower Panther Creek at the Hade, Rogers, and Shook properties. Also, overbank deposits were remediated at the Panther Creek Inn and Campground in areas where removals were not conducted during the Early Actions in 1998.

- Lower Blackbird Creek—Contaminated in-stream and overbank deposits were removed from the Blackbird Creek channel downstream from the Panther Creek Road bridge. In addition, earthen containment berms and deflector structures were constructed along the Blackbird Creek channel in this reach to reduce the potential for channel migration and erosion.

4.4.3 Fall 2004-Winter 2005 Construction

Construction was begun on several elements of the remedial actions in fall of 2004 and continued into early 2005 until construction was shut down by winter weather. The construction elements installed during the fall of 2004 and early 2005 included:

- Upper Blackbird Creek—Construction of a new pumping well down gradient from the groundwater cutoff wall near the WTP, with piping to the WTP. This well collects contaminated groundwater that bypasses the cutoff wall and directs it to the WTP for treatment.

- Upper Bucktail Creek—The eastern embankment section of the upper Bucktail Creek sediment dam was removed to expose the native subgrade soils and seeps/springs along the east side of the drainage. Excavated soils were placed as embankment fill upgradient of the western part of the dam, and to establish a temporary diversion dam upgradient of the fill area. Seep collection structures with associated piping were installed to collect contaminated seeps and direct their flow to the lower Bucktail pumping station.

- Overbank Deposits Along Panther Creek—High flows during the spring of 2003 resulted in mobilization of arsenic-contaminated materials along Blackbird Creek with

transport downstream and re-deposition at areas along Panther Creek that had been previously cleaned up during the Early Actions. Testing indicated that some of these re-deposited overbank materials contained arsenic above the cleanup levels and therefore needed to be removed. Overbank deposits were excavated from the Cobalt Townsite, Noranda Pastures, and Sillings property and were hauled to the West Fork Tailing Impoundment for disposal. A 12-inch layer of clean fill material was subsequently placed in selected portions of the removal areas.

4.4.4 2005 through 2006 Construction

The following remedial action construction activities were completed during the 2005 and 2006 construction seasons. This construction was originally planned to be completed during the 2005 construction season, but portions of the construction had to be delayed until the 2006 construction season due to the onset of winter weather in 2005.

4.4.4.1 Bucktail Creek Construction

- Re-construction of the Bucktail Creek channel through Upper Bucktail Sediment Dam removal area.
- Construction of seepage collection structures for three contaminated seeps between the Upper Bucktail Sediment Dam and 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 Pumping Station and associated piping to pump contaminated waters to the upper Bucktail Pumping Station.
- Modifications to the upper Bucktail Pump Station to handle increased flows.

4.4.4.2 Blackbird Creek Construction

- The walls of the concrete channel conveying clean waters of Blackbird Creek were damaged by high groundwater and winter freeze-thaw conditions in the area upgradient from the groundwater cutoff wall and at the confluence of Blackbird Creek and Meadow Creek. Significant repair actions were required to address this problem including: excavation of the soils adjacent to the channel; placement of drain piping at the base of the channel walls; backfill adjacent to the channel with free-draining talus rock materials; insulation of the channel and talus materials to reduce freezing potential in the backfilled materials; installation of steel struts at the top of the channel; and instrumentation to detect future movement of the channel walls during freeze-thaw conditions.
- It was discovered that an old concrete culvert beneath the fill materials adjacent to the WTP was carrying water contaminated with high concentrations of cobalt and copper. A manhole over this culvert was modified to collect the contaminated waters, and a pump and piping system was installed to pump the waters to the WTP for treatment.

4.4.4.3 Overbank Deposits Along Panther Creek

Overbank deposits were removed from two targeted areas at the Rufe Property along lower Panther Creek. Excavated materials were hauled to the West Fork Tailings Impoundment for disposal. The removal areas were backfilled with clean fill and reseeded.

4.4.5 2007 Construction Summary

There was minimal construction performed during the 2007 construction season, mainly to complete and refine construction elements begun in previous years. This construction included completion of the Blackbird Creek channel wall modifications, and modifications to the pumping control system at the Lower Bucktail Pumping Station to correct a problem with cavitation during pump startup.

4.4.6 Remedial Actions Not Yet Completed

There is one remedial action and a number of contingent actions identified in the ROD that have not yet been constructed. These actions are discussed below.

4.4.6.1 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 required because modeling conducted during the Feasibility Study indicated that remedial actions in upper Bucktail Creek cannot be effective enough such that water quality cleanup levels can be met in South Fork Big Deer Creek. The diversion pipeline will extend from the vicinity of the Lower Bucktail Sediment Dam to Big Deer Creek downstream from the South Fork Big Deer Creek (see Figure 3-2). By removing the metals loads coming from Bucktail Creek, the ROD concluded that water quality cleanup levels are 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 naturally recover.

The Bucktail diversion pipeline has not yet been constructed because there are residual metals in the in-stream sediments and overbank deposits along Bucktail Creek downstream from the remedial actions in upper Bucktail Creek. It is assumed that the loads to Bucktail Creek surface waters from these residual metals will be reduced over time as the sediments and deposits are allowed to naturally recover along Bucktail Creek. However, the extent of metals loadings from the residual materials is unknown. If monitoring indicates that the residual materials would cause continuing exceedances of water quality cleanup levels in Big Deer Creek, contingent actions were identified in the ROD to address the potential loads from these residual materials. These contingent actions include removal of the residual materials along Bucktail Creek or construction of a passive or semi-passive treatment system for Bucktail Creek waters prior to discharge into Big Deer Creek. If the treatment system is chosen, this could alter the routing of the diversion pipeline.

EPA therefore decided to schedule the construction of the bypass pipeline to be three years following the construction of the upper Bucktail Creek remedial actions to allow the effectiveness of the upper Bucktail Creek remedial actions to be determined and to allow the residual materials along Bucktail Creek to begin to naturally recover. If monitoring during this period (2007, 2008, and 2009) indicates that Big Deer Creek can meet water quality

cleanup levels without the contingent actions, the Bucktail diversion pipeline will be constructed to bypass South Fork Big Deer Creek, such that water quality cleanup levels can be met in South Fork Big Deer Creek. If monitoring during the three year period indicates that Big Deer Creek cannot meet water quality cleanup levels, alternatives for contingent actions will be evaluated to address the residual metals loads from Bucktail Creek.

4.4.6.2 Status of Contingent Actions

The status of the contingent actions identified in the ROD is discussed below.

- Actions to reduce the hydraulic head upstream of the cutoff wall on upper Blackbird Creek – Rather than reduce hydraulic head upstream of the cutoff wall, a new pumping well was constructed downstream from the cutoff wall to intercept contaminated water that bypasses the cutoff wall. Water from this well is pumped to the WTP for treatment. This contingent action is completed.

- Increases to the water storage and/or treatment capacity – The BMSG prepared a report to evaluate the need for additional water storage and/or treatment capacity (Golder 2008a). This report concluded that additional measurements were required during a year of greater-than-average snowpack to provide definitive determinations concerning the need for additional storage and/or treatment capacity. The snowpack in 2008 was above average and measurements made during the spring of 2008 will be evaluated to determine if the 2008 snowpack was sufficiently large to provide definitive determinations.

- Additional removal of overbank deposits along Blackbird Creek – EPA has not yet determined if additional removal of overbank deposits along Blackbird Creek will be required.

- Run-on/run-off controls for the cover on the West Fork Tailings Impoundment – 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 the stability of the dam – Monitoring indicates that the water table has risen approximately 10 to 15 feet in the last fifteen years. Stability analyses indicate that the current level of the water table could rise as much as an additional 30 feet before it would threaten the stability of the dam. EPA will continue to monitor the water table.

- Additional collection and treatment of Bucktail Creek seeps, if they result in unacceptable metals loading to Big Deer Creek – The remedial actions in upper Bucktail Creek (see Section 4.4.3 and 4.4.4) have resulted in collection of all identified contaminated springs and seeps along upper Bucktail Creek. It is not likely that additional contaminated springs or seeps will be discovered in the future; however, if any are discovered, they can be connected to the collection system in upper Bucktail Creek.

- Removal of Bucktail Creek sediments and/or overbank materials, or installation of a passive (or semi-passive) treatment system, if water quality goals in Big Deer Creek are not achieved – As described above in Section 4.4.6.1, EPA will monitor water quality in Big Deer Creek, and will determine if these actions are required in the future based on that monitoring.

- 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 – Following construction of the Bucktail Diversion Pipeline, EPA will monitor the water quality in South Fork Big Deer Creek and will determine at that time if alternatives to address metals discharges are required.

- Additional removals along Panther Creek if monitoring following storm events indicates that re-deposition at overbank areas exceed remediation goals–A high flow event occurred during the spring of 2003 that caused unacceptable contamination in several of the overbank areas along Panther Creek. These areas were sampled and the re-contaminated soils were subsequently removed in 2004. Another high flow event has occurred during the spring of 2008 in Blackbird Creek that washed out part of the Blackbird Creek road that may contain contaminated material. In addition, the instream sediments and portions of the overbank areas along Blackbird Creek where contaminated material remained were scoured and washed downstream. Based on a reconnaissance by IDEQ, the Forest Service, and EPA's contractor, there has been deposition in overbank areas along Panther Creek downstream from Blackbird Creek. The BMSG will be required to sample the newly deposited materials and to remove any materials that exceed the cleanup levels. The performance of additional removals of overbank areas along Panther Creek after high flow events, if deemed necessary by EPA, has been incorporated into the final operation and maintenance plan. However, due to the recent flood events in 2003 and 2008, additional measures will be evaluated along Blackbird Creek to reduce the amount of contaminated materials released by Blackbird Creek during future large runoff events.

- Monitoring to determine if the mixing zones are protective of cold water biota in Panther Creek and Big Deer Creek – This monitoring has not yet been conducted. EPA anticipates that this monitoring will be conducted in Panther Creek during 2009 and in Big Deer Creek after construction of the Bucktail Creek Diversion Pipeline. The pipeline construction is currently scheduled for 2010, so it is anticipated that Big Deer Creek mixing zone monitoring will be conducted in 2011.

- 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 cleanup levels in Big Deer Creek–The potential sources of these dissolved copper loads have been studied extensively by the BMSG, in consultation with EPA and the Natural Resource Trustees (see Section 6.1.1.1.2 for additional information concerning these loads). EPA has decided to monitor these loads to determine if there are changes in these loads or their characteristics over time, and to determine if the water quality cleanup levels can be achieved without additional remedial actions. If

water quality cleanup levels cannot be achieved, and if additional investigations can be identified that can more definitively determine the source(s) of the loads, additional investigations will be conducted in the future.

4.5 Summary of O&M

The BMSG performs operation and maintenance (O&M) and regular monitoring at the site. The O&M is conducted in accordance with a series of O&M plans that have now been consolidated into a site-wide O&M manual (Golder 2007b). In addition to ongoing O&M, the BMSG conducts regular inspections of the various facilities as required by the O&M manual. EPA, Idaho Department of Environmental Quality (IDEQ), and USFS also conduct annual inspections of the above ground facilities and the underground mine facilities. Golder Associates, on behalf of the BMSG, conducts dam safety inspections of the 7000 Dam, the 7100 Dam, and the Lower Bucktail Creek Sediment Dam every five years. In addition, the Idaho Department of Water Resources conducts dam safety inspections, typically every other year.

5.0

5.0 Five-Year Review Process

5.1 Administrative Components

The community on EPA's mailing list and the Potentially Responsible Parties (the BMSG) were notified that EPA would be conducting the Five-Year Review of the Blackbird Mine Site in 2008 in a Fact Sheet dated September 2007. In addition, an announcement that the Five-Year Review would be performed in 2008 was published in the Salmon Recorder-Herald on Sept. 13, 2007. The Five-Year Review was led by Fran Allans, Remedial Project Manager for EPA, and included input from EPA's oversight contractor, and review by the U.S. Forest Servce and the State of Idaho and the Natural Resource Trustees (National Marine Fisheries Service, and National Oceanic and Atmospheric Administration).

Components of the Five-Year Review included:

- Document Review
- Data Review
- Site Inspection
- Community Involvement
- Five-Year Review Report Development and Review

5.2 Document Review

Existing documents relevant to the Five Year Review were reviewed for this report. The type of documents reviewed included: Early Action design and construction completion reports; the RI/FS; the ROD and ESD; Remedial Action construction completion reports; yearly monitoring reports; operation and maintenance documents and reports; and the Environmental Impact Statement (EIS) for the ICP. A complete list of the documents reviewed is included in Section 11.

5.3 Data Review

Monitoring data as required by the Performance Monitoring Plan (Golder 2006b) is summarized in an annual report prepared by the BMSG. The 2007 data for surface water, groundwater, and in-stream sediments was provided in the annual Monitoring Report (Golder 2008b), and is described below. The cleanup levels established in the ROD are described in Section 4.2.2 above.

5.3.1 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 contaminants of concern in surface waters in these streams are arsenic, copper, and cobalt. The arsenic standard of 0.014 mg/L has been consistently met in these three creeks for the past several years, so the monitoring focus has been on copper and cobalt. The surface water cleanup level for dissolved copper is the Idaho Water Quality Standard and is based on hardness. At the typical hardness values seen in these three streams, the chronic cleanup level for dissolved copper varies from about 0.0035 mg/L to about 0.010 mg/L. There is no Idaho Water Quality Standard for cobalt; therefore EPA established a risk-based value of 0.038 mg/L in the ROD as the dissolved cobalt water quality cleanup level. Subsequent to the issuance of the ROD, the BMSG conducted a site-specific cobalt toxicity study. Based on the results of this toxicity study, EPA issued an Explanation of Significant Differences to the ROD (EPA 2007) that revised the surface water cobalt cleanup level from 0.038 mg/L to 0.086 mg/L.

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. Three sampling events are conducted in the spring and one sampling event is conducted during the fall. There are twelve samples collected at each station during each sampling event. The twelve samples are then statistically analyzed to determine if an exceedance of the water quality cleanup levels has occurred. The UAO SOW also established a statistical methodology for determining when the water quality cleanup levels are met in each stream. This methodology essentially requires that there be no unacceptable exceedances of the cleanup levels at any water quality sampling station for a five year period.

Water quality data for 2007 for surface waters are summarized below. The data from 2007 are summarized because this is the most recent year for which validated data are available. It should be noted that 2007 was a comparatively low water year and may not be representative of conditions during an average or above-average water year.

5.3.1.1 Panther Creek

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 each year. In 2007, the highest concentration of dissolved cobalt measured in Panther Creek was 0.053 mg/L while the highest concentration of dissolved copper was 0.007 mg/L. The water quality cleanup levels for both dissolved cobalt and copper were achieved at all Panther Creek stations during all 96-hour sampling events during 2007. This was the first year that water quality cleanup levels have been consistently met at all stations in Panther Creek.

5.3.1.2 Big Deer Creek

Four samples were collected at the station just downstream from the South Fork Big Deer Creek in 2007 (BDSW-03A), and all samples were at or below the water quality cleanup levels for dissolved cobalt and copper. The highest concentration of dissolved cobalt was 0.007 mg/L (cleanup level of 0.086 mg/L), while the highest concentration of dissolved

copper was 0.005 mg/L (cleanup level of 0.005 mg/L at the measured hardness value). However, because remedial actions had only recently been completed in Bucktail Creek upstream from Big Deer Creek, EPA did not require that the rigorous 96-hour sampling events be conducted in 2007. Therefore, it cannot be determined whether Big Deer Creek downstream from South Fork Big Deer Creek (at Station BDSW-03A) is meeting the standards in accordance with the sampling protocols required by the SOW. The rigorous 96-hour sampling will be conducted in Big Deer Creek during 2008 and subsequent years. At the station at the mouth of Big Deer Creek (BDSW-01), the sampling during four sampling events indicated that concentrations of dissolved cobalt and copper were somewhat higher than at BDSW-03A, with highest concentrations measuring 0.010 mg/L for dissolved cobalt (cleanup level of 0.086 mg/L) and 0.008 mg/L for dissolved copper (cleanup level of 0.004 mg/L at the measured hardness value). The higher dissolved copper concentrations at the mouth of Big Deer Creek are due to dissolved copper loads that are introduced along Big Deer Creek. The source of these loads has not been determined with certainty at this time (see Section 6.1.1.1.2 for a discussion of the dissolved copper load increases along Big Deer Creek).

5.3.1.3 South Fork Big Deer Creek

The remedial actions have not yet been completed for the South Fork Big Deer Creek (the Bucktail diversion pipeline). Therefore, EPA did not require that the rigorous 96-hour sampling events be conducted in 2007. Four sampling events were conducted along South Fork Big Deer Creek in 2007. The highest dissolved cobalt concentration was 0.039 mg/L while the highest concentration of dissolved copper was 0.030 mg/L. The water quality cleanup level (0.086 mg/L) was met for dissolved cobalt during all sampling events, but was significantly exceeded for dissolved copper. At the hardness values measured, the peak copper concentration was about 3.1 times the cleanup level of 0.0096 mg/L.

5.3.1.4 Blackbird Creek and Bucktail Creek

The Idaho Department of Environmental Quality (IDEQ) 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 (IDEQ 1997 and IDEQ 2002). The ROD therefore does not require that numeric surface water cleanup levels be met in Blackbird Creek or Bucktail Creek, with the exception of arsenic in Blackbird Creek, where the standard is 0.050 mg/L, based on Idaho's secondary contact recreation standard. Based on 2007 sampling data, the highest concentration of arsenic in Blackbird Creek waters was 0.024 mg/L, therefore the arsenic standard was met.

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 (see Section 4.4.2). Panther Creek met the water quality cleanup levels in 2007, therefore the non-numeric goal for water quality was met in Blackbird Creek. The water quality cleanup levels were not met at all stations in South Fork Big Deer Creek and Big Deer Creek in 2007, therefore the non-numeric goal for water quality has not yet been met in Bucktail Creek.

In addition, the non-numeric cleanup 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. Prior to cleanup actions, the benthic macroinvertebrate and fish communities in Blackbird Creek were almost completely eliminated downstream of the mine discharges (Mebane 1994). Macroinvertebrate and fisheries data are available for 2007 (Ecometrix 2008) for Blackbird Creek and Napias Creeks, a nearby similar sized creek, to assess the progress toward this portion of the remedial goal.

Macroinvertebrate sampling conducted in Blackbird Creek just upstream from Panther Creek found macroinvertebrates to be present at a density of 305 individuals/m^2. The macroinvertebrates found in Blackbird Creek represented 12 taxa, predominately midges and caddis fly larvae. Metals sensitive taxa such as mayflies were lacking. For comparison, in lower Napias Creek macroinvertebrate density was 3,603 individual/m^2 representing 28 taxa, including five species of mayflies.

A total of 86 fish representing five different species were collected in Blackbird Creek in 2007 at the same location as the macroinvertebrate sampling. The majority of those collected in Blackbird Creek were Chinook salmon and rainbow trout. Sampling in Lower Napias Creek found 90 individuals representing two species (rainbow trout and shorthead sculpin).

Based on these data, it appears that the cleanup actions have been effective at promoting recovery of the macroinvertebrate community. Blackbird Creek currently supports a modest macroinvertebrate community in terms of density and diversity, compared to nearby streams such as Napias Creek. However, Blackbird Creek still lacks metals sensitive taxa, such as mayflies. It is also clear that fish, including salmonids, are now capable of using Blackbird Creek habitat. Therefore, the non-numeric goals for Blackbird Creek in terms of supporting aquatic life was met.

5.3.2 Groundwater Quality Data

Groundwater quality during 2007 was measured in ten wells within the Blackbird Creek drainage. Five wells are located near the WTP and five wells are located within and downgradient from the West Fork Tailings Impoundment. The contaminants of concern in groundwater at the site include arsenic, cobalt, and copper.

- WTP Wells—The measured concentrations of arsenic ranged from 0.005 mg/L to 0.081 mg/L in the wells near the WTP. Concentrations of cobalt ranged from 0.84 mg/L to 5.6 mg/L. Concentrations of copper ranged from 0.024 mg/L to 7.8 mg/L. The highest concentrations were significantly above the maximum contaminant level (MCL) or risk-based level for arsenic, cobalt, and copper (MCL for arsenic is 0.010 mg/L and for copper is 1.3 mg/L; there is no MCL for cobalt, however the site-specific risk based level is 1.53 mg/L).
- West Fork Tailings Impoundment Wells—The measured concentrations of arsenic ranged from 0.005 mg/L to 0.070 mg/L in the wells at the West Fork Impoundment. Concentrations of cobalt ranged from 0.01 mg/L to 4.3 mg/L. Concentrations of copper ranged from 0.001 mg/L to 0.004 mg/L. The highest concentrations were significantly above the MCL or risk-based level for arsenic and cobalt, and below the MCL for copper.

Groundwater quality is not regularly monitored in the Bucktail Creek drainage. The most recent groundwater quality monitoring in the Bucktail Creek drainage was conducted in

2004, in conjunction with design investigations for the groundwater collection system in upper Bucktail Creek. The 2004 data from 13 wells in the Bucktail Creek drainage indicated that concentrations of arsenic ranged from non-detect to 0.003 mg/L. Concentrations of cobalt ranged from non-detect to 5.96 mg/L. Concentrations of copper ranged from non-detect to 14.3 mg/L. The highest concentrations were below the MCL for arsenic and significantly above the MCL or risk-based level for cobalt and copper.

The groundwater at the Blackbird mine is not currently used for drinking water and will be protected from potential future use as a drinking water source through institutional controls (see Section 6.1.3 for a discussion of institutional controls).

5.3.3 Sediment Data

In-stream sediment data for 2007 for Panther Creek, Big Deer Creek and South Fork Big Deer Creek are summarized below. The contaminants of concern for in-stream sediments include arsenic, cobalt, and copper. The in-stream sediment cleanup levels are summarized in Section 4.2.2. For EPA to determine that the sediment cleanup goals have been met, sediment cleanup levels must be met for five consecutive years at all sediment monitoring stations in Panther Creek, Big Deer Creek, and South Fork Big Deer Creek.

- Panther Creek—Sediment data were collected from seven sampling stations along Panther Creek downstream from the mouth of Blackbird Creek. The arsenic concentrations ranged from 8 to 108 mg/kg (cleanup level of 35 mg/kg). Cobalt concentrations ranged from 44 to 317 mg/kg (cleanup level of 80 mg/kg). Copper concentrations ranged from 33 to 267 mg/kg (cleanup level of 149 mg/kg).
- Big Deer Creek—Sediment data were collected from three stations located downstream of the mouth of South Fork Big Deer Creek. The arsenic concentrations downstream from South Fork Big Deer Creek ranged from 9 to 14 mg/kg (cleanup level of 35 mg/kg). Cobalt concentrations ranged from 52 to 86 mg/kg (cleanup level of 80 mg/kg). Copper concentrations ranged from 239 to 508 mg/kg (cleanup level of 149 mg/kg).
- South Fork Big Deer Creek—Sediment data were collected from one station located downstream of the mouth of Bucktail Creek. The arsenic concentration downstream from Bucktail Creek was 65 mg/kg (cleanup level of 35 mg/kg). Cobalt concentration was 273 mg/kg (cleanup level of 436 mg/kg). Copper concentration was 2,510 mg/kg (cleanup level of 637 mg/kg).

In general, concentrations of contaminants of concern in sediments in Panther Creek, South Fork Big Deer Creek, and Big Deer Creek vary considerably, with many samples being greater than the sediment cleanup levels established in the ROD. Sediment monitoring over time indicates that there has been a slow improvement in sediment quality downstream from the mine. However, definitive trends in sediment quality cannot be established due to the considerable variability in sediment quality, both spatially and temporally.

The non-numeric cleanup goals for Blackbird Creek and Bucktail Creek are to improve sediment quality such that cleanup levels can be met in the downstream creeks that have numeric sediment cleanup levels. Because the sediment cleanup levels were not

consistently met downstream from Blackbird Creek and Bucktail Creek in 2007, the non-numeric sediment goals have not yet been met for Blackbird Creek and Bucktail Creek.

5.4 Site Inspection

EPA conducts regular site inspections at the Blackbird Mine site to inspect remedial action construction activities and to review the ongoing operation and maintenance at the site. These inspections are typically conducted in the autumn of each year, and the most recent inspection was conducted in October 2007. 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 2007 to be sufficient for the purposes of the Five Year Review.

5.5 Community Involvement

5.5.1 Community Interviews

Interviews were conducted with several members of the local community, which includes property owners along Panther Creek downstream from Blackbird Creek. Interviews were conducted between May 28, 2008 and July 14, 2008. The results of these interviews are included in Appendix B.

Comment:

One issue raised by a property owner during the interviews indicated that the BMSG does not receive sufficient oversight by the EPA.

Response:

EPA is assisted in its oversight role through frequent on-site visits by IDEQ and the USFS. EPA is in regular communication with the IDEQ and the USFS and addresses issues raised by these agencies regarding oversight of BMSG activities as they occur.

Comment:

Another issue raised by a property owner concerned sampling subsequent to subsurface construction on their property. The owner stockpiled excavated subsurface soils on the ground adjacent to the excavation. After backfilling, the BMSG did not sample surface soils under stockpile areas to determine if the surface soils had become contaminated by the stockpiled soils..

Response:

The surface soils in the stockpile areas were sampled by the BMSG the week of July 21st 2008.

5.5.2 Input from Natural Resource Trustees

EPA received comments on a draft of this Five Year Review from NOAA and IDEQ. Copies of the letters from these agencies are included in Appendix B.

NOAA on behalf of the Natural Resource Trustees (NOAA and USFS) provided comments on the draft Five- Year Review Report. The comments from NOAA were primarily editorial and have been incorporated into the text of the Five Year Review. In addition, their letter stated that they concur with the conclusions of the Five-Year review.

The comments from IDEQ are addressed below.

IDEQ Comment *– The recent water quality data collected at the site may not be entirely representative of site conditions because three of the last four years have had lower than average snow pack.*

Response – EPA acknowledges that recent snow packs at the site have been lower than normal. EPA will continue to monitor the water quality sampling results to determine how the runoff during an average or above-average water year affects the water quality in area creeks.

IDEQ Comment *– IDEQ believes that significant portions of the dissolved copper loads along Big Deer Creek may be derived from overbank deposits along Big Deer Creek.*

Response – As noted in Section 6.1.1.1.2, EPA agrees that a portion of the dissolved copper loads along Big Deer Creek may be derived from overbank deposits. However, the studies conducted by the BMSG, in consultation with EPA, the State, and Trustees, determined that only a portion of the observed loads could be attributable to the overbank deposits. It could not be determined with certainty whether this portion was significant enough to cause an exceedance. As noted in Section 6.1.1.1.2 and in Section 8.0, EPA will monitor the dissolved copper loads along Big Deer Creek to determine if there are changes to the loads or their characteristics over time, and to determine if the copper water quality cleanup level can be met in Big Deer Creek. If the Big Deer Creek loads continue to result in exceedances of the water quality cleanup level, and if additional investigations can be identified, they will be conducted.

IDEQ Comment *– IDEQ sampling indicated that the dissolved cobalt water quality cleanup level was exceeded in Panther Creek in March 2008. The IDEQ data indicated that the concentrations of dissolved cobalt were correlated with the concentrations of iron and IDEQ therefore suggested a low-cost treatment system for removal of iron.*

Response – Temporary spikes of dissolved cobalt concentrations above the cleanup level of 0.086 mg/L were observed in Panther Creek during the early spring of 2002. EPA therefore required monitoring of Panther Creek water quality during the early spring periods in 2003 through 2007. The monitoring during these years did not show a recurrence of the temporary dissolved cobalt spikes observed during 2002. Therefore, in October 2007, EPA approved a discontinuation of the early spring cobalt sampling. However, based on the spring 2008 data from IDEQ, EPA will consider re-instating the early spring monitoring for cobalt. EPA will also consider modifying the sampling protocols to better define the timing of the cobalt loads and to better define the sources of the loads that result in the temporary cobalt spikes. Depending on the results of this sampling, treatment of iron and/or cobalt may be one of the options considered.

IDEQ Comment *– IDEQ is concerned about the long term efficacy of the Blackbird Creek clean water channel near the WTP. This is because recent modifications and annual maintenance have been required to keep the channel in good working order.*

Response—EPA shares IDEQ's concerns regarding the clean water channel. As noted in Section 8.0, EPA will continue to monitor the condition of the clean water channel. If the recent modifications are not effective at correcting the conditions that resulted in damage to the channel, it may be necessary to replace the channel.

5.5.3 Input from Blackbird Mine Site Group

An interview was conducted with Dave Jackson and Dan Myers, who represent the BMSG, on May 29, 2008. The results of this interview are included in Appendix B.

5.5.4 Input from Formation Capital Corporation

As described in Section 3.2.3, Formation Capital Corporation (FCC) is in the process of permitting a cobalt and copper mine (the Idaho Cobalt Project or ICP) within and adjacent to the Blackbird Mine site. On April 1, 2008, FCC submitted comments to EPA for consideration during the Five Year Review process. EPA has reviewed FCC's comments in the context of the scope and purpose of a Five Year Review, which is a review *"...to evaluate the implementation and performance of a remedy in order to determine if the remedy is, or will be, protective of human health and the environment."* (Section 121[c] of CERCLA). EPA reviewed and considered comments and supporting information presented by FCC that were relevant to the adequacy or protectiveness of the selected remedy for the Five Year Review, and for those issues we have provided a response below. Other issues raised by FCC, such as, requirements/conditions for approval of FCC's plan of operations, conditions of a proposed NPDES permit for discharges from the ICP, and questions about financial assurance requirements of the UAO are not relevant to the Five Year Review process and are not specifically responded to below. A copy of the FCC comments is included in Appendix A.

5.5.4.1 Blackbird Mine is out of Compliance with the 1995 NRDA Consent Decree's Copper Ambient Water Quality Criteria

FCC Comment—*FCC commented that the Blackbird Mine Site is in violation of the 1995 Consent Decree because the mine continues to release hazardous substances that cause violations of ambient water quality standards. FCC commented that the 1995 Consent Decree contained a provision requiring the dissolved copper water quality standard to be achieved at specified sampling stations in Panther Creek and Big Deer Creek for three consecutive years prior to January 2005 (or a shorter time period as determined by the natural resource trustees) in order to facilitate the reintroduction of salmon, an activity to be overseen by the natural resource trustees. FCC commented that Panther Creek is not yet meeting the copper water quality standard in both creeks, thus the consent decree is being violated and FCC contends that CERCLA is thus being violated.*

Response—The 1995 Consent Decree was primarily a settlement of the natural resource damage claims brought by the State of Idaho and the United States and is generally referred to as a NRDA Consent Decree. As summarized by FCC, the NRDA Consent Decree contained a provision requiring the copper water quality standard to be achieved at specified sampling stations in Panther Creek and Big Deer Creek for three consecutive years prior to January 2005 in order to facilitate the reintroduction of salmon, an activity to be overseen by the natural resource trustees. The Consent Decree also included other commitments related to natural resource restoration.

The 1995 NRDA Consent Decree requires the Settling Defendants to carry out any response activities at the site, and provides that these response activities will be selected in an EPA ROD and conducted pursuant to separate EPA administrative orders or separate consent decrees not covered by the 1995 Consent Decree (1995 CD at pages 2-3 and paragraph 5[b]). It further states that "[n]othing in this Consent Decree is intended to predetermine or limit EPA's authority to select any Response Actions, including cleanup standards...related to the site." (1995 CD at page 3) In 2002, the Natural Resource Trustees determined that the BMSG was not in compliance with the Consent Decree in regard to the meeting of water quality objectives (1995 CD, Section V.B.5.c). Application of Additional Actions (CD, Section XI) and liquidated damages (CD, Section XXIV) were discussed but not pursued by the Trustees, because the BMSG was conducting EPA-required actions that would lead to the achievement of water quality levels.

CERCLA's mandate, and this Five Year Review, concern the remedy selected in the 2003 ROD and required by an EPA-issued Unilateral Administrative Order (UAO). The 2003 ROD established the State of Idaho's copper water quality standard as one of the cleanup levels for surface waters in Panther Creek, Big Deer Creek, and South Fork Big Deer Creek. EPA developed a cleanup level for cobalt because there is no promulgated water quality standard for cobalt. The ROD also laid out numerous remedial actions necessary to reduce copper and cobalt loadings to those surface waters to provide sufficient reductions to achieve the copper and cobalt water quality cleanup levels in those water bodies. The BMSG has been constructing and implementing the required remedial actions since 2003. Surface water monitoring has shown significant reductions in copper and cobalt in Panther Creek and the other surface waters. The ROD did not contain a specific deadline by which the water quality cleanup levels would have to be achieved, but rather selected numerous actions that would be required, along with long-term operation and maintenance. The actions required by the ROD are anticipated to attain the cleanup levels in a reasonable timeframe. Current monitoring data indicates favorable downward trends in chemicals of concern in relevant surface waters (see Section 5.3.1 above and Section 6.1.1.1 below).

5.5.4.2 The Blackbird Remedy Does Not Meet Applicable Water Quality Standards

<u>FCC Comment</u>– The FCC comments indicate that the Blackbird Mine remedy is "...out of compliance with CERCLA standards...." in that it does not meet applicable water quality cleanup levels at three locations: 1) Panther Creek downstream from Big Deer Creek; 2) Big Deer Creek downstream from South Fork Big Deer Creek; and 3) South Fork Big Deer Creek.

<u>Response</u>–EPA's ROD established surface water quality cleanup levels for copper based on the promulgated Idaho Water Quality Standard for dissolved copper for aquatic life listed in IDAPA 58.01/02.210 and established a site-specific cleanup level for dissolved cobalt. The dissolved copper standard varies based on hardness, and at the hardness values typical for Panther Creek, Big Deer Creek, and South Fork Big Deer Creek, the standard varies from approximately 0.0035 mg/L to 0.010 mg/L. The dissolved cobalt cleanup level is based on site-specific biological studies and was set at 0.086 mg/L by EPA through an Explanation of Significant Differences (EPA 2007). The water quality trends for Panther Creek, Big Deer Creek, and South Fork Big Deer Creek are discussed separately below.

5.5.4.2.1 Panther Creek downstream from Big Deer Creek. There have been significant improvements in the waters of Panther Creek downstream from Big Deer Creek

as a direct result of the Blackbird Mine remedy. Recent water quality data in this stretch of Panther Creek indicates that the copper and cobalt water quality cleanup levels have been consistently met during all sampling conducted by the BMSG in 2007 (see Section 5.3.1.1 above and Section 6.1.1.1.1 below).

5.5.4.2.2 Big Deer Creek downstream from South Fork Big Deer Creek. Again, there have been significant improvements in the waters of Big Deer Creek downstream from South Fork Big Deer Creek as a direct result of the Blackbird Mine remedy (see Section 5.3.1.2 above and Section 6.1.1.1.2 below), and the cobalt water quality cleanup level is being met consistently. In 2007, the copper water quality cleanup level was met at the station just downstream from South Fork Big Deer Creek (Station BDSW-03A). However, the copper water quality cleanup level is not yet being consistently met in all reaches of Big Deer Creek. This is because there are dissolved copper loads that are introduced to Big Deer Creek between Station BDSW-03A and Panther Creek, primarily during the spring. These loads typically result in an increase of dissolved copper concentrations of 0.003 to 0.006 mg/L in Big Deer Creek between Station BDSW-03A and Panther Creek (see Section 6.1.1.1.2 for a further discussion of these loads). It is unknown whether these loads will result in exceedances of the copper water quality cleanup level in Big Deer Creek in the future. These loads will be monitored to determine if there are changes in these loads or their characteristics over time.

5.5.4.2.3 South Fork Big Deer Creek. The water quality cleanup level for dissolved cobalt is currently being met in South Fork Big Deer Creek; however, the dissolved copper cleanup level is not being met. It is anticipated that the dissolved copper cleanup level can be met once the diversion pipeline is constructed to bypass the waters of Bucktail Creek around South Fork Big Deer Creek. As described in Section 4.4.6.2 above, the construction of the Bucktail diversion pipeline has been scheduled to be completed three years after completion of the remedial actions in upper Bucktail Creek. Once the waters of Bucktail Creek are bypassed around South Fork Big Deer Creek and the contaminated sediments along South Fork Big Deer Creek are allowed to naturally recover, it is anticipated that the water quality cleanup levels will be met in the South Fork Big Deer Creek.

5.5.4.3 The Remedial Actions at the Blackbird Water Treatment Plant and at the West Fork Tailings facility are Inadequate

FCC Comment—FCC indicated that there is a "compliance problem" with dissolved copper in Panther Creek downstream from Big Deer Creek, that this problem is "substantially derived" from copper loads in Blackbird Creek, and that the copper loads in Blackbird Creek are due to inadequate remedial actions at the Blackbird Water Treatment Plant (WTP) and at the West Fork Tailings impoundment.

Response—Each of the issues raised in the FCC comment is addressed below.

- Panther Creek Water Quality Downstream from Big Deer Creek. As noted in Section 5.3.1.1 above, the dissolved copper water quality cleanup level was consistently met in Panther Creek downstream from Big Deer Creek during all sampling events in 2007. In fact, the dissolved copper concentrations in Panther Creek downstream from Big Deer Creek are often considerably lower than the copper water quality cleanup level.

- Copper Loads from the WTP and the West Fork Tailings Impoundment. The WTP utilizes a high density sludge treatment process, which is the standard of the industry for metals treatment. The effluent standards for the WTP have been set low enough such that the effluent will not cause exceedances of the water quality cleanup levels in Panther Creek. In addition, the dissolved copper loads from the West Fork Tailings Impoundment are very small and are not sufficient to cause exceedances of the water quality cleanup levels in Panther Creek.

Based on 2007 data, there were no exceedances of the copper water quality cleanup level in Panther Creek downstream from Big Deer Creek, and there is no evidence that the combined loads from the WTP and from the West Fork Tailings Impoundment are causing exceedances of the water quality cleanup levels in Panther Creek. Therefore, based on existing information, the remedy is functioning as anticipated and the remedial actions at the WTP and the West Fork Tailings Impoundment are adequate.

5.5.4.4 The BMSG Maintains That There is No Scientific Evidence That the Blackbird Remedy Will Achieve Copper Water Quality Cleanup Goals During the Life of the ICP

FCC Comment—This comment from FCC is based on a comment submitted by the BMSG to the USFS during the public comment period on the draft Environmental Impact Statement (DEIS) for the ICP. The FCC comment reiterates the BMSG position that there is "no scientific basis" for the assumption that the copper water quality cleanup levels will be met in area creeks during the 13 year projected life of the ICP.

Response—EPA's interpretation is that the BMSG comment was relative to an assumption made in the DEIS that water quality cleanup standards, particular copper, would be achieved in South Fork Big Deer Creek and in Big Deer Creek during the thirteen year life of the proposed ICP

First, a statement made by the BMSG in the context of public comment on the draft EIS for the ICP is not directly transferable to implementation of the 2003 ROD at Blackbird Mine. EPA cannot respond for the BMSG and will not attempt to here. However, EPA is aware of the information and analysis conducted on the environmental impacts of the ICP. The USFS technical consultant utilized a sophisticated model known as the Dynamic Systems Model (DSM) to predict potential water quality impacts in Bucktail Creek, South Fork Big Deer Creek and Big Deer Creek from the ICP for the various alternatives evaluated in the DEIS using several different assumptions concerning schedule and mitigation measures. An important requirement of the DSM was to establish baseline conditions for water quality against which to model potential water quality impacts. The DSM was set up to predict water quality impacts during several time frames of the ICP (for example, initial construction, full-scale mining operation, and post-mining).

It was necessary to make assumptions of future water quality in Big Deer Creek for the DSM evaluations. The BMSG's comment related to the assumptions used in the modeling effort. Based on modeling conducted in the Blackbird Mine Feasibility Study and on best professional judgment, it was assumed that the copper water quality cleanup levels would be met in Big Deer Creek approximately three years after completion of the Bucktail Creek remedial actions. Similarly, it was assumed that the copper water quality cleanup levels would be met in South Fork Big Deer Creek approximately three years after completion of

the Bucktail Creek Diversion Pipeline. Based upon the remedial action schedule in place at the time, these dates were 2009 for Big Deer Creek and 2012 for South Fork Big Deer Creek. Actual completion of the Bucktail Creek remedial actions has subsequently required these estimated dates to be pushed back by one year to 2010 and 2013, respectively. It should be noted that the Blackbird Mine ROD did not contain a date certain by which water quality cleanup levels need to be met. The estimated dates were developed solely for the modeling effort used as input to the Environmental Impact Statement for the Idaho Cobalt Project.

5.5.4.5 Storage of Contaminated Waters in Blackbird Mine Underground Workings May Cause Contamination to Groundwater and Surface Waters

FCC Comment--Thisis comment purports that the storage of contaminated waters in the Blackbird Mine underground workings poses a threat of contamination to groundwater and to surface waters.

Response--The Blackbird WTP is not normally operated during the winter months and contaminated water from the Bucktail Creek collection system is pumped to the 6930 adit for transport to the 6850 level of the old Blackbird underground workings, where the water is stored for later treatment. As much as 50 acre-feet of water can be stored in the underground workings on the 6850 level. This storage of contaminated waters can result in localized impacts to the groundwater in the vicinity of the Blackbird underground workings; however any potential impacts to localized groundwater do not affect the overall effectiveness of the Blackbird mine remedy. This is because:

- The Blackbird Mine workings act as a sink for groundwater. During the analysis of alternatives for the Early Actions, an evaluation was conducted of the groundwater in the vicinity of the mine workings (Golder 1995). This evaluation concluded that, on a regional basis, the mine workings act as a sink for groundwater surrounding the mine workings (i.e. groundwater flows toward the mine workings rather then exfiltrating from the mine workings), and that the potential for significant amounts of contaminated water exfiltrating from the mine workings was limited. This evaluation also concluded that the limited groundwater that might exfiltrate would come from the lower levels of the mine workings, and that the contaminated groundwater would migrate toward Meadow Creek. There was virtually no potential for groundwater to exfiltrate from the mine workings toward the Bucktail side of the drainage.
- The Blackbird Mine remedy provides for capture of any groundwater that exfiltrates from the mine toward Meadow Creek. Any mine groundwater draining into Meadow Creek upgradient from the 7100 Dam is captured by the 7100 Dam and transported to the WTP for treatment (see Figure 5-1). In addition, one of the Early Actions was the consolidation of waste rock into the historic channels of Meadow Creek and Blackbird Creek between the 7100 Dam and the WTP. The waste rock is capped with a low-permeability soil cap and the surface waters of Meadow Creek and Blackbird Creek are transported across the top of the soil cap in concrete-lined channels. Underlying the cap is a system of drainage pipes to collect any groundwater or infiltrating surface water that makes its way under the cap and to transport the water to the WTP. The furthest downgradient extent of the old mine workings is the 6850 adit. This was the lowest level of the mine that had a surface expression (there were two levels of the old mine workings that extended to the 6600 level, but there was no adit associated with these levels and these levels are now permanently flooded). The 6850 adit has been plugged with a concrete plug at the 6850 portal, and this is

the point where stored waters are withdrawn from the mine workings for transport through a pipeline system to the WTP. The 6850 portal is approximately 700 feet upgradient from the groundwater cutoff wall (which is the downgradient end of the collection system beneath the cap). Any contaminated groundwater exfiltrating from the mine workings will tend to flow toward Meadow Creek and Blackbird Creek along the path of least resistance and will be expressed beneath the cap and transported to the WTP. It is extremely unlikely that any exfiltration from the mine would be expressed downgradient from the groundwater cutoff wall. Therefore, any significant contaminated groundwater exfiltrating from the old mine workings is currently captured and treated in the WTP.

- There is no use of the groundwater in the vicinity of the old mine workings. There are no potable wells in the vicinity of the old mine workings, and therefore there is no current human health risk associated with this groundwater. In addition, institutional controls will be implemented to assure that there is no future use of the groundwater in this vicinity (see Section 6.1.3 for a discussion of institutional controls).

In summary, there is a potential for contaminated water to exfiltrate from the waters stored in the old underground workings. However, this contaminated groundwater does not pose an unacceptable risk to human health because there is no current use and potential future human use of the groundwater will be precluded once institutional controls are in place. In addition, the groundwater is collected and treated in the WTP, thereby controlling the risks to the environment. The remedy is therefore operating as intended.

5.5.4.6 BT Bypass Pipeline not Compliant with NPDES

FCC Comment–The FCC commented that the Bucktail diversion pipeline that would collect water from Bucktail Creek and route it around South Fork of Big Deer Creek will be a point source discharge under the Clean Water Act. Thus, the remedy should be to collect Bucktail Creek water and treat that water to meet water quality standards, or EPA must do an ARAR waiver.

Response–The ROD discussed the basis for how the remedy would comply with applicable or relevant and appropriate requirements at Section 13.2. The ROD provides that that the Clean Water Act National Pollutant Discharge Elimination (NPDES) system regulations are relevant and appropriate (not applicable) to the diversion of Bucktail Creek into Big Deer Creek, including the mixing zone provisions of the State of Idaho's water quality standards. Bucktail Creek currently flows into South Fork of Big Deer Creek which flows into Big Deer Creek. Relocating an upstream flow in the same drainage basin without adding pollutants is not regulated by the NPDES program. The diversion pipeline has not yet been designed and, as previously summarized in this review, more monitoring and analyses are required to determine how the diversion pipeline will be designed, and which NPDES regulations will be relevant and appropriate for protectiveness.

6.0

6.0 Technical Assessment

6.1 Question A: Is the Remedy Functioning as Intended?

6.1.1 Remedial Action Performance

No, the remedy is not yet functioning as intended because institutional controls have not yet been fully implemented. However, the remedy does function as intended for those elements that have been completed. It is anticipated that the remedy will function as intended for all elements upon completion of all remedial actions, completion of any potential contingent actions, evaluation and completion of any potential additional measures along Blackbird Creek, implementation of all institutional controls, and following natural recovery of sediments. The discussion of the functioning of the remedy is separated into discussions of water quality, groundwater, in-stream sediments and overbank deposits.

6.1.1.1 Water Quality

There have been significant improvements to water quality in the creeks downstream from the site since initiation of cleanup actions. The improvements vary among the creeks for which water quality cleanup levels have been established in the ROD. The specifics are discussed below (also see Section 5.3.1 for additional information on water quality and for the UAO SOW methodologies for determining when water quality cleanup levels have been met). Water quality data focus on copper and cobalt because the data indicate that the arsenic standard is consistently met in all area streams. The data are provided for 2007 because this is the most recent year for which validated data are available. It should be noted that 2007 was a comparatively low water year and may not be representative of conditions during an average or above-average water year.

6.1.1.1.1 Panther Creek. In Panther Creek, water quality has improved substantially, with peak dissolved copper concentrations downstream from Blackbird Creek decreasing from 0.218 mg/L in 1995 to 0.007 mg/L in 2007. This represents a 97 percent reduction in peak concentrations. Peak dissolved cobalt concentrations at this location have been reduced from 0.273 mg/L in 1995 to 0.053 mg/L in 2007, an 81 percent reduction. Historical concentrations of copper and cobalt in Panther Creek at the stations immediately downstream from Blackbird Creek are shown on Figures 6-1 through 6-3. To determine if water quality cleanup levels are being met in accordance with the UAO SOW, water quality concentrations in Panther Creek are measured at four stations (upstream and downstream from Blackbird Creek and upstream and downstream from Big Deer Creek) during four 96-hour sampling events each year. In 2007, water quality cleanup standards were achieved at all Panther Creek stations (Golder 2008b). From a water quality standpoint in Panther Creek, the remedy is therefore functioning as intended in meeting water quality cleanup levels for 2007. However, based on preliminary unvalidated data, water quality cleanup levels were exceeded in Panther Creek for copper during the high flow event in Blackbird Creek that occurred in the spring of 2008 (see section 4.4.6.2 and 6.1.1.4).

6.1.1.1.2 Big Deer Creek. In Big Deer Creek, water quality has also improved substantially. At 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 0.005 mg/L in 2007. This represents a 98.5 percent reduction in concentrations. Peak cobalt concentrations have been reduced at this location from 0.110 mg/L in 1995 to 0.007 mg/L in 2007, a 94 percent reduction. Historical concentrations of copper and cobalt at this station are shown on Figures 6-4 and 6-5, respectively. Four samples were collected at this station in 2007, and all samples were at or below the water quality cleanup levels. However, because remedial actions had only recently been completed in Bucktail Creek upstream from Big Deer Creek, the rigorous 96-hour sampling events were not conducted in 2007. Therefore, it cannot be determined whether Big Deer Creek is meeting the standards in accordance with the sampling protocols required by the UAO SOW. The rigorous 96-hour sampling will be conducted in Big Deer Creek during 2008 and subsequent years.

There are dissolved copper loads that are introduced to Big Deer Creek between Station BDSW-03A and Panther Creek, primarily during the spring. These loads typically result in an increase of dissolved copper concentrations of 0.003 to 0.006 mg/L in Big Deer Creek between Station BDSW-03A and Panther Creek. The potential sources of these dissolved copper loads have been studied extensively by the BMSG, under EPA and the Natural Resource Trustees oversight (Golder 2003, 2004a, 2004b, 2005, 2006a, and 2007a). The following potential sources were investigated: flushing of copper from leachable overbank deposits and wetted-perimeter soils adjacent to Big Deer Creek; dissolution of copper from in-stream sediments; discharges of deep bedrock groundwater; surface water or shallow groundwater flow from naturally mineralized areas along Big Deer Creek; and contributions of surface water or shallow groundwater from side drainages. Of these potential sources, the investigations determined that only the overbank deposits and wetted-perimeter soils could be providing significant copper loading. However, it was determined that the loads from the overbank deposits and wetted perimeter sources were insufficient to cause more than about half of the observed copper load increases in Big Deer Creek. The source and significance of the remainder of the loads could not be determined with certainty. Depending on the effectiveness of the remedial actions along Bucktail Creek, the loads from the overbank deposits and wetted perimeter sources may not be sufficient to cause exceedances of the copper water quality cleanup levels in Big Deer Creek in the future. Therefore, EPA decided to monitor these loads to determine if there are changes in these loads or their characteristics over time, and to determine if the water quality cleanup levels can be achieved without additional remedial actions. If water quality cleanup levels cannot be achieved, and if additional investigations can be identified that can more definitively determine the source(s) of the loads, additional investigations will be conducted in the future.

It is anticipated that the water quality standards will be met in Big Deer Creek at Station BDSW-03A immediately downstream from South Fork Big Deer Creek within the next several years and the remedy will function as intended. Because of the copper loads between Station BDSW-03A and Panther Creek, it cannot be determined at this time if the water quality standards will be consistently achieved in all reaches of Big Deer Creek.

6.1.1.1.3 South Fork Big Deer Creek. Water quality has also improved substantially in South Fork Big Deer Creek. Peak concentrations of dissolved copper have been reduced at the furthest downstream station in South Fork Big Deer Creek (SFSW-01) from 1.340 mg/L in 1995 to 0.030 mg/L in 2007. This represents a 98 percent reduction in concentrations. Peak dissolved cobalt concentrations have been reduced at this location from 0.871 mg/L in 1995 to 0.038 mg/L in 2007, a 96 percent reduction. The cobalt concentrations in 2007 were all significantly lower than the standard of 0.086 mg/L. However, the copper concentrations were substantially above the standard in 2007, averaging about 3.7 times the standard at the hardness concentrations measured.

It is anticipated that the water quality standards can be met in South Fork Big Deer Creek once the diversion pipeline is constructed to bypass the waters of Bucktail Creek around South Fork Big Deer Creek (see Section 4.4.6.2 for a discussion of the diversion pipeline). Once the waters of Bucktail Creek are removed from South Fork Big Deer Creek, and contaminated sediments along the creek have been allowed to naturally recover, it is anticipated that the water quality cleanup levels will be met in South Fork Big Deer Creek and the remedy will function as intended. However, if water quality levels are not met, there is a contingent action to perform additional investigations on metal discharges from groundwater and/or overbank deposits along South Fork Big Deer Creek and to evaluate alternatives to address these discharges if deemed necessary (see Section 4.4.6.2 for a description of contingent actions).

6.1.1.1.4 Blackbird Creek and Bucktail Creek. Monitoring in Blackbird Creek in 2007 indicated that there had been no exceedances of the surface water cleanup level for arsenic (0.050 mg/L). With the exception of 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 have determined that certain uses and water quality criteria cannot be attained on these creeks (see Section 5.3.1.4) 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. Panther Creek met the water quality cleanup levels in 2007 and Blackbird Creek supports aquatic life at levels similar to nearby reference streams, therefore the non-numeric goal for water quality was met in Blackbird Creek and the remedy is functioning as intended. The water quality cleanup levels were not met at all stations in South Fork Big Deer Creek and Big Deer Creek in 2007, 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

6.1.1.2 Groundwater

As noted in Section 5.3.2, monitoring wells at the mine indicate that groundwater at the mine does not consistently meet maximum contaminant levels or risk-based levels for arsenic, cobalt, and copper. The groundwater at the mine is not currently used for drinking water and will be protected from future use as a drinking water source through institutional controls (see Section 6.1.3). Once the institutional controls are implemented, the remedy will function as intended.

6.1.1.3 Instream Sediments

As noted in Section 5.3.3, data on in-stream sediments in Panther Creek, South Fork Big Deer Creek, and Big Deer Creek vary considerably, with certain of the stations meeting the sediment cleanup levels for some of the parameters (arsenic, cobalt, and copper). There has been slow improvement in the sediments over the past few years, however, the in-stream sediment cleanup levels have not yet been consistently achieved downstream from the mine. Once the sediments are cleaned up through natural recovery, it is anticipated that the remedy will function as intended.

The non-numeric narrative cleanup goals for sediments in Blackbird Creek and Bucktail Creek have also not yet been met because the cleanup goals have not yet been met in the downstream creeks. Once the sediments are cleaned up in the downstream creeks through natural recovery, the remedy in Blackbird Creek and Bucktail Creek will function as intended.

6.1.1.4 Overbank Deposits

All overbank deposits along Blackbird Creek and Panther Creek that posed an unacceptable human health risk due to arsenic contamination from the Blackbird Mine were cleaned up to the soil cleanup levels as part of the Early Actions or Remedial Actions. In addition, overbank areas along Blackbird Creek that were easily subject to re-mobilization with deposition downstream in Panther Creek were either removed or stabilized in-place. Surface soil concentrations are therefore currently protective of human health based on data through 2007. Institutional controls are in place for the downstream private properties to protect the remedy if contaminated subsurface soils are brought to the surface in the future (see Section 6.1.3 below for a discussion of institutional controls).

There is a potential that arsenic-contaminated materials could be transported down Blackbird Creek during high flow events in the future and re-contaminate overbank areas along Panther Creek. Therefore after high flow events, the UAO SOW indicates that EPA will determine if there is a reasonable risk that the overbank areas along Panther Creek have been re-contaminated with arsenic above the cleanup levels. If EPA makes this determination, the BMSG is required to sample the overbank areas. If any overbank areas have been re-contaminated with arsenic at unacceptable concentrations, the BMSG will be required to clean up the re-contaminated areas. A high flow event occurred during the spring of 2003 that caused unacceptable contamination in several of the overbank areas along Panther Creek. These areas were sampled and the re-contaminated soils were subsequently removed in 2004. Another high flow event has occurred during the spring of 2008 in Blackbird Creek and, based on a reconnaissance by IDEQ, the Forest Service and EPA's oversight contractor, there has been deposition in overbank areas along Panther Creek downstream of Blackbird Creek. The BMSG will be required to sample the newly deposited materials and to remove any materials that exceed the cleanup levels. The performance of additional removals of overbank areas along Panther Creek after high flow events, if deemed necessary by EPA, has been incorporated into the final operation and maintenance plan.

All overbank areas have been cleaned up along Blackbird Creek and Panther Creek and the measures described above are in place to assure the protectiveness of the cleanup. It was anticipated in the ROD that high flow events could re-mobilize contaminated materials

along Blackbird Creek and re-deposit them at overbank areas along Panther Creek. Therefore, the remedy in the overbank areas is functioning as intended by the ROD. However, due to the recent flood events in 2003 and 2008, additional measures will be evaluated along Blackbird Creek to reduce the amount of contaminated materials released by Blackbird Creek during future large runoff events.

6.1.2 Operation and Maintenance

The BMSG performs operation and maintenance (O&M) at the site. The O&M is conducted in accordance with a site-wide O&M Manual (Golder 2007b). In addition to ongoing O&M, the BMSG conducts regular inspections of the various facilities as required by the O&M manual. EPA, IDEQ, and the USFS also conduct annual inspections of the above ground facilities and the underground mine facilities. The O&M and inspection procedures are adequate to maintain the protectiveness of the remedy.

Costs for operation and maintenance since 2002 are summarized in Table 6-1. These costs were obtained from the BMSG, and O&M costs are not available in the same format prior to 2002. In general, recent O&M costs have been fairly constant from year to year, with the exception of costs for *Civil Engineering Structures and Improvements* in 2006 and 2007. These increased costs were due to work required to fix problems associated with repair of a failure in the backfill of a pipeline to bypass clean water around the 7100 Dam and with high groundwater and freeze-thaw damage to the Blackbird Creek channel near the Water Treatment Plant (WTP). This work has now been completed. If these one-time repair costs are subtracted from the O&M costs shown in Table 6-1, the O&M costs appear to be reasonably stable, indicating that there are no O&M cost increases that could point to potential problems with the remedy as implemented.

There is one element of the O&M costs that will change in the future. Sludge from the water treatment plant (WTP) is currently pumped to an isolated portion of the underground workings, the Hawkeye Ramp, for disposal. At present sludge generation rates, the Hawkeye Ramp will be filled with sludge within the next few years. EPA will direct the BMSG to prepare an evaluation of alternatives for sludge handling and disposal at an alternate location. Following review of this evaluation, EPA will select an alternate sludge handling and disposal scheme. It is likely that the revised sludge handling and disposal scheme will increase O&M costs for the WTP.

Table 6-1
Operations, Maintenance, and Monitoring Costs for the Blackbird Mine Remedy
(Source--Blackbird Mine Site Group)

Description	2002[a]	2004[a]	2005	2006	2007	Yearly Average for 1999-2007[b]
Water Treatment Plant, Pumping, Non-Civil Site Maintenance	$423,492	$502,019	$563,400	$485,326	$454,735	$456,912
Civil Engineering Structures and Improvements	$219,212	$148,992	$154,857	$808,135	$619,378	$384,697
Underground Mine	$98,441	$59,730	$111,046	$59,606	$129,634	$98,777
Monitoring and Reporting	$132,457	$373,705	$273,175	$375,491	$365,297	$258,610
Total O&M Cost	$873,602	$1,084,446	$1,102,478	$1,728,558	$1,569,044	$1,198,997

[a]Costs not available for calendar year 2003

[b]BMSG did not record costs on a calendar year basis prior to 2002. However, total O&M costs are available for the period of 1999 to 2007. This column provides the average yearly O&M costs over that period.

6.1.3 Implementation of Institutional Controls

Section XIX. of the 2003 UAO requires that any Respondent that owns or controls any property within the Site must provide access and they shall implement the institutional controls set forth in the ROD and the SOW, including providing long-term, permanent, enforceable easements or comparable instruments that run with the land and are binding upon future landowners (see Paragraph 70 of the Amendment #1 of the UAO). The UAO also requires that the Respondents refrain from using the Site, or such other property, in a manner that would interfere with or adversely affect the implementation, integrity, or protectiveness of the remedy. Specific restrictions include, but are not limited to, the following:

1) Prohibit the use of contaminated groundwater for drinking water purposes in the Blackbird Creek Drainage Basin and the Bucktail Creek Drainage Basin;

2) Prohibit residential use and intensive recreational use (e.g. camping in excess of 14 days) of property located in the Blackbird Creek Drainage Basin and the Bucktail Creek Drainage Basin containing arsenic in excess of 100 mg/kg; and

3) Restrict construction and related activities that may impact the integrity of the remedy and/or the attainment and maintenance of Performance Standards.

Additionally, the UAO also requires that Respondents use best efforts to obtain access and institutional controls on property not under their ownership and control and that the ICs need to be long-term, permanent, enforceable easements or comparable instruments that run with the land and binding upon future landowners. Additionally, Sections 2.1.1.8, 2.1.2.5, 2.1.3.5 of the Statement of Work provided for the specific purposes and objectives for institutional controls in each of the drainage basins, which were also set forth in the 2003 ROD (see Section 4.3).

Institutional Controls for the downstream privately-owned properties have been put into place. An Idaho Uniform Environmental Covenant was recorded on the Rogers Property on December 10, 2007, which effectuates restrictions consistent with the ROD and 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 soils management program and provide a disposal repository to the landowners if they excavate soils 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 re-contamination 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 re-contamination 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. The first annual notice to the landowners was sent on May 5, 2008.

EPA will oversee and enforce the BMSG's obligations under the UAO and soils management workplan and address private property owners' compliance with procedures and directions for managing contaminated subsurface soils along Panther Creek. The soils management plan is expected to meet the RAOs and be protective.

To date, no institutional control that runs with the land has been implemented on the private properties along Panther Creek, other than the Rogers property. Two property owners have recorded a deed notice on their property. However, discussions to date with certain landowners indicate a reluctance to record a deed notice or covenant on the title of their property which would help assure that future prospective purchasers and/or landowners would be notified of the need to provide access and of the subsurface contamination and the necessary soils management activities.

To date, no institutional control running with the land has been implemented for the mine site or the Cobalt Townsite which is owned by the Blackbird Mine Company [general] Partnership. Negotiations and development of an easement to the USFS for the Cobalt townsite have been ongoing for a significant amount of time. Likewise, discussions and negotiations for placement of a Idaho Uniform Environmental Covenant on the mine have not yet resulted in a recorded covenant. However, the UAO prohibits Respondents from conducting activities inconsistent with the ROD and monitoring and inspections demonstrate that no unacceptable uses or exposures are occurring on those properties. The UAO requirements can be enforced against the current landowners if unacceptable uses or exposures were to occur.

The final Environmental Impact Statement (EIS) for the Idaho Cobalt Project was issued by the USFS on June 12, 2008. The final EIS and Record of Decision includes requirements for modifications to the Plan of Operations (POO) for the Idaho Cobalt Project that will require approval by the EPA and USFS Remedial Project Managers on road designs, or any excavation or construction that could disturb the historic mine wastes or remedial infrastructure. Additional institutional controls are needed on properties controlled by the USFS to protect the remedy. EPA will consult with the USFS and seek to modify its MOU with the USFS to get assurances that administrative procedures are put in place on properties under the control of the USFS to assure protectiveness.

6.1.4 Monitoring Activities

Monitoring activities are extensive at this site and are conducted regularly for water quality, WTP effluent, monitoring wells, in-stream sediments, fish, and benthic organisms. As needed, monitoring is also conducted at the overbank areas along Panther Creek (see Section 6.1.1.2 above). Monitoring is conducted in accordance with the Performance Monitoring Plan for the site (Golder 2006b). The monitoring is adequate to determine the protectiveness and effectiveness of the remedy.

6.1.5 Opportunities for Optimization

The BMSG has been very pro-active at identifying and acting on opportunities for optimization of the remedy. This optimization has included:

- Bucktail Creek Remedy – collection of additional contaminated springs and seeps that were encountered during the construction of collection system for the Lower Bucktail Pumpback Station and modifications to the Lower Bucktail Pumpback Station discharge piping controls to eliminate cavitation during startup.
- Blackbird Creek Remedy – modifications to the WTP to improve operation efficiency and copper effluent quality, construction of groundwater drains along the base of the Blackbird Creek channel to improve the channel and cutoff wall performance, collection of contaminated waters from the old Blackbird Creek pipeline beneath the fill materials adjacent to the WTP, and replacement of the sludge disposal pipeline.

These optimization measures have significantly improved water quality downstream from the remedial actions, which is evidenced by the continuing improvement in water quality in Big Deer Creek and Panther Creek from year to year (see Section 6.1.1). There were no opportunities identified during the Five Year Review process for additional optimization.

6.1.6 Early Indicators of Potential Remedy Problems

Nothing was identified during the preparation of this Five Year Review that would be an early indicator of potential remedy problems.

6.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Still Valid?

Yes, the exposure assumptions, toxicity data, and RAOs are still valid. The cleanup levels established in the ROD are still valid with the exception of the cobalt surface water quality cleanup level. The cobalt surface water cleanup level was changed from 0.038 mg/L to 0.086 mg/L through an Explanation of Significant Difference in 2007, based on site-specific toxicity testing.

6.2.1 Changes in ARARs

There have been no changes in federal or promulgated state standards or criteria that affect the protectiveness of the remedy.

6.2.2 Changes in Exposure Pathways or Land Use

Current and anticipated future land and water uses at or near the Blackbird Mine Site have not changed since the ROD, therefore the exposure pathways evaluated in the risk assessments remain valid at this time.

6.2.3 New Contaminants or Contaminant Sources

No new contaminants or contaminant sources have been identified at the Blackbird Mine site.

6.2.4 Changes in Toxicity or Contaminant Characteristics

Cancer slope factors and reference doses used for contaminants during the human health risk assessment and the development of preliminary removal goal (PRGs) have not changed since completion of the risk assessments. Additionally, ecological effects levels and assumptions used to evaluate the risk to the environment during the ecological risk assessments remain protective.

6.2.5 Changes in Risk Assessment Calculations

EPA has published several new risk assessment guidance documents since the ROD. The following new guidance documents were reviewed to verify that the remedy at the Blackbird Mine Site is valid:

- U.S. Environmental Protection Agency. 2005. *Guidelines for Carcinogen Risk Assessment.*
- U.S. Environmental Protection Agency. 2004. *Risk Assessment Guidance for Superfund–*
- *Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Final.*
- U.S. Environmental Protection Agency. 2002. *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites.*
- U.S. Environmental Protection Agency. 2005. *Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens.*
- U.S. Environmental Protection Agency. 2007. *Framework for Metals Risk Assessment.*

Considering the potential receptors, routes of exposure, and contaminants of concern at the Blackbird Mine Site, newer guidance would not affect the conclusions of the risk assessments or the remedy.

6.2.6 Changes in Remedial Action Objectives

EPA has reviewed the Remedial Action Objectives (RAOs) listed in Section 4.2.1. There have been no changes in the RAOs and the RAOs remain valid.

6.3 Question C: Has Other Information Come to Light that Could Call Into Question the Protectiveness of the Remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

6.4 Technical Assessment Summary

According to the data reviewed, the site inspections, and input from the community, the remedy is functioning as intended by the ROD, with the exception that the Bucktail Diversion Pipeline and any required contingent actions have not yet been constructed. In addition, the BMSG has not yet implemented institutional controls at the Cobalt Townsite and the mine site, and the USFS has not yet implemented institutional controls on USFS properties.

It was anticipated in the ROD that high flow events could re-mobilize contaminated materials along Blackbird Creek and re-deposit them at overbank areas along Panther Creek. Therefore, the remedy in the overbank areas is functioning as intended by the ROD. However, due to the recent flood events in 2003 and 2008, additional measures will be evaluated along Blackbird Creek to reduce the amount of contaminated materials released by Blackbird Creek during future large runoff events.

Once the remaining remedial actions and contingent actions are completed, all institutional controls are put in place, and additional measures along Blackbird Creek have been evaluated and potentially implemented, the remedy will function as intended. Obviously, the remedy requires diligent, long-term operation and maintenance. There have been no changes to the physical conditions of the site that would affect the protectiveness of the remedy. There have been no changes in the toxicity factors for the contaminants of concern that were used in the risk assessments, and there have been no changes to the standardized risk assessment methodology that could affect the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

7.0

7.0 Issues Raised During Five Year Review Process

There were several issues raised during the process of preparing the Five Year Review that could potentially impact the protectiveness of the remedy if these issues are not addressed. These issues include:

Issue	Currently Affects Protectiveness	May Affect Future Protectiveness
There are dissolved copper loads along Big Deer Creek; the sources and significance of these loads could not be determined with certainty (see Section 6.1.1.1.2 for details). These loads may or may not cause exceedances of the copper water quality cleanup levels in portions of Big Deer Creek, depending on the effectiveness of upstream remedial actions.	Yes	Yes
High flows in Blackbird Creek in spring 2008 caused erosion and channel re-alignment along Blackbird Creek, with downstream deposition of potentially contaminated sediments along the banks of Panther Creek.	No	No
Not all of the institutional controls at the site have been implemented. In addition, the USFS has not yet established administrative procedures on USFS properties at the mine site and along Panther Creek (see Section 6.1.3 for details). Currently no unacceptable uses are occurring on the properties. If these institutional controls are not established and implemented, the protectiveness of the remedy may be impacted. Likewise, the long-term effectiveness of the soils management program will require the cooperation and diligence of both the BMSG and the affected landowners to assure no unacceptable exposures occur.	No	Yes

There is one other issue that could effect the protectiveness of the remedy if it occurs and is not adequately addressed--this is the rise in water surface within the West Fork Tailings Impoundment. During the review of the site monitoring data during 2007, EPA observed that the water table had been rising within the tailings at the West Fork Tailings Impoundment. The water table near the dam had risen by approximately 10 to 15 feet from

the time that water surface measurements were first made in 1993. Because of this rise in the water surface within the tailings, EPA required that the BMSG revise the dam stability analyses initially conducted in 2001. Golder Associates conducted the revised stability analyses and determined that the water surface within the tailings could rise an additional 30 to 40 feet within the tailings before it would cause a concern from a dam stability standpoint (Golder 2008c).

8.0

8.0 Recommendations and Follow-up Actions

EPA has identified the following recommendations and follow-up actions to address the issues identified in Section 7 above. EPA will be the agency responsible for oversight of the follow-up actions.

Issue	Recommendations/Follow-up Actions	Party Respon -sible	Mile-stone Date	Affects Protectiveness	
				Curren t	Future
Copper Loads Along Big Deer Creek	EPA will monitor the dissolved copper loads along Big Deer Creek to determine if there are changes to the loads or their characteristics over time, and to determine if the copper water quality cleanup level can be met in Big Deer Creek. If the Big Deer Creek loads continue to result in exceedances of the water quality cleanup level, and if additional investigations can be identified, they will be conducted.	EPA	Evaluate water quality in 4/ 2010 based on 2009 monitoring results	Yes	Yes
Spring 2008 High Flows in Blackbird Creek	EPA will direct the BMSG to sample the materials deposited in the overbank areas along Panther Creek. Depending on the results of this sampling, removals of the deposited materials may be required. EPA will also direct the BMSG to evaluate alternatives for additional measures to reduce the release of materials during high flow events in Blackbird Creek.	BMSG	Sampling in 8/08. Removals in 9 &10/08. Evaluate alts. in 2/09	No	No
Institutional Controls	EPA will continue to work with the BMSG to have the necessary institutional controls implemented at the Cobalt townsite and the mine. If ongoing negotiations and discussions are not successful, an enforcement action to seek	EPA, BMSG, and USFS	12/09 for BMSG property 12/09 for USFS property	No	Yes

	compliance with the UAO may be necessary. In addition, EPA will consult with the USFS and seek to modify its MOU with the USFS to get assurances that administrative procedures are put in place on properties under the control of the USFS to assure protectiveness.				

Regarding the rising water table within the West Fork Tailings Impoundment—the site Operation and Maintenance manual includes a requirement that the water table within the West Fork Tailings Impoundment be monitored quarterly and the results included in the annual monitoring report. EPA will review the water table information provided by the BMSG in the annual monitoring reports. It is unknown if the water table will continue to rise or if the rate of rise will continue at the current rate in the future. If the water table continues to rise and approaches a level of concern (approximately 30 feet higher than 2007 levels), EPA will require that additional stability analyses be conducted at that time. If these stability analyses indicate that stability is a concern, additional remedial measures to address the higher water table will be required.

9.0

9.0 Protectiveness Statements

The remedy at the Blackbird Mine Site is expected to be protective of human health and the environment upon completion of all remaining remedial actions, completion of any required contingent actions, evaluation and completion of any potential additional measures along Blackbird Creek, and implementation of all institutional controls. In the interim, exposure pathways that could result in unacceptable risks to human health are being controlled.

10.0

10.0 Next Review

Because hazardous substances, pollutants, or contaminates remain at the site that are above levels that allow for unrestricted use and unlimited exposure, another Five-Year Review is required. The next Five-Year Review will be conducted no later than August 2013, but may be conducted earlier at USEPA's discretion.

11.0

11.0 Documents Cited and Reviewed

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

CH2M HILL 1998. *Human Health Risk Assessment for the Panther Creek Inn Area of the Blackbird Mine Site*, prepared for the U.S. Environmental Protection Agency, Region 10 by CH2M HILL, September, 1998.

CH2M HILL 1999. *Human Health Risk Assessment for the Panther Creek Overbank Deposit Areas of the Blackbird Mine Site*, prepared for the U.S. Environmental Protection Agency, Region 10 by CH2M HILL, August 1999.

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

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

Ecometrix 2008. Draft *Biomonitoring Study, Panther Creek Watershed, September 2007*, prepared for the BMSG by Ecometrix, Inc., April, 2008.

EPA 2003. *Blackbird Mine Superfund Site Record of Decision*, prepared by Office of Environmental Cleanup, EPA Region 10, February 2003.

Golder 1995. *Analysis of Early Action Alternatives*, prepared for the BMSG by Golder Associates, Inc., April 19, 1995.

Golder 2000. *Terrestrial Ecological Risk Assessment*, prepared for the BMSG by Golder Associates, Inc., September, 1, 2000.

Golder 2001a. *Final Blackbird Mine Site Remedial Investigation*, prepared for the BMSG by Golder Associates, Inc., November 30, 2001.

Golder 2001b. *Addendum to the Blackbird Mine Site Remedial Investigation*, prepared for the BMSG by Golder Associates, Inc., December 28, 2001

Golder 2003. Draft *Technical Memorandum, Spring 2003 Water Quality Results for Lower Big Deer Creek*, prepared for the BMSG by Golder Associates, Inc., August 29, 2003.

Golder 2004a. *Draft Technical Memorandum, Assessment of Lower Big Deer Creek Metals Loading*, prepared for the BMSG by Golder Associates, Inc., February 6, 2004.

Golder 2004b. *Technical Memorandum, Spring 2004 Weekly Big Deer Creek Monitoring*, prepared for the BMSG by Golder Associates, Inc., September 10, 2004.

Golder 2005. *Report on 2004 Assessment of Lower Big Deer Creek Metals Loading*, prepared for the BMSG by Golder Associates, Inc., April 4, 2005.

Golder 2006a. *Report on Assessment of Lower Big Deer Creek Metals Loading*, prepared for the BMSG by Golder Associates, Inc., January 13, 2006.

Golder 2006b. *Performance Monitoring Plan, Blackbird Mine Site*, prepared for the BMSG by Golder Associates, Inc., March 17, 2006.

Golder 2007a. *Final Report on Lower Big Deer Creek 2006 Field Investigations*, prepared for the BMSG by Golder Associates, Inc., March 23, 2007.

Golder 2007b. *Draft for EPA Review, Blackbird Mine Site Operation and Maintenance Manual*, prepared for the BMSG by Golder Associates, Inc., November 13, 2007.

Golder 2008a. Blackbird Mine Site Storage/Treatment Assessment, prepared for the BMSG by Golder Associates, Inc., June 19, 2008.

Golder 2008b. *Draft Report for EPA Review, Blackbird Mine Site 2007 Monitoring Report*, prepared for the BMSG by Golder Associates, Inc., January 31, 2008.

Golder 2008c. *Final Addendum, West Fork Tailings Impoundment Stability Analyses*, prepared for the BMSG by Golder Associates, Inc., March 3, 2008.

IDEQ 1997. *Use Attainability Analysis, Blackbird Creek*, prepared by Christopher Mebane for Idaho Division of Environment Quality and U.S. EPA, September 1997.

IDEQ 2002. *Use Attainability Analysis, Bucktail Creek*, prepared by Christopher Mebane for Idaho Department of Environment Quality, February 2002.

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, 1994.

Mebane 1994. *Preliminary Natural Resources Survey: Blackbird Mine. Lemhi County, Idaho.* National Oceanic and Atmospheric Administration, Office of Resource Conservation and Assessment, Seattle, WA, October 23, 1994.

USFS 2008. *Final Environmental Impact Statement, Idaho Cobalt Project*, prepared by the U.S. Department of Agriculture, Forest Service, June 12, 2008.

Appendixes

Appendix A

Appendix A

Comments Received from Support Agencies and/or the Community

INTERVIEW RECORD

Site Name:	Blackbird Mine		**EPA ID No.:**		IDD980725832
Subject:	Interview with property owners and managers along Panther Creek	**Time:**	1:00 PM	**Date:**	May 28, 2008 and July 7, 2008
Type:	☒ **Telephone**	☐ **Visit**		☐ **Other:**	
Location of Visit:	Teleconference				

Contact Made By:

Name:	Fran Allans	**Title:**	RPM	**Organization:**	EPA-Region 10

Individual Contacted:

Name:	Confidential Owner (owner asked that name not be included in Five Year Review)	**Title:**	N/A	**Organization:**	N/A

Telephone No.:	Confidential	**Street Address:**	Along Panther Creek Road				
E-Mail Address:	N/A	**City:**	N/A	**State:**	ID	**Zip:**	?????

Summary of Conversation

This interview was with the owners and managers of one of the private properties along Panther Creek. The initial interview was with the owners on May 28, 2008, and the subsequent interview was with the managers of the property on July 7, 2008. The owners asked to remain confidential and that the name of the owners not be mentioned in the Five Year Review. The interview consisted of EPA questions and responses by the owners, with clarification by the managers. Each of the questions asked by EPA is repeated verbatim followed by the owner's responses.

Q1: Do you have any thoughts or concerns regarding the cleanup at the mine site or along Panther Creek?

R1: The owners believed that the cleanup was not done properly because not all of the arsenic-contaminated soils were removed and the the clean backfill materials were not comparable to the soils that were removed. The backfill materials had too much gravel and rocks in them and not enough fine materials. The owner also believed that the sediment ponds at the Panther Creek Inn were under-sized and this results in not enough fine sediments to be settled out by the sediment ponds. The owners also believed that Blackbird Creek upstream of the PCI sediment ponds should be returned to more of a natural channel with more natural meanders and less channelization. The owner also stated that the Blackbird Creek Road should be re-aligned and the grade raised in certain areas that are currently subject to flooding and erosion during large flow events in Blackbird Creek.

Q2: Are you aware of any concerns by other members of the community? If so, who should EPA contact to discuss these concerns?

R2: The owners suggested that EPA contact Chuck Fernandez (one of the property owners along Panther Creek) because the owners had heard that Mr. Fernandez was concerned that there may have been re-contamination on his property.

Q3: If you had a cleanup on your property, have you done any sub-surface construction or other activities that could potentially affect the remedy in the vicinity of the cleanup actions on your property? Do you have any plans to do any sub-surface construction in the future? If so, please describe the planned construction.

R3: The owners stated that they had excavated for water lines, sewer lines, and a septic tank on their property, with some of the excavations being as much as six feet deep. The excavated materials were placed back into the trenches or excavations as backfill. No sampling was done of the excavated materials or of the surface soils in the vicinity following construction. According to the managers of the PCI excess soils remaining following construction were removed from the owner's property and transported to the West Fork repository. Clean soils were supplied by the BMSG to use as the top layer of backfill over portions of the excavated areas. The owners stated that the

owners had contacted the BMSG prior to and during construction activities. The BMSG did not offer to conduct any sampling of the ground following the backfilling of the excavated areas.

The owners have plans for future construction that could affect the remedy including construction of footings for a building, additional water and sewer construction, and digging of holes to plant landscaping trees.

Q4: Do you have any concerns or recommendations regarding the BMSG's management of the mine site or of the BMSG's operation and management procedures at the mine site?

R4: The owners were concerned that the BMSG did not address problems as they occur and that the BMSG did not adequately "police" themselves. The owners believed that additional oversight by an appropriate government entity was required to assure that the BMSG follows proper operation and management procedures and institutes proper soils management procedures in the future.

Q5: Do you have any concerns or recommendations regarding the BMSG's management plans for the sub-surface soils at your property or at other properties along Panther Creek?

R5: The owners were aware of the procedures required in the "Draft Work Plan for Management of Subsurface Soils" (see Appendix D) to avoid recontamination during future sub-surface construction. The owners wanted to make sure that the BMSG's obligations under this plan would be complied with (i.e. testing of soils, removal of contaminated soils to a repository, supply of clean replacement soils, etc.).

INTERVIEW RECORD

Site Name:	Blackbird Mine		**EPA ID No.:**		IDD980725832
Subject:	Interview with Blackbird Mine Site Group	**Time:**	10:45 AM	**Date:**	May 29, 2008
Type:	☒ **Telephone**	☐ **Visit**		☐ **Other:**	
Location of Visit:	Teleconference				

Contact Made By:

Name:	Fran Allans	**Title:**	RPM	**Organization:**	EPA-Region 10

Individual Contacted:

Name:	Dave Jackson and Dan Myers	**Title:**	Project Managers	**Organization:**	Blackbird Mine Site Group

Telephone No.:	208-756-6688	**Street Address:**		P.O Box 1645			
E-Mail Address:	blackbirdmine@centurytel.net	**City:**	Salmon	**State:**	ID	**Zip:**	83467

Summary of Conversation

This interview was with Dave Jackson and Dan Myers who represent the Blackbird Mine Site Group (BMSG). The interview consisted of EPA questions and responses by the BMSG. Each of the questions asked by EPA is included below followed by the BMSG's responses.

Q1: The BMSG recently provided EPA with a spreadsheet (Table 6-1) with summaries of operation and maintenance (O&M) costs for the Blackbird remedy from 1999 to 2007. However, the yearly O&M costs were not provided for several of those years. Why were yearly O&M costs not provided for all years?

A1: The BMSG periodically totals the O&M costs at various dates during the year. However, the dates for totalizing O&M costs did not always fall at year's end. Thus, some of the years in the 1999 to 2003 period did not have end of year costs summarized. The total costs for the 1999 to 2007 period are accurate, so an average based on costs for the total period will provide an accurate estimate of average yearly O&M costs. Specific yearly costs are only available for 2002, and 2004 through 2007.

Q2: Have there been unexpected O&M difficulties or costs in the past five years? If so, please describe.

A2: There are two recent O&M items that were not anticipated that have resulted in significant costs to correct. The first of these was a failure in the backfill of the 30-inch pipeline that transports intercepted clean waters around the west side of the 7100 Dam. This resulted in a pipeline break and erosion of some of the backfill materials into the 7100 Dam reservoir. This failure occurred in 2005 and is reflected in the line item for "Civil Engineering Structures and Improvements" in the O&M spreadsheet for 2006. The second item is the work to repair the Blackbird Creek concrete channel upstream from the water treatment plant. The damage to the channel was the result of freeze-thaw conditions in the backfill adjacent to the channel, and the fix has been documented in an Engineering Change Notice (ECN No. 07_01). The costs to make the channel repairs are reflected in the line items for "Civil Engineering Structures and Improvements" in the spreadsheet for 2006 and 2007. The channel repairs are now essentially completed. A review of the O&M costs in the spreadsheet indicates that, if these unexpected costs had not been incurred, the annual yearly O&M costs would be fairly consistent for the 1999 to 2007 period.

Q3: We understand that there has been some damage to facilities along Blackbird Creek as a result of high flows this spring in Blackbird Creek. Please describe this damage and BMSG plans to fix the damage.

A3: The high flows in spring 2008 resulted in: erosion to Blackbird Creek road in several locations; deposition of gravels and re-alignment of the Blackbird Creek channel upstream from the West Fork Tailings Impoundment with loss of the flow measurement station at BBSW-03; filling of the West Fork and PCI sediment ponds with sediments;

erosion of a small portion of the eastern berm of the creek channel in the vicinity of the PCI; and transport of sediments from Blackbird Creek downstream to Panther Creek. The BMSG is still considering potential fixes to address this damage, but will likely include: raising the grade of the Blackbird Creek road or armoring the road embankment in selected locations; removal of the sediments in the sediment ponds; repair of the berm damage near the PCI; and relocation of the flow measurement station BBSW-03. The BMSG is not currently considering stream channel alteration to create additional meanders in Blackbird Creek.

EPA and the BMSG discussed the need to do a reconnasaince along Panther Creek to determine the potential for redeposition of contaminated material in overbank areas and submit a work plan for sampling if redeposition is found. In addition, a memorandum needs to be submitted to EPA describing the event, damage caused and proposals to prevent and /or significantly reduce such remobilization from occuring in the future. Any changes to the designs for the remedy will be documented through the normal Engineering Change Notice procedures.

Q4: Have there been opportunities to optimize O&M or monitoring efforts? If so, please describe.

A4: The BMSG has made several recent changes to facilities and O&M procedures to optimize the O&M. These have included: interception of contaminated flows in the old pipeline that transported Blackbird Creek waters beneath the fill near the WTP with transport to the WTP for treatment; installation of a pumping well downgradient from the groundwater cutoff wall to intercept leakage of contaminated water through the cutoff wall and pump it to the WTP for treatment; installation of a pump in the WTP to transfer stored contaminated waters between the underground mine and the 7100 Dam; installation of a large emergency generator at the WTP such that all WTP facilities can be operated during extended power outages; and modifications to the controls for the pumps at the lower Bucktail Pumping Station to eliminate cavitation during startup. Monitoring has been optimized by eliminating some of the monitoring that is no longer necessary. The changes in monitoring were documented in the Performance Monitoring Plan Amendments submitted to EPA in 2007.

INTERVIEW RECORD

Site Name:	Blackbird Mine			**EPA ID No.:**	IDD980725832
Subject:	Interview with property owners along Panther Creek	**Time:**	7:30 PM	**Date:**	July 14, 2008
Type:	☒ **Telephone**	☐ **Visit**		☐ **Other:**	
Location of Visit:	Teleconference				

Contact Made By:

Name:	Fran Allans	**Title:**	RPM	**Organization:**	EPA-Region 10

Individual Contacted:

Name:	Chuck and Claire Fernandez	**Title:**	Owner	**Organization:**	N/A

Telephone No.:	208-879-2408	**Street Address:**		Along Panther Creek			
E-Mail Address:	N/A	**City:**	near Cobalt	**State:**	ID	**Zip:**	Unknown

Summary of Conversation

This interview was with the owners of private property along Panther Creek whose property has been cleaned up by the BMSG. The interview consisted of EPA questions and responses by the owners. Each of the questions asked by EPA is repeated verbatim followed by the owners' responses.

Q1: Do you have any thoughts or concerns regarding the cleanup at the mine site or along Panther Creek?

R1: The Fernandez were concerned with the recontamination that potentially occurred during the spring 2008 runoff event. They wanted to make sure that EPA would require the BMSG to conduct any required cleanup of these materials in an appropriate manner. EPA explained the procedures in the AOC SOW that require the BMSG to sample these materials and to remove any materials that were above the cleanup levels.

Q2: Are you aware of any concerns by other members of the community? If so, who should we contact to discuss these concerns?

R2: The Fernandez had no suggestions for others to contact.

Q3: If you had a cleanup on your property, have you done any sub-surface construction or other activities that could potentially affect the remedy in the vicinity of the cleanup actions? Do you have any plans to do any sub-surface construction in the future? If so, please describe the construction.

R3: The Fernandez have not done any subsurface construction at their property and have no plans for any subsurface construction in the future.

Q4: Do you have any concerns or recommendations regarding the BMSG's management of the mine site or of the BMSG's operation and management procedures at the mine site?

R4: The Fernandez indicated that EPA should consider other measures to assure that the potential recontamination from the spring 2008 runoff event does not occur in the future.

Q5: Do you have any concerns or recommendations regarding the BMSG's management plans for sub-surface soils at your property or at other properties along Panther Creek?

R5: The Fernandez were familiar with the requirements for sub-surface construction and indicated that they would comply with the requirements if they contemplate any sub-surface construction in the future.

INTERVIEW RECORD

Site Name:	Blackbird Mine		**EPA ID No.:**		IDD980725832
Subject:	Interview with property owner along Panther Creek	**Time:**	10:00 AM	**Date:**	July 14, 2008
Type:	☒ Telephone	☐ Visit		☐ Other:	
Location of Visit:	Teleconference				

Contact Made By:

Name:	Fran Allans	**Title:**	RPM	**Organization:**	EPA-Region 10

Individual Contacted:

Name:	Dick Sillings	**Title:**	Owner	**Organization:**	N/A
Telephone No.:	208-940-0195	**Street Address:**	Along Panther Creek		
E-Mail Address:	N/A	**City:**	near Cobalt	**State:** ID	**Zip:** Unknown

Summary of Conversation

This interview was with one of the private property owners along Panther Creek whose property has been cleaned up by the BMSG. The interview consisted of EPA questions and responses by the owner. Each of the questions asked by EPA is repeated verbatim followed by the owner's responses.

Q1: Do you have any thoughts or concerns regarding the cleanup at the mine site or along Panther Creek?

R1: Mr. Sillings was concerned that he was unable to do any construction in the vicinity of the headgate that provides irrigation water for his property due to potentially arsenic-contaminated materials that were deposited there during the high flow event in spring 2008. He requested that EPA expedite the sampling of these materials and (if necessary) the subsequent cleanup of these materials so he could work in the vicinity of the headgate.

Q2: Are you aware of any concerns by other members of the community? If so, who should we contact to discuss these concerns?

R2: Mr. Sillings had no suggestions for others to contact.

Q3: If you had a cleanup on your property, have you done any sub-surface construction or other activities that could potentially affect the remedy in the vicinity of the cleanup actions? Do you have any plans to do any sub-surface construction in the future? If so, please describe the construction.

R3: Mr. Sillings has not done any subsurface construction at his property and has no plans for any subsurface construction in the future.

Q4: Do you have any concerns or recommendations regarding the BMSG's management of the mine site or of the BMSG's operation and management procedures at the mine site?

R4: Mr. Sillings had no concerns or recommendations.

Q5: Do you have any concerns or recommendations regarding the BMSG's management plans for sub-surface soils at your property or at other properties along Panther Creek?

R5: Mr. Sillings was familiar with the requirements for sub-surface construction and indicated that he would comply with the requirements if he contemplates any sub-surface construction in the future.

INTERVIEW RECORD

Site Name:	Blackbird Mine		**EPA ID No.:**		IDD980725832
Subject:	Interview with property owner along Panther Creek	**Time:**	10:00 AM	**Date:**	July 14, 2008
Type:	☒ **Telephone**	☐ **Visit**		☐ **Other:**	
Location of Visit:	Teleconference.				

Contact Made By:

Name:	Fran Allans	**Title:**	RPM	**Organization:**	EPA-Region 10

Individual Contacted:

Name:	Charla Bevan	**Title:**	Owner	**Organization:**	N/A
Telephone No.:	208-394-2222	**Street Address:**	Along Panther Creek		
E-Mail Address:	N/A	**City:**	near Cobalt	**State:** ID	**Zip:** Unknown

Summary of Conversation

This interview was with one of the private property owners along Panther Creek whose property has been cleaned up by the BMSG. The interview consisted of EPA questions and responses by the owner. Each of the questions asked by EPA is repeated verbatim followed by the owner's responses.

Q1: Do you have any thoughts or concerns regarding the cleanup at the mine site or along Panther Creek?

R1: Mrs. Bevan is not familiar with the cleanup at the mine site and did not have any thoughts or concerns.

Q2: Are you aware of any concerns by other members of the community? If so, who should we contact to discuss these concerns?

R2: Mrs. Bevan had no suggestions for others to contact.

Q3: If you had a cleanup on your property, have you done any sub-surface construction or other activities that could potentially affect the remedy in the vicinity of the cleanup actions? Do you have any plans to do any sub-surface construction in the future? If so, please describe the construction.

R3: Mrs. Bevan has not done any subsurface construction at her property and has no plans for any subsurface construction in the future.

Q4: Do you have any concerns or recommendations regarding the BMSG's management of the mine site or of the BMSG's operation and management procedures at the mine site?

R4: Mrs. Bevan had no concerns or recommendations.

Q5: Do you have any concerns or recommendations regarding the BMSG's management plans for sub-surface soils at your property or at other properties along Panther Creek?

R5: Mrs. Bevan was familiar with the requirements for sub-surface construction and indicated that she would comply with the requirements if she contemplates any sub-surface construction in the future.

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration

MEMORANDUM

To: Fran Allāns, USEPA

From: John Kern, NOAA

Subject: Trustee comments on draft "Five Year Review Report, Blackbird Mine Site

p. 1. 1.4. "These agencies are collectively referred to as the Natural Resource Trustees (Trustees). In addition to the USFS and IDEQ, the Trustees include ~~the National Marine Fisheries Service (NMFS), and~~ the National Oceanic and Atmospheric Administration (NOAA). The U.S. Fish and Wildlife Service (USFWS), **the National Marine Fisheries Service (NMFS),** and the Idaho Department of Fish and Game (IDFG) have also been involved during consultations regarding threatened and endangered species and aquatic resources." *NOAA is the Natural Resource Trustee with regard to the CERCLA activity. NMFS is part of NOAA.*

p. 16. 3.3.3 Idaho Cobalt Project: "The U.S. Forest Service has recently completed an environmental impact statement..."

p. 19. 3.4.2 Non Time-Critical Removals – sentence in middle of first paragraph: "In addition, historic populations of anadromous fish (including threatened and endangered species) ~~essential~~ no longer existed in area streams."

p. 19. Second paragraph:
"The Early Actions were initiated during the summer of 1995 and were continued in five phases each year through 2002. These actions were conducted pursuant to AOC issued by EPA to the BMSG in June 1995 (EPA Docket No. 10-95-0083, as amended). The Early Actions ~~were conducted in five phases and~~ focused on controlling sources of acid rock drainage that were impacting water quality." *Redundant*

p. 39. 5.3.1.4. Blackbird Creek and Bucktail Creek: Fourth paragraph, second sentence: "The macroinvertebrates found in Blackbird Creek represented 12 taxa, predominately midges and ~~caddisflys~~. **caddis fly larvae**

p. 40. Second full paragraph on page: "in Blackbird Creek were Chinook salmon"

p. 43. 5.5.4.1 Blackbird Mine is out of Compliance with the 1995 NRDA Consent Decree's Copper Ambient Water Quality Criteria. *Comment: We agree that the NRDA CD does not predetermine or limit EPA's authority to select any Response Actions but the CD compliance issue commented on by Formation Capital is a requirement separate from that in the 2003 ROD. We think that FMCs issue can be addressed more directly by inserting some language at the end of the second paragraph:*

"The 1995 NRDA Consent Decree requires the Settling Defendants to carry out any response activities at the site, and provides that these response activities will be selected in an EPA ROD and conducted pursuant to separate EPA administrative orders or separate consent decrees not covered by the 1995 Consent Decree (1995 CD at pages 2-3 and paragraph 5[b]). It further states that "[n]othing in this Consent Decree is intended to predetermine or limit EPA's authority to select any Response Actions, including cleanup standards...related to the site." (1995 CD at page 3) In 2002, the Ntural Resource Trustees determined that the BMSG was not in compliance with the Consent Decree in regard to the meeting of water quality objectives (1995 CD, Section V.B.5.c). Application of Additional Actions (CD, Section XI) and Liquidated Damages (CD, Section XXIV) were discussed but not pursued by the Trustees, as the BMSG was conducting EPA-required actions that would lead to the achievement of water quality levels."

p. 54. "3) Restrict construction and related activities that may impacte the integrity of the remedy and/or the attainments and maintenance of Performance Standards."

p. 54. "Additionally, Sections 2.1.1.8, 2.1.2.5, 2.1.3.5 of the Statement of Work provided for the specific purposes and objectives for institutional controls in each of the drainage basins, which were also set forth in the 2003 ROD (see Section 4.3)." *Comma added after basins.*

In general, we concur with the conclusions of the five-year review.

STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

August 4, 2008

900 North Skyline Drive, Suite B • Idaho Falls, Idaho 83402 • (208) 528-2650

C.L. "Butch" Otter, Governor
Toni Hardesty, Director

Ms. Fran Allens
Remedial Project Manager
US EPA Region 10, Idaho Operations Office
Idaho Operations Office
1435 North Orchard Street
Boise, ID 83706

RE: IDEQ comments on Blackbird Mine Site Five Year Review

Dear Ms. Allens:

The Idaho Department of Environmental Quality has reviewed the above referenced document and respectfully submits the following comments.

General Comment:
The text and all discussions of water quality results use data collected during the last four years (2003-2007). This data may not be entirely representative of site conditions because three of the last four snow pack spring runoff has been well below average.

Specific Comments:

1) Issues, page ES-9:

Text states "The source of dissolved copper loads along Big Deer Creek could not be determined with certainty". IDEQ feels that the significant portions of the load may be derived from the overbank sediments in and along Big Deer Creek.

2) Issues, page ES-9:

Preliminary results obtained by IDEQ indicated that Panther Creek exceeded the dissolved chronic cobalt clean up goal of 86 ppb in March, 2008. The exceedances of this Contaminant of Concern may be tied to the concentration and/or occurrence of iron which in turn is tied to rising flows in Blackbird Creek. It is suggested a low cost treatment system for the removal or reduction of this source at the West Fork Tailings be studied.

3) Issues, page ES-9:

Idaho DEQ is concerned about the long term usefulness and replacement cost of the Blackbird clean water channel. To date this channel has required extensive modification

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and annual maintenance to keep it in good working order. This channel may at some point need to be replaced and could become a high capital cost item.

If we can clarify these comments in any way, please do not hesitate to contact either me or Elton Modroo via email or dial 208.528.2650.

Thank you for the opportunity to comment on this document.

Sincerely,

Troy Saffle
Regional Water Quality Manager

c: John Lincoln, CH2M Hill
Elton Modroo, Blackbird Project Manager

Formation Capital
Corporation, U.S.

Formation Capital Corporation, U.S.

comments submitted to

United States Environmental Protection Agency

on

Blackbird CERCLA Mine Site Five Year Review

April 1, 2008

Prepared by:

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Formation Capital Corporation, U.S.
Comments on EPA Blackbird Mine Site Five Year Review
April 1, 2008

1.0 Introduction and Executive Summary

2.0 Background

3.0 The Blackbird Mine Site is in violation of both the Blackbird Mine Site Consent Decree and CERCLA because the Blackbird Mine continues to release hazardous substances that are causing violations of Ambient Water Quality Standards.

3.1 Blackbird Mine is out of compliance with the specific language of the Consent Decree's copper Ambient Water Quality Criteria

3.2 The Blackbird Mine is also demonstrably out of compliance with CERCLA standards (ARARs) in South Big Deer Creek.

3.3 The forest fire in 2000 is not an applicable force majeure event.

3.4 Blackbird Mine copper standard compliance problems at Compliance Point 2 (Panther/Big Deer Creek) are substantially derived (slightly more than ½ of copper loading) from the Blackbird Creek drainage; thus the remedial actions concerning the West Fork Tailings and the treatment plant are demonstrably inadequate.

4.0 The Blackbird Mine Settling Defendants maintain that there is "no scientific basis" for assuming Settling Defendants will achieve compliance with the copper Ambient Water Quality Criteria in the next 13 years or, in fact, ever.

5.0 Blackbird Mine Site's Failure to Comply with Applicable and Relevant or Appropriate Standards ("ARARs")

5.1 Applicability of ARARs to the Blackbird Mine - Generally

5.2 Determination of the Environmental Standards Applicable to the Blackbird Cobalt Mine and Formation's Cobalt Mine

6.0 ARAR – Blackbird Mine ambient water quality standards are based upon dissolved metal concentrations, in accordance with State of Idaho law, but EPA uses total recoverable metal concentrations for determining Idaho Cobalt Project compliance for potential discharges into the very same ambient waters.

7.0 ARAR – The Settling Defendants and EPA have called upon the Idaho Cobalt Project to have "no negative impacts" and "ICP cannot have releases . . . that will result in . . . interference with achieving performance standards in the [ROD]", respectively, without citation to law, regulation or policy; if this is a standard "legally applicable" to the Idaho Cobalt Project (which it is not), it would also be an ARAR "legally applicable" to the Blackbird Mine Site as an ARAR

8.0 ARAR – Settling Defendants cannot address compliance issues created by Bucktail Creek discharges by collecting Bucktail Creek and then discharging it without treatment to Big Deer Creek without going through the process of waiving the Clean Water Act/NPDES ARAR.

9.0 ARAR – The Agencies have required the Idaho Cobalt Project to conduct sophisticated ground water evaluations and modeling to project potential future impacts to groundwater from their proposed underground workings; we are unaware of any such studies being required of the Blackbird Mine for operation of the underground contaminated wastewater storage facility only recently put into use by Settling Defendants, even though the threat of this future contamination caused by the management of the Blackbird Mine underground workings is almost certainly greater than that posed by the Idaho Cobalt Project underground workings.

10.0 ARAR - Financial assurances required by the United States to address potential future releases from the Blackbird acid metal liquid waste underground storage unit cannot rationally be less than the financial assurances required by the United States to address potential future releases from the Idaho Cobalt Project underground workings, nor could the financial assurances for the Idaho Cobalt Project underground workings rationally be greater than those required for the Blackbird underground workings.

10.1 CERCLA Consent Decree Financial Assurances versus Forest Service Mine Plan of Operation Financial Assurances

10.2 Relative substantive and financial risk of future releases from the Blackbird acid metal liquid waste underground storage unit compared to and contrasted with the Idaho Cobalt Project

Formation Capital Corporation, U.S.
Comments on EPA Blackbird Mine Site Five Year Review
April 1, 2008

1.0 Introduction and Executive Summary

The Settling Defendants under the Blackbird Mine Site Consent Decree are in violation of the plain language of the Consent Decree, which requires the Blackbird Mine Site to be in compliance with the Ambient Water Quality Criteria for copper in Panther Creek and Big Deer Creek not later than January 1, 2002. However, not only are Settling Defendants currently out of compliance, they have never been *in* compliance in these salmon fisheries. Additionally, Settling Defendants assert that there is "no scientific basis" for assuming Settling Defendants will ever achieve compliance in the next 13 years, or ever.

The remedies imposed by the Consent Decree have failed and must be evaluated and revised. As a practical matter, if there is no compliance deadline, there will not be any significant cleanup activity. If compliance is not achieved, Settling Defendants will never be required to reestablish the salmon populations in the creeks, which is the ultimate purpose of the now 13 year old Consent Decree. In fact, after twenty-five years of State and Federal enforcement, Settling Defendants have not even started to reestablish salmon in the creeks. Importantly, Settling Defendants have asserted in a separate regulatory forum that "it is not known when or if the copper water quality standard will ever be achieved consistently and throughout South Fork Big Deer Creek or Big Deer Creek." Thus, Settling Defendants cannot even pretend they have a timetable to establish compliance.

The "legally applicable" standard addressing these violations pursuant to CERCLA is the Clean Water Act, NPDES program. By statute, NPDES permits run for terms of five years, and when a site is out of compliance at the time of NPDES permit issuance, a "schedule of compliance" to reestablish compliance must be entered into as part of the NPDES permit obligations. NPDES permits require that an out of compliance facility develop a program that ensures compliance as soon as reasonably possible, but in not less than five years (i.e., the life of the permit). Thus, EPA must assess appropriate penalties and return to the Court to reestablish the Court-ordered deadlines as soon as possible.

In the meantime, EPA's Blackbird Five Year Review should proceed to determine why the CERCLA remedy has failed and to develop a program to ensure compliance is achieved as soon as reasonably possible. EPA should carefully examine the applicable and relevant standards (ARARs) applied to the Blackbird Mine Site. It would appear that incorrect application of ARARs is part of the compliance problem. Additionally, simple remedies, such as upgrading the demonstrably inadequate treatment plant, should be ordered immediately. Finally, since EPA set financial assurance amounts on the assumption that the remedies would achieve compliance and even Settling Defendants have stated that "it is not known when or if the copper water quality standard will ever be achieved consistently and throughout South Fork Big Deer Creek or Big Deer Creek" financial assurances must be increased to reflect this and other uncertainties regarding the Blackbird Mine Site remediation.

2.0 Background

EPA is conducting a five year review ("Review") of the Blackbird Mine CERCLA Site ("Blackbird Mine Site") during 2008. Formation Capital Corporation, U.S., ("Formation") is providing comments on the Blackbird Mine Site Review that identify those issues that are not in compliance with applicable law and those issues that need to be clarified to determine if the Blackbird cleanup is in compliance with applicable law. CERCLA Section 121(c) mandates that EPA "review such remedial action no less often than each 5 years after the initiation of such remedial action to assure that human health and the environment are being protected by remedial action being implemented." As discussed below, the remedial action is not protecting the environment in accordance with applicable law.

3.0 The Blackbird Mine Site is in violation of both the Blackbird Mine Site Consent Decree and CERCLA because the Blackbird Mine continues to release hazardous substances that are causing violations of Ambient Water Quality Standards.

3.1 Blackbird Mine is out of compliance with the specific language of the Consent Decree's copper Ambient Water Quality Criteria

The Blackbird Mine Site is subject to that certain "Consent Decree," dated April 1995, "In the United States District Court for the District of Idaho" in Consolidated Case 83-4179 (R). Section 5(c) of the Consent Decree provides, in part:

> **Settling Defendants shall achieve and ensure that the Ambient Water Quality Criteria for dissolved copper established by EPA** pursuant to Section 304(a)(1) of the Clean Water Act, 33 U.S.C. § 1314(a)(1), and set forth in the BRCP **are maintained as set forth in the BRCP for three consecutive years prior to January 1, 2005** . . . , as set forth in Appendix B.

(Emphasis added.) Thus, at a minimum[1], the explicit plain language of the Consent Decree requires Settling Defendants to have been achieving the Ambient Water Quality Standard for copper by January 1, 2002, i.e., more than six (6) years ago. These standards and deadlines can only be modified by a written order from the Court.[2]

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[1] We say "at a minimum" because this plain language does not address the need for the Settling Defendant's to meet "applicable and relevant or achievable" standards ("ARARs"), as well as this particular copper standard. This copper standard is singled out by the Consent Decree to establish and to clarify for the Court and for the public that this one particular ARAR, above all, shall not be violated and shall not be subject to compromise, whereas other less critical standards, e.g., cobalt, may be subject to site-specific relaxation without the need to return to the Court for approval. See February 2003 ROD, p. 8-12.

[2] The Consent Decree, "XXXII Modification," Paragraph 94, p. 37 states "[n]o material modifications shall be made to the BRCP without written notification to and written approval of the State, the United States, and the Settling Defendants *and with the approval of the Court*." (Emphasis added.) Please also note that Section 5(c) provides that "[c]ompliance with the requirements of this Subparagraph shall be determined in accordance with the procedures set forth in the BRCP."

The Consent Decree, Appendix B, page 19, provides for three paired stations creating three surface water compliance points for the Consent Decree including:

1.0 Panther Creek downstream of the mouth of Blackbird Creek ("Compliance Point 1");
2.0 Panther Creek downstream of the mouth of Big Deer Creek ("Compliance Point 2");
3.0 Big Deer Creek downstream of the mouth of South Fork of Big Deer Creek ("Compliance Point 3").

Attached are several Tables providing water quality analytical data collected by Settling Defendants [3] and Formation. Tables 1a and 1b demonstrate that Settling Defendants have always been, and continue to be, in violation of the Consent Decree copper standard at Compliance Point 3. Tables 2a and 2b demonstrate that Settling Defendants continue to be in violation of the Consent Decree copper standard at Compliance Point 2 for approximately one half of Settling Defendant's data points in 2007. There is no data for 2008 at this time. Obviously, Settling Defendants are still not meeting the Consent Decree's copper standard more than six (6) years after the Federal Court's deadline.

3.2 The Blackbird Mine is also demonstrably out of compliance with CERCLA standards (ARARs) in South Big Deer Creek.

The Consent Decree, specifically, and CERCLA, generally, require the Settling Defendants to meet CERCLA's remedial standards (i.e., ARARs). Thus, not only must Settling Defendants satisfy Ambient Water Quality Standards at the "Compliance Points," among other things, Settling Defendant's are also required to achieve the Ambient Water Quality Standard for copper in South Fork Deer Creek. Tables 3a and 3b demonstrate that Settling Defendants have always been, and continue to be, in violation of the Consent Decree copper standard in South Fork Deer Creek.

3.3 The forest fire in 2000 is not an applicable force majeure event.

The Consent Decree provides for claims of force majeure under appropriate circumstances, and then only if Settling Defendants properly invoke the provision. (See Consent Decree, Paragraphs 54 – 56.) In 2000 a forest fire came through the area that raised the issue of whether force majeure should be claimed. We do not know if Settling Defendants sought to claim force majeure or not. However, review of graphs showing dissolved copper concentrations at Compliance Points 2 and 3 before, during and after the relevant period demonstrate that, now, almost eight (8) years after the fire, force majeure is no longer a credible argument, nor has it been a credible assertion for years.

The Panther Creek graph (Figure 1) shows great fluctuations before and after the fire, and only the May 2002 and 2003 data points suggests any impact of the 2000 fire. The Big Deer Creek graph (Figure 2) for May 1999 through 2007 indicates an obvious and consistently sloped trend line in which the May 2000 data seem to be outliers, suggesting

[3] The Settling Defendants are those persons who are signatories to the Consent Decree and therefore who are legally responsible for the pollution from the Blackbird Mine.

quality assurance/quality control problems or circumstances unique to that year's run-off; moreover, even if the May 2000 data is deemed to be validly representative, Figure 2 also indicates May 2006 and May 2007 are both in the same approximate range as the May 2000 data. Thus, if any argument could ever have been properly made for the 2000 forest fire being a force majeure event, the period of force majeure was terminated in 2005 and EPA should have reestablished a timeline for final compliance pursuant to Consent Decree Section 5(c).

Finally, it must be noted that, at some point, forest fires are a natural part of the ecosystem. If the remedial measures cannot take this into account eight years after a fire, the remedy is inadequate to address the normal, natural conditions. For example, the upstream data graphs for Big Deer Creek during the relevant period indicate very little influence in dissolved copper concentrations, even after the 2000 fire. Thus, additional remedial measures are indicated.

3.4 Blackbird Mine copper standard compliance problems at Compliance Point 2 (Panther/Big Deer Creek) are substantially derived (slightly more than ½ of copper loading) from the Blackbird Creek drainage; thus the remedial actions concerning the West Fork Tailings and the treatment plant are demonstrably inadequate.

As discussed above in Section 3.1, Settling Defendants are not in compliance with the Consent Decree. It is completely unacceptable to find that more than one-half (½) of the copper loading at Compliance Point 2 (Panther/Big Deer) causing violations of Ambient Water Quality Criteria is coming from Blackbird Creek. (See Figures 3 and 4) Obviously, the remedial measures at the West Fork Tailing unit and the operation Blackbird treatment plant are demonstrably inadequate and additional remedial measures are required. Certainly, the performance of the West Fork waste management unit needs a fresh look. However, more egregiously, as we understand the design and operation of the Blackbird treatment plant, it is engaged in simple elementary neutralization of acid rock drainage. This only achieves modest incidental copper removal. Given the ongoing compliance problems at the Panther Creek compliance points, Settling Defendants must implement modern advanced treatment methods specifically directed at metals removal.

It is surprising that the Settling Defendants and the Agencies would take the complicated administrative actions necessary to deem the previous beneficial uses of Blackbird Creek "unattainable" (e.g., fishing, swimming and salmonid habitat), thereby rendering Blackbird Creek a mere industrial waste conduit before ever using modern treatment methods to remove additional metals from Blackbird Creek. For example, we believe simple tighter screening of suspended solids in the influent to the treatment system would almost certain substantially cut copper loading to Panther Creek. Unfortunately, it would appear that performing the Blackbird Creek Use Attainability analysis has merely encouraged the Blackbird Mine to use inadequate treatment technology. In contrast, both the EPA and the Forest Service are requiring the Idaho Cobalt Project to use technologies directed at removing copper and other metals.

4.0 The Blackbird Mine Settling Defendants maintain that there is "no scientific basis" for assuming Settling Defendants will achieve compliance with the copper Ambient Water Quality Criteria in the next 13 years or, in fact, ever.

Section 3.0 above demonstrates that the current Blackbird Mine Site CERCLA ROD, UAO and remedial measures are not resulting in compliance with the Consent Decree or CERCLA; however, importantly, Settling Defendants themselves state there is "no scientific basis" for believing they will achieve compliance with the copper Ambient Water Quality Criteria in the next 13 years or, in fact ever. More specifically, Settling Defendant's have stated:

> A fundamental assumption in the DEIS (page 4-6) is that water quality standards in the Big Deer Creek will be consistently met during the life [approximately 13 years] of the ICP [Idaho Cobalt Project] as a result of the BMSG [i.e., the Settling Defendants] actions. No scientific basis is presented in the DEIS for this assumption. Based on extensive site monitoring and studies conducted in the BMSG, there is no valid basis for this assumption for copper. . . . In spite of the years of study, there are still undefined sources of metals loadings discharging into Big Deer Creek. It is not possible to distinguish the source of these loadings. Although some of the sources that contribute to copper concentrations in Big Deer Creek are expected to diminish over time through processes referred to as natural attenuation, it is not known when or if the copper water quality standard will ever be consistently achieved and [sic] throughout South Fork Big Deer Creek or Big Deer Creek.

"Report on Technical Review of the Idaho Cobalt Project Draft Environmental Impact Statement *submitted to* The Blackbird Mine Site Group *submitted by* Golder Associates Inc.," dated May 23, 2007 (the "Golder Report"). As EPA and the Forest Service know, Golder is the prime environmental technical contractor for the so-called BMSG, i.e., the Settling Defendants.

If there is "no scientific basis" for assuming that Settling Defendants will satisfy the plain language of the Consent Decree in the next 13 years, then there is no basis for assuming the plain language of the Consent Decree will be met. The Court provided a date certain for compliance and Blackbird's compliance with that date is six years overdue. At a bare minimum, penalties need to be assessed and a new compliance date reestablished with the Court.

If, as Settling Defendants state, "[i]n spite of the years of study, there are still undefined sources of metals loadings discharging into Bucktail and Big Deer Creek . . . [and] [i]t is not possible to distinguish the source of these loadings," then the remedial investigation is insufficient. Since the remedial investigation is insufficient and cannot identify the source of existing metal loadings, then the Settling Defendants must control and treat Bucktail Creek itself to meet the plain language of the Consent Decree. Settling Defendants legally cannot simply sit back and say it cannot be done; if that is true (which it is not), there are many more administrative hoops to jump through to implement a waiver of standards, as indicated below in Section 5.1.

5.0 Blackbird Mine Site's Failure to Comply with Applicable and Relevant or Appropriate Standards ("ARARs")

5.1 Applicability of ARARs to the Blackbird Mine - Generally

As discussed above in Section 3.0 of these comments, the Consent Decree explicitly requires the Blackbird Site to comply with the copper Ambient Water Quality Criteria, absent a written determination by the Court (see footnote 2 above). Therefore EPA must enforce this as written. However, as mentioned above regarding South Fork Big Deer Creek in Section 3.2, this means that Settling Defendant's must also achieve ARARs in waters of the United States that are not Consent Decree Compliance Points. Through the years, Formation has made this point repeatedly to the Settling Defendant's, to EPA and to the Forest Service, see for example, the January 27, 2005 Memorandum ("BHW 2005 Memorandum") from Formation's counsel, Baird Hanson Williams LLP ("BHW"), and reiterated in the May 24, 2007 by letter from BHW ("BHW 2007 Letter") letter to EPA and Forest Service.[4]

As Formation told EPA and the Forest Service in the 2005 Memorandum (Section 7.1, p. 14):

> We were unable to identify any provision by which CERCLA provides EPA with the authority to waive "water quality standards" established pursuant to the Clean Water Act without [Settling Defendants] application to, and a grant of approval by EPA for waiver of ARARs; and we are unaware that either such event has occurred.

However, additionally, and very importantly, the Blackbird Mine Site must not only achieve Ambient Water Quality Criteria, the Blackbird Mine Site must also comply with all other CERCLA standards that are "applicable and relevant or appropriate" (i.e., "ARARs").

Settling Defendants, EPA and the Forest Service are, and have been fully aware of this, for many years, arguably decades, but Formation highlighted this legal obligation again in the BHW 2007 Letter, which quotes from CERCLA 121(d)(2)(A) stating:

> Pursuant to the Comprehensive Environmental Response Compensation and Liability Act of 1980, as amended ("CERCLA"), the Blackbird Mine remedial action was required to comply with:
>
> (i) any standard, requirement, criteria, or limitations under any Federal environmental law, including, but not limited to, the Toxic Substances Control Act, the Safe Drinking Water Act, the Clean Air Act, Clean Water Act, the Marine Protection, Research and Sanctuaries Act, or the Solid Waste Act; or

[4] The 2005 Memorandum and 2007 Letter are attached hereto and incorporated by reference.

> (ii) any promulgated standard, requirement, criteria, or limitation under a State environmental . . . law that is more stringent than any Federal standard, requirement, criteria, or limitation . . .
>
> [that] is legally applicable to the hazardous substance or pollutant or contaminant concerned or is relevant and appropriate under the circumstances or the release or threatened release of such hazardous substance or pollutant or contaminant . . . [s]uch remedial action shall require a level or standard of control which at least attains Maximum Contaminant Level Goals established under the Safe Drinking Water Act . . . 42 U.S.C. 9621(d)(2)(A). In short, at a minimum, the EPA is required to regulate the Blackbird Mine to any "legally applicable" standard.

As summarized by the American Law of Mining, 2nd Edition, Section 171.04[4][d][ii][B], p. 171-23:

> "Applicable requirements" are defined as cleanup standards of control, and other substantive requirements, criteria, or limitations promulgated pursuant to federal or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. [ftnt 61, 40 CFR 300.5 (2002)] **Applicable requirements will vary according to the site, but determining whether the requirement is applicable involves little discretion.**

(Emphasis added.) Because the "applicable" requirements involve so little discretion, Formation has been troubled by the substantially more lenient standards being applied to the Blackbird cobalt mine, when compared to Formation's proposed cobalt mine. This is particularly true when one considers that the Agencies have the legal authority to hold the Blackbird Mine to higher standards than those applicable to Formation under CERCLA's "relevant and appropriate" authority[5] and that "[d]etermining whether a particular standard is relevant and appropriate involves much discretion and will depend on specific site circumstances." American Law of Mining, 2nd Edition, Section 171.04[4][d][ii], p. 171-24. Thus, given that the Blackbird Mine has failed to comply with applicable law for more than 25 years and that the owner of the Blackbird Mine is Formation's major business competitor, Formation has been troubled that EPA and the Forest Service have consistently held Formation to higher standards than the Blackbird Mine, even when the substantive and legal issues are identical, even when "new facility" issues have been factored out.[6]

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[5] According to the American Law of Mining, Section 171.04[4][d][ii], p. 171-24: "'[r]elevant and appropriate' requirements are promulgated cleanup standards of control, and other substantive requirements that, while not applicable to the substance, location, or action address problems and situations sufficiently similar to those encountered at a CERCLA site." [footnote, 40 CFR 300.5 (2002)]

[6] Obviously, some ARARs on their face are not applicable to an existing operation like the Blackbird Mine, but are applicable to the Idaho Cobalt Project. For example, the Clean Water Act NPDES "New Source Performance Standards" [emphasis added] would apply to Formation's discharges, but not necessarily to the Blackbird Mine's discharges; however, that does not change the relevant ambient water quality standard for the same receiving waters. Yet, as discussed in Section 6.0 of these comments, EPA is applying dissolved metals criteria to the Idaho Cobalt Project and yet applying total metals criteria to Formation. There can be no logic to support such determination.

5.2 Determination of the Environmental Standards Applicable to the Blackbird Cobalt Mine and Formation's Cobalt Mine

After appropriate analysis, the BHW May 2007 Letter, p. 2, to EPA and the Forest Service states:

> Thus, the standards applicable to both mines [i.e., the Blackbird Mine and the proposed Idaho Cobalt Project] should be identical, unless EPA is able to provide [and does in fact articulate] an articulable reason for any difference [in the standards being applied to the Blackbird Mine a Formation cobalt mine].

We are unaware that EPA has ever articulated why it is applying one set of standards to the Blackbird Mine and another much more stringent set to the Idaho Cobalt Project. Moreover, based upon the water quality data described above in Section 3.0 of these comments and Settling Defendants' statement quoted in Section 4.0, we know that the Settling Defendants have failed to meet the plain language of the Consent Decree, and there is no scientific basis for assuming they will meet the requirements of the Consent Decree in the future. Thus, even the Settling Defendants acknowledge that the Blackbird ROD has failed. One source of the ROD failure may have been the ARARs selected by the EPA and the Forest Service.

Generally, an ARAR's analysis for an older mine, particularly the determination of what environmental standards are "legally applicable," is an abstract "mine permitting" analysis which seeks to evaluate "What if this mine were being permitted now instead of being already in existence prior to the application of the CERCLA process?" This requires a great deal of professional guesswork. However, it is hard to imagine a better checklist for determining whether EPA and the Forest Service have properly evaluated what standards are "legally applicable" to the Blackbird cobalt mine than the mine permitting and approval of Formation's adjacent cobalt mine. The Idaho Cobalt Project is being placed next door to the Blackbird Mine, in the same bedrock, using underground mining techniques to mine similar ore, and operating in some of the same drainages as the Blackbird Mine. This as close to a perfect ARARs checklist template as EPA and the Forest Service will ever had on any CERCLA site; thus the Idaho Cobalt Project permitting and approval template it should be relied upon throughout EPA's Five Year Review of the Blackbird Mine Site to help determine out why the Blackbird cleanup has never achieved compliance with the law.

Comparing and contrasting the Blackbird Mine ARARs to those used for the Idaho Cobalt Project will also help determine the extent to which inapplicable standards are being applied to the Idaho Cobalt Project. As discussed below, we believe EPA and the Forest Service decision-making at the Blackbird Mine have failed to consider or properly apply certain highly germane standards that **are** being applied to the Idaho Cobalt Project. On the other hand, EPA and the Forest Service are applying clearly inapplicable standards to Formation that are not being applied to the Blackbird Mine. This is not only

a matter of CERCLA law. It is also a matter of fundamental fairness, since the corporate parents of the Blackbird mine owners are Formation's most formidable business competitor, controlling over 80% of the world's high purity cobalt market.

6.0 ARAR – Blackbird Mine ambient water quality standards are based upon dissolved metal concentrations, in accordance with State of Idaho law, but EPA uses total recoverable metal concentrations for determining Idaho Cobalt Project compliance for potential discharges into the very same ambient waters.

In Formation's Draft NPDES Permit for the Idaho Cobalt Project,[9] EPA has identified all effluent compliance limits and ambient water quality compliance limits in terms of total or total recoverable analyses ("totals"). Thus, EPA plans to use these analyses for Ambient Water Quality Criteria compliance determinations for the Idaho Cobalt Project. Currently, the Blackbird Consent Decree requires ambient compliance determinations based upon dissolved metal concentrations. The Idaho Water Quality Standards indicate use of dissolved metals for compliance purposes, per IDAPA 58.01.02, footnote i.

EPA has the authority to use dissolved analytical methods for determining ambient water quality compliance for the Idaho Cobalt Project. EPA also has the authority to use totals for determining water quality compliance for the Blackbird Mine either through use of the ARARs "relevant and appropriate" process or pursuant to Consent Decree Section 5(c) which provides:

> . . . EPA [may] select a standard for water quality at the Site different from the standard set forth in this Subparagraph [based upon dissolved analyses], and the Trustees agree, in their discretion, that the standard selected by EPA will achieve a level of water quality in Panther Creek and Big Deer Creek sufficient to sustain salmonids through all life stages, this Subparagraph will be modified through Section XXXII (Modification) to reflect the standard of water quality selected by EPA.

However, EPA does **not** have the authority to apply two different standards for the same substance in the exact same water body simply based upon who is introducing the metal load. Either the science requires concern for totals or it does not. The needs of the stream do not change depending upon whether the metal were to come from Blackbird Mine or the Idaho Cobalt Project. Obviously, it would be arbitrary and capricious and an abuse of discretion to allow this situation to arise. It would also render any efforts for the Agencies and the private parties to ever come to a collective agreement or setting of a TMDL to improve the local water quality nearly impossible or at least **extremely** difficult.

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[9] The EPA issued Draft Permit No.: ID-002832-1 together with a fact sheet on February 8, 2007. Page 9 of 27, Item D.4. requires all metals monitoring analyses to be total recoverable concentrations.

7.0 ARAR – The Settling Defendants and EPA have called upon the Idaho Cobalt Project to have "no negative impacts" and "ICP cannot have releases . . . that will result in . . . interference with achieving performance standards in the [ROD]", respectively, without citation to law, regulation or policy; if this is a standard "legally applicable" to the Idaho Cobalt Project (which it is not), it would also be an ARAR "legally applicable" to the Blackbird Mine Site as an ARAR

In a letter to the Forest Service dated July 26, 2001,[10] the Settling Defendants assert that: "[a]ny mining operations in the area must be performed in a manner that has *no negative environmental impacts* on surface water quality, ground-water quality, or aquatic biota. Extensive monitoring programs and contingency measures would be needed to *insure impact-free performance*, and substantial financial assurance would be needed to *fund remedies for any problems that may arise.*" (Emphasis added.) In a September 13, 2007 letter, EPA essentially parroted the Noranda party line stating :

> Specifically, the ICP cannot result in releases of hazardous substances that would . . . interfere with achieving the performance standards in the Superfund Record of Decision.[11]

Importantly, neither the Settling Defendants, nor EPA, have ever provided a citation to statute, regulation or policy to support the supposed "no impact"/"no interference" standard because it does not exist. This was addressed in detail in Section 2.0 of the attached BHW 2005 Memorandum to EPA that called out the "no impact" standard to be the "red herring." For all practical purposes, the Forest Services counsel, Sharmian White, impliedly agreed with Formation's assessment on this point in her May 1, 2005 letter (attached), so hopefully this is now a non-issue regarding a non-standard. However, if the "no impact" performance standard is applicable to the Idaho Cobalt Project, it becomes "legally applicable" as an ARAR to the Blackbird cleanup as well. Of course, if this is true, then as a practical matter, it means the hard and expensive work of cleaning up the Blackbird Mine Site has not really even begun. It is noteworthy that the existing Use Attainability Analyses for Blackbird and Bucktail Creek would be unacceptable if such "no impact" ARAR were applied.

8.0 ARAR – Settling Defendants cannot address compliance issues created by Bucktail Creek discharges by collecting Bucktail Creek and then discharging it without treatment to Big Deer Creek without going through the process of waiving the Clean Water Act/NPDES ARAR.

As indicated above in Section 4.0, Settling Defendants have stated that "[i]n spite of the years of study, there are still undefined sources of metals loadings." Obviously, if the source cannot be controlled, then the effects must be controlled. This is crudely and

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[10] Letter from David Jackson and Dan Myers to George Matejo July 26, 2001. Re: Formation Capital Corporation – Idaho Cobalt Project. Page 1, second paragraph.

[11] Of course, this would have the practical effect of shifting the liability for the Blackbird Mine environmental malfeasance to the Idaho Cobalt Project, as EPA must recognize, and the BHW 2005 Memorandum to EPA; p28, explicitly discussed..

ineffectually attempted in the 2003 ROD. The BT-5 alternative identified in the Record of Decision[12] would collect water from Bucktail Creek, route it around the South Fork of Big Deer Creek, and discharge the water into Big Deer Creek. The purpose of this diversion is to prevent the contaminated water from Bucktail Creek from polluting the South Fork of Big Deer Creek. It uses the relatively large flows of clean water in Big Deer Creek to dilute the Bucktail Creek contamination. Upon its construction, the diversion would become a point source discharge under the Clean Water Act. Clearly, such a diversion and use of "dilution as the solution to pollution" without use of any treatment methodology whatsoever fails under any NPDES program ARARs analysis. Thirty six years after the passage of the NPDES program this proposal is so patently unacceptable that it is not worth the time to step through the obvious NPDES program violations. Settling Defendants should be required to collect and treat the water or EPA must take them through an ARARs waiver process. Both the current situation and the proposed BT-5 are illegal and environmentally unacceptable.

9.0 ARAR – The Agencies have required the Idaho Cobalt Project to conduct sophisticated ground water evaluations and modeling to project potential future impacts to groundwater from their proposed underground workings; we are unaware of any such studies being required of the Blackbird Mine for operation of the underground contaminated wastewater storage facility only recently put into use by Settling Defendants, even though the threat of this future contamination caused by the management of the Blackbird Mine underground workings is almost certainly greater than that posed by the Idaho Cobalt Project underground workings.

The subject matter that has been by far the most controversial for the Idaho Cobalt Project is the speculative possibility of future (including post-closure) releases of hazardous substance from the closed underground workings to the groundwater based upon sophisticated ground water modeling predictions. Moreover, such modeling assumes that groundwater impacts will be transmitted to surface water. In fact, this has been the largest single component (about half) of the bond that EPA and the Forest Service have suggested might be appropriate. We are unaware that any such potential future impacts evaluation has ever been conducted on the relatively recent conversion of the Blackbird Mine underground workings into a reservoir to receive injection of acid and metal contaminated water on an annual basis.[13] However, the potential for impacts to groundwater and surface water from the recent current active management of the Blackbird Mine underground workings presents a greater threat of groundwater contamination than the Idaho Cobalt Project underground workings, if modeled to the same extent. The reasons for this are simple, intuitive and discussed below.

The Blackbird Mine was operated in the 1940's, 50's and 60's. Since the facility is in existence and has been in existence for decades, then under some circumstances, one might reasonably assume that one could measure the long-term effects of the

[12] Blackbird Mine Superfund Site Record of Decision Prepared by Office of Environmental Cleanup EPA Region 10 February 2003.

[13] Query – Did EPA consider the applicability of the Underground Injection Control (UIC) program requirements in authoring this new use of the Blackbird Mine during the ARARs analysis?

underground workings simply by monitoring the environment. For better or worse, one could assume the Blackbird underground workings had achieved some sort of stasis with the groundwater and surface water environments. Thus, one might assume that by directly measuring ground and surface water quality, one would be able to project impacts into the future to be roughly the same as are currently being measured (ignoring for the moment remedial measures). Unfortunately, as part of the remedial measures, the Settling Defendants created a new use for the Blackbird Mine underground workings by turning it into a liquid waste management unit for receiving injections of acidic and metal contaminated water[14] for the part of the year Settling Defendants do not operate the treatment plant. This is a new use of the Blackbird Mine, one for which it was never intended by the original mine design and it is a use of underground workings to which the Idaho Cobalt Project underground workings[15] will never be subjected. Moreover, since the Blackbird acid water reservoir is a new and particularly noxious use, EPA actually has less information about its potential future impacts on water quality than on the Idaho Cobalt Project.

In post-closure, Formation will only allow water of natural background chemistry into its workings. During operation the underground working will be kept dewatered. Formation's underground post-closure situation will rapidly achieve a stable groundwater table level so that no oxygen can enter the workings, thereby precluding future acid rock generation.[16] Formation's backfilled tailings will be subjected to a bulk flotation to remove essentially all sulfide and metal rich tailings for shipment off-site. Formation will be using an amended backfill of the workings to further chemically stabilize the materials in the underground workings. In stark contrast to the Idaho Cobalt Project:

1.0 Settling Defendants are injecting acidic and metal contaminated water into the Blackbird underground workings.

2.0 Settling Defendants are disturbing the ground water table on an annual basis, which substantially increases the interaction of the contaminated water with the Blackbird's backfilled tailings in the underground workings and with (otherwise) uncontaminated groundwater outside of the workings.[17]

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[14] If the concentrations of metals exceed the RCRA TCLP levels, then RCRA hazardous waste standard may not be "legally applicable," but they are certainly "relevant and appropriate" and should have been explicitly considered and implemented.

[15] As we address these issues, please keep in mind that Formation has never had releases, the DEIS does not expect the Idaho Cobalt Project to have significant releases and, importantly, we are unaware of any mine remediation ever being required in to engage in mitigation or remediation because of direct discharge from Idaho underground hardrock mine workings to the ground water, which is the only possible release pathway identified by the DEIS for the Idaho Cobalt Project. In fact, we are unaware of any such mitigation or remediation being required for any underground mine site anywhere.

[16] Flooding underground workings with natural groundwater per the Idaho Cobalt Project plan is the same CERCLA remedial measure selected for the Triumph Mine Superfund site, and it was selected without contingent ground water remediation.

[17] If either Settling Defendants or EPA believe that this annual ebb and flow flushing essentially cancels out impacts on ground water, this is an optimistic assessment indeed and could only be demonstrated by modeling far more extensive than even that performed for the Idaho Cobalt Project.

3.0 Settling Defendants' storage of contaminated water create a hydraulic head that will force the contaminated water into the ground water, a situation that did not exist during the operation of the Blackbird Mine and which will never exist at the Idaho Cobalt Project either during or after the operational life.

4.0 Settling Defendants are constantly mixing more oxygen and acidic water with sulfide minerals into the backfilled and waste rock to generate newly created acid and metal contaminated water; moreover, Settling Defendant's plan to do this forever.

5.0 The Blackbird underground workings are located at the head of two drainages making the spread of any contamination much greater and more difficult to control if predictions are incorrect.

All of this might be acceptable at a cleanup site that was otherwise in compliance; however, at the Blackbird we know that:

1.0 The Blackbird Mine is in fact out of compliance with the Consent Decree and CERCLA and Ambient Water Quality Standards.

2.0 EPA has stated that "EPA is particularly concerned about the influence of mine facilities (including underground workings . . .) on ground water resources and the potential for contaminant delivery to surface waters that are hydrologically connected . . . [t]his pathway has been observed at Blackbird Mine . . .".[18]

3.0 Settling Defendants have stated that "there are still undefined sources of metals loadings." Golder Report, p. 7.

Further technical support for such concerns is provided by the entire Golder Report. If one merely reviews the major topic headings of the Golder Report one rapidly finds that anything stated in the Golder Report applies with far greater force to the Blackbird underground contaminated reservoir activities than to the Idaho Cobalt Project.

Thus, since (1) monitoring indicates that there continues to be a water quality problem at the Blackbird Mine, (2) EPA has determined the surface water quality problem at the Blackbird is, in part, a direct result of the Blackbird underground workings, and (3) Settling Defendants acknowledge they do not know all sources of the contamination, and operation of the underground contaminated water facility is relatively new, the collective weight of this extraordinary uncertainty about Settling Defendants potential future impacts requires EPA to conduct the same type of ground water evaluation and prediction of future impacts as has been deemed to be "legally applicable" to the Idaho Cobalt

[18] Letter from David C. Tomten to Ray Henderson, October 31, 2001, Re: Scoping Comments for the Proposed Idaho Cobalt Project Mene, Salmon-Challis National Forest, Lemhi County, ID. Page 4, second paragraph.

Project.[19] This is particularly true if the ground monitoring has not identified the full nature and extent of the underground contamination pathway "EPA has observed at the Blackbird Mine."

In the alternative, if EPA does not require such measures to address the Blackbird ground water pathway, EPA is making a de facto determination that the Blackbird Mining District bedrock (in which the Idaho Cobalt Project is also located) is so geologically competent and "tight" that even contaminated water under a hydraulic head will not escape the underground workings. We would agree that this is a correct determination. Thus, if EPA and/or the Forest Service were to cause Formation to go through the exercise of addressing possible future releases to ground water from its underground workings as contingent mitigation measures, this would be arbitrary, capricious and an abuse of discretion. We might also add that this would be outrageously unfair. Settling Defendants cannot have it both ways.

10.0 ARAR - Financial assurances required by the United States to address potential future releases from the Blackbird acid metal liquid waste underground storage unit cannot rationally be less than the financial assurances required by the United States to address potential future releases from the Idaho Cobalt Project underground workings, nor could the financial assurances for the Idaho Cobalt Project underground workings rationally be greater than those required for the Blackbird underground workings.

10.1 CERCLA Consent Decree Financial Assurances versus Forest Service Mine Plan of Operation Financial Assurances

Technically, "financial assurances" (sometimes referred to as "bonding") are not an ARAR. However, as a matter of applicable law, the obligations and authorities of the Agencies to bond for possible future releases of hazardous substances from the Blackbird underground acid metal liquid waste reservoir versus the Idaho Cobalt Project are substantially equivalent, and, in fact, Agency obligations and authority are almost certainly greater regarding Blackbird Mine than the Idaho Cobalt Project.

Consent Decree, Paragraph 41 provides broad, powerful and, importantly, continuing authority to require financial security for implementation of the BRCP and the ROD.

[19] The National Environmental Policy Act ("NEPA") requires a Federal agency to study and consider a project's likely environmental impacts before giving an approval necessary for the project to proceed. Additionally, the relevant agency may require certain measures to mitigate for the environmental impacts. Accordingly, pursuant to the plain language of NEPA, EPA and Forest Service decisions under CERCLA are subject to NEPA compliance. Nevertheless, as a general rule, actions under CERCLA generally are considered to be "functionally equivalent" to NEPA, and therefore if NEPA compliance will not be required. However, at a minimum, a legally supportable environmental evaluation under CERCLA (i.e., an RI/FS) must at least evaluate the same subject matter topics as a NEPA analysis. In fact, this has not been the case regarding ground water evaluations at the Blackbird Mine Site and assessment of future impacts.

> The following requirements under this Section [XVII] are intended to ensure that Settling Defendants maintain sufficient financial security to finance implementation of the BRCP. . . . If the United States decides, in its discretion, that financial security for implementation of the ROD is needed in excess of that provided herein, such financial security shall be provided by Settling Defendants pursuant to the consent decree or administrative order implementing the ROD.

Thus, in summary, the only standard provided for determining the need for financial security related to the Blackbird Mine Site is that the "United States decides, in its discretion, that financial security for implementation of the ROD is needed . . .". In short, the United States can increase the amount of financial assurances for implementation of the ROD and the BRCP, subject only to the general Administrative Procedures Act of "arbitrary and capricious" standard of review.

In contrast, the Forest Service authority legally applicable to the Idaho Cobalt Project states "[a]ny operator required to file a plan of operations shall, when required by the authorized officer, furnish a bond conditioned upon compliance with Sec. 228.8(g) . . .". 36 CFR 228.13(a). In turn, 36 CFR 228.8(g) states "[u]pon exhaustion of the mineral deposit . . . operator shall, where practicable, reclaim the surface disturbed in operations by taking such measures as will prevent or control onsite and off-site damage to the environment and forest surface resources." Additionally, the Forest Service "Training Guide for Reclamation Bonding Estimation and Administration, For Mineral Plans of Operation authorized and administered under 36 CFR 228A, USDA – Forest Service, April 2004," ("Forest Service Bond Guidance") provides more specific instructions, stating:

> "Bonds are required to cover the estimated reclamation costs for prospecting, mining and other mineral operations on National Forest System Lands." [ftnt, quoting from Forest Service Manual 6561.3.] "In determining the amount of the bond, consideration will be given to the estimated cost of stabilizing, rehabilitating, and reclaiming the area of operations." [ftnt, quoting from 36 CFR 228.13(b).]

The Forest Service Bond Guidance specifically warns against attempts to bond for contingency items.

> [Reclamation] cost should be estimated based on anticipated reclamation as approved in the POO (**not worst case scenario**)." (emphasis in original) (Forest Service Bond Guidance, page 9)
>
> "Including a contingency cost item is a common practice in cost estimation and **<u>is not</u>** a way to estimate the cost of worst-case scenarios..." (emphasis in original) (Forest Service Bond Guidance, page 44)
>
> "Contingency costs are meant to address the errors that exist in every estimate resulting from the use of assumptions and conceptual information rather than actual measurement of work to be performed." (Forest Service Bond Guidance, page 44)

The specific prohibition on "worst case scenario" properly describes the applicable law, regulation and policy under NEPA that mitigation measures do not include addressing "worst case scenarios." Madelker, "NEPA Law and Litigation," Second Ed., Section 10:22. Accordingly, the Idaho Cobalt Project financial assurances for mitigation must, as a matter of law, address the Mine Plan of Operation ("MPO") and mitigation "anticipated" by the NEPA analysis, not speculative possible future water quality impacts. The Forest Service DEIS on the Idaho Cobalt Project "anticipates" that the MPO will not have significant impacts on water quality.

Thus, while United States' Bonding authority under the Blackbird Consent Decree is very broad, based only upon whether the ". . . United States decides, in its discretion, that financial security for implementation of the ROD is needed . . .," the United States bonding authority governing the Idaho Cobalt Project is limited to the financial assurances needed to complete the Mine Plan of Operation reclamation and the reasonably "anticipated" mitigation measures deemed necessary. Although one could quibble, there would seem to be very little question that the United States' authority for bonding of the Blackbird Mine Site remediation under CERCLA is broader than that the Agencies have over the Idaho Cobalt Project; at a minimum, one must concede there is certainly *no less* ability to require additional financial assurance from the Settling Defendants of the Blackbird than that available regarding the Idaho Cobalt Project.

10.2 Relative substantive and financial risk of future releases from the Blackbird acid metal liquid waste underground storage unit compared to and contrasted with the Idaho Cobalt Project

As discussed above in Section 9, if the potential future impacts of the Blackbird acid metal liquid waste underground storage unit were estimated using methodologies similar to those used to estimate the potential future impacts of the Idaho Cobalt Project there would be little question that the risk posed by the Blackbird Mine Site underground workings is greater. Accordingly, the financial assurances required by the United States for possible future release from the underground facilities at the Blackbird should not be less than those required from the Idaho Cobalt Project. It would certainly not be rational to cause the Idaho Cobalt Project underground facilities to be bonded for amounts greater than those of the Blackbird.

At this time, we understand that the Blackbird acid metal liquid waste underground storage unit is not subject to **any** specifically calculated financial assurances estimates at all. Thus, rationally, the appropriate amount of financial assurances that should be required from the Idaho Cobalt Project for future speculative hazardous substance release from the underground workings is zero. On the other hand, if the United States seeks worst case scenario or speculative financial assurances for the Idaho Cobalt Project underground workings, it would be irrational and unsustainable upon judicial challenge for similar protections to the environmental not being required of the Blackbird Mine Site underground workings.

Tables

Table 1a Select Water Quality Data for Big Deer Creek at WQ-24/24a

Location	Collection Date	Flow	Hardness	Chronic Cu Criteria	Dissolved Copper	Total Recoverable Copper	Dissolved Cobalt	Total Recoverable Cobalt
		cfs		mg/L	mg/L	mg/L	mg/L	mg/L
WQ-24	5/17/01		21.9	0.0035	0.019	0.057	0.0169	0.0206
WQ-24	5/29/01		20.7	0.0035	0.014	0.022	0.012	0.0124
WQ-24	6/10/01		24.6	0.0035	0.0133	0.0199	0.0152	0.0157
WQ-24	8/13/01		44.4	0.0057	0.029	0.0349	0.0299	0.0295
WQ-24	10/14/01		42.6	0.0055	0.0259	0.0304	0.0244	0.0255
WQ-24	5/30/02		19.7	0.0035	0.0344	0.285	0.0121	0.0247
WQ-24	6/14/02		25.2	0.0035	0.0205	0.0319	0.0182	0.0198
WQ-24	7/9/02		37.4	0.0049	0.0252	0.0372	0.0248	0.0254
WQ-24	8/12/02		43.3	0.0056	0.0209	0.0286	0.0265	0.0283
WQ-24	10/15/02		44.9	0.0057	0.0229	0.0259	0.0253	0.025
WQ-24	6/24/03		30.2	0.0041	0.023		0.0177	
WQ-24	11/20/03		43.2	0.0055	0.0121		0.0146	
WQ-24	8/1/04		27.8	0.0038	0.0155		0.0173	
WQ-24	10/14/04		43.5	0.0056	0.0132	0.0171	0.0222	0.0188
WQ-24	8/18/05		42	0.0054	0.0069	0.0114	0.0158	0.013
WQ-24	10/5/05		42	0.0054	0.0087	0.013	0.0121	0.0149
WQ-24A	8/16/05	13.8	40	0.0052	0.008	0.0104	0.0147	0.0123
WQ-24A	10/5/05	11.0	42	0.0054	0.0083	0.012	0.0134	0.0139
WQ-24a	8/15/06	11.9	43	0.0055	0.0083	0.0105	0.014	0.0117
WQ-24a	9/27/06	12.4	42	0.0054	0.008	0.0101	0.0122	0.0121
WQ-24a	5/22/07	102	17	0.0035	0.0023	0.0039	0.0039	0.0023
WQ-24a	7/30/07	15.8	39	0.0051	0.0069	0.0127	0.009	0.0057
WQ-24a	9/26/07	10.7	41	0.0053	0.0056	0.0071	0.0087	0.0054
				min (ug/l)	3.90	2.30	2.30	3.90
				max (ug/l)	15	9.0	13.9	13
				average (ug/l)	10.8	8.8	9.1	9.5

concentration is above IWQS Chronic Criteria

Table 1b Select Water Quality Data for Big Deer Creek at BDSW-03/03A

LOCATION	DATE	Flow	Hardness	Cu IWQS Chronic (CCC)	Dissolved Copper	Total Copper	Dissolved Cobalt	Total Cobalt
		cfs	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
BDSW-03	7/18/95				0.342	0.42	0.108	0.111
BDSW-03	8/23/95				0.175	0.3	0.056	0.0563
BDSW-03	9/19/95				0.144	0.804	0.11	0.12
BDSW-03	10/17/98		32.9	0.0044	0.076	0.153	0.067	0.057
BDSW-03	5/5/99		18.1	0.0035	0.012	0.018	0.013	0.007
BDSW-03	5/26/99		10.5	0.0035	0.036	0.064	0.013	0.015
BDSW-03	8/22/99		38.1	0.0050	0.025	0.039	0.021	0.017
BDSW-03	4/6/00		27.8	0.0035	0.011	0.011	0.006	0.008
BDSW-03	4/27/00		19	0.0035	0.009	0.008	0.008	0.008
BDSW-03	5/3/00		12.1	0.0035	0.005	0.006	0.0025	0.0025
BDSW-03	5/16/00		15	0.0035	0.006	0.009	0.003	0.004
BDSW-03	5/18/00		11.8	0.0035	0.004	0.009	0.0025	0.009
BDSW-03	5/23/00		9.95	0.0035	0.004	0.0015	0.0025	0.0025
BDSW-03	5/24/00		9.51	0.0035	0.0015	0.006	0.006	0.0025
BDSW-03	9/19/00		39.3	0.0051	0.021	0.024	0.011	0.01
BDSW-03	5/17/01		15.8	0.0035	0.011	0.027	0.01	0.01
BDSW-03	9/20/01		40.7	0.0053	0.022	0.028	0.022	0.021
BDSW-03	5/20/02		17.7	0.0035	0.011	0.134	0.007	0.018
BDSW-03	9/19/02		33.9	0.0045	0.016	0.019	0.019	0.018
BDSW-03	3/4/03		35.1	0.0045	0.0107	0.0154	0.0134	0.0128
BDSW-03	4/11/03		35.5	0.0047	0.0101	0.0249	0.0173	0.018
BDSW-03	5/29/03		18.3	0.0035	0.012	0.431	0.003	0.026
BDSW-03	6/17/03		19	0.0035	0.007	0.009	0.008	0.007
BDSW-03	9/23/03		45.7	0.0058	0.0109	0.019	0.0191	0.0163
BDSW-03	3/18/2004		36.5					
BDSW-03	4/8/2004	38.2	22.8					
BDSW-03	4/14/2004	42.1	20.5					
BDSW-03	4/21/2004	26.7	24.9					
BDSW-03	4/28/2004	45.1	21.9					
BDSW-03	5/5/2004	90.7	14.8					
BDSW-03	5/19/2004	69.3	20					
BDSW-03	5/26/2004	69.5	22.1					
BDSW-03	6/2/2004	68.8	20.7					
BDSW-03	8/9/2004	83.1	17.1					
BDSW-03	8/15/2004	59.4	23.1					
BDSW-03	9/24/2004	14.1	36.7					
BDSW-03A	3/21/2005	9.54						
BDSW-03A	5/9/2005	81.59						
BDSW-03A	5/25/2005	91.58			0.004	0.007	0.01	0.01
BDSW-03A	9/14/2005	10.47	44.8	0.00572	0.009	0.012	0.01	0.02
BDSW-03	4/27/2006		38	0.0049	0.008	0.023		
BDSW-03	5/2/2006	79.41	22	0.0035	0.009	0.007	0.01	0.01
BDSW-03	5/10/2006		29	0.0038	0.006	0.029	0.011	0.012
BDSW-03	5/20/2006		17	0.0035	0.006	0.067	0.002	0.008
BDSW-03	5/22/2006	163.32	17	0.0035	0.003	0.061		
BDSW-03	5/30/2006	92.62	33	0.0035	0.005	0.008	0.006	0.006
BDSW-03	10/20/2006	11.19	37	0.0049	0.008	0.015	0.007	0.01
BDSW-03A	4/25/2007	25.6	29	0.0039	0.004	0.007	0.007	0.004
BDSW-03A	5/8/2007	55.34	20	0.0035	0.003	0.005	0.004	0.003
BDSW-03A	5/21/2007	67.64	16.3	0.0035	0.002	0.005	0.003	0.002
BDSW-03A	10/8/2007	10.44	38	0.005	0.005	0.008	0.01	0.005

calculated by Tetrtech using standard methods

concentration below detectable limits ("U" or half the detection limit shown)

additional quantity may be biased high

concentration is above IWQS Chronic Criteria

Table 2a Select Water Quality Data for Panther Creek at WQ-25

Location	Collection Date	Flow	Hardness	Chronic Cu Criteria	Dissolved Copper	Total Recoverable Copper	Dissolved Cobalt	Total Recoverable Cobalt
		cfs		mg/L	mg/L	mg/L	mg/L	mg/L
WQ-25	5/18/01		21.3	0.0035	0.004	0.01	0.0087	0.0137
WQ-25	5/28/01		19.1	0.0035	0.0035	0.007	0.0065	0.0102
WQ-25	6/27/01		24.8	0.0035	0.0019	0.0033	0.0087	0.0106
WQ-25	8/8/01	79.9	39.4	0.0051	0.0021	0.0028	0.0143	0.0155
WQ-25	10/16/01		36.8	0.0048	0.0049	0.005	0.0196	0.0241
WQ-25	5/20/02		22.5	0.0035	0.0107	0.109	0.0114	0.0528
WQ-25	7/1/02		23.5	0.0035	0.0043	0.0057	0.0064	0.0094
WQ-25	9/9/02		40.3	0.0052	0.0045	0.0024	0.0168	0.0176
WQ-25	10/9/02	62.3	38.5	0.0050	0.0035	0.022	0.0221	0.0233
WQ-25	11/25/03		41.9	0.0054	0.0025		0.0211	
WQ-25	10/21/04	82.0	39.4	0.0051	0.00112	0.0032	0.0238	0.0204
WQ-25	10/10/05	65.0			0.0022	0.0036	0.0125	0.013
WQ-25	8/17/06	72.3	32.9	0.0044	0.0014	0.002	0.01	0.0066
WQ-25	9/28/06	60.8	39.6	0.0051	0.001	0.0021	0.0185	0.0192
WQ-25	5/24/07		20	0.0035	0.0016	0.0023	0.0063	0.0067
WQ-25	8/2/07	69.7	38	0.0050	0.0016	0.0022	0.0093	0.0106
WQ-25	9/24/07	81.3	38	0.0050	0.0013	0.0031	0.012	0.0168
				min (ug/l)	1.00	2	6.30	5.7
				max (ug/l)	10.7	109	23.8	53
				average (ug/l)	3.07	11.6	13.4	17.0

concentration is above WQO Chronic Criteria

Table 2b Select Water Quality Data for Panther Creek at PASW-04/04X

LOCATION	DATE	Flow	Hardness	Cu IWQS Chronic (CCC)	Dissolved Copper	Total Copper	Dissolved Cobalt	Total Cobalt
		cfs	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
PASW-04	4/13/95				0.0499	0.0593	0.0698	0.0714
PASW-04	4/25/95				0.0107	0.0506	0.0637	0.0681
PASW-04	5/4/95				0.0427	0.0972	0.0717	0.08
PASW-04	5/10/95				0.0675	0.153	0.0766	0.1
PASW-04	5/18/95				0.0465	0.0983	0.052	0.0639
PASW-04	5/24/95				0.0371	0.0593	0.032	0.039
PASW-04	6/2/95				0.0241	0.0568	0.0144	0.0268
PASW-04	7/19/95				0.0339	0.0462	0.024	0.0268
PASW-04	8/22/95				0.0246	0.0388	0.0297	0.0318
PASW-04	9/20/95				0.039	0.113	0.0436	0.0476
PASW-04	10/17/98		31.7	0.0043	0.01	0.022	0.027	0.028
PASW-04	3/23/99		34.3	0.0045	0.016	0.028	0.052	0.055
PASW-04	3/29/99		34.8	0.0046	0.016	0.026	0.046	0.046
PASW-04	4/6/99		36.4	0.0048	0.009	0.015	0.052	0.05
PASW-04	4/12/99		37.4	0.0049	0.012	0.015	0.053	0.052
PASW-04	4/19/99		33.5	0.0045	0.019	0.051	0.04	0.05
PASW-04	4/26/99		27.1	0.0037	0.023	0.037	0.03	0.035
PASW-04	4/29/99		26.8	0.0036	0.016	0.037	0.033	0.037
PASW-04	5/5/99		32.9	0.0044	0.02	0.03	0.03	0.034
PASW-04	5/10/99		26.6	0.0037	0.014	0.023	0.028	0.026
PASW-04	5/17/99		22.4	0.0035	0.021	0.021	0.027	0.024
PASW-04	5/24/99		20.2	0.0035	0.021	0.078	0.019	0.047
PASW-04	5/26/99		17.2	0.0035	0.013	0.036	0.0025	0.016
PASW-04	6/1/99		17.5	0.0035	0.007	0.017	0.005	0.01
PASW-04	6/8/99		15.4	0.0035	0.006	0.011	0.007	0.01
PASW-04	6/15/99		19	0.0035	0.011	0.025	0.007	0.007
PASW-04	6/22/99		16.4	0.0035	0.004	0.008	0.0025	0.005
PASW-04	8/26/99				0.0015	0.004	0.01	0.013
PASW-04	9/21/99		40.5	0.0052	0.005	0.008	0.031	0.036
PASW-04	3/27/00		38.2	0.0050	0.004	0.01	0.024	0.029
PASW-04	4/4/00		33.2	0.0044	0.005	0.012	0.022	0.027
PASW-04	4/6/00		36.3	0.0048	0.013	0.015	0.031	0.029
PASW-04	4/11/00		36.8	0.0048	0.014	0.017	0.025	0.023
PASW-04	4/19/00		32.3	0.0043	0.01	0.013	0.022	0.022
PASW-04	4/27/00		31.8	0.0043	0.01	0.013	0.026	0.022
PASW-04	5/3/00		26.1	0.0036	0.009	0.017	0.008	0.01
PASW-04	5/11/00		26.4	0.0036	0.01	0.019	0.016	0.02
PASW-04	5/17/00		24.8	0.0035	0.006	0.008	0.019	0.0065
PASW-04	5/18/00		21.7	0.0035	0.0015	0.0015	0.0025	0.013
PASW-04	5/24/00		17.2	0.0035	0.015	0.024	0.0025	0.012
PASW-04	6/2/00		21.9	0.0035	0.004	0.004	0.009	0.017
PASW-04	9/20/00		42.7	0.0055	0.0015	0.003	0.023	0.028
PASW-04	5/17/01		21.1	0.0035	0.0015	0.007	0.008	0.011
PASW-04	9/20/01		37.8	0.0049	0.003	0.005	0.009	0.012
PASW-04	5/20/02		21.7	0.0035	0.009	0.056	0.011	0.032
PASW-04	8/19/02		35.8	0.0047	0.0012	0.0026	0.017	0.02
PASW-04	3/19/03		42.4	0.0055	0.0056	0.0074	0.0193	0.0212
PASW-04	4/4/03		44.2	0.0056	0.0075	0.0135	0.0214	0.0238
PASW-04	5/22/03		23.7	0.0035	0.0061	0.013	0.0115	0.0108
PASW-04	6/17/03		21.3	0.0035	0.011	0.006	0.009	0.003
PASW-04	9/24/03		40.7	0.0053	0.0022	0.0036	0.0174	0.0165
PASW-04	4/8/2004	248.90	31.9					
PASW-04	4/14/2004		30.7					
PASW-04	4/21/2004		35.3					
PASW-04	4/28/2004		30.9					

Table 2b Select Water Quality Data for Panther Creek at PASW-04/04X

LOCATION	DATE	Flow	Hardness	Cu IWQS Chronic (CCC)	Dissolved Copper	Total Copper	Dissolved Cobalt	Total Cobalt
		cfs	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
PASW-04	5/4/2004	330.50	24.1					
PASW-04	5/5/2004		34.6					
PASW-04	5/19/2004	416.60	23.9					
PASW-04	5/26/2004	460.40	26.2					
PASW-04	6/2/2004	371.60	21.7					
PASW-04	6/9/2004	376.40	22.7					
PASW-04	8/15/2004	302.00	26					
PASW-04	9/23/2004	79.40	33.5					
PASW-04	9/26/2004	70.47						
PASW-04	9/27/2004	67.82						
PASW-04	3/21/2005	61.18						
PASW-04	5/17/2005	511.86	21 D	0.00347	0.005	0.014	0.01	0.01
PASW-04	6/13/2005		25 D	0.00347	0.004	0.004	0.005	0.005
PASW-04	6/14/2005		24 D	0.00347	0.002	0.004	0.005	0.005
PASW-04	6/15/2005		23	0.00347	0.003	0.004	0.005	0.005
PASW-04	6/16/2005		23 D	0.00347	0.003	0.004	0.005	0.005
PASW-04	6/17/2005		22 D	0.00347	0.002	0.004	0.005	0.005
PASW-04	9/14/2005	79.88	43	0.00552	0.003	0.004	0.01	0.01
PASW-04	4/20/2006	186.93						
PASW-04	4/23/2006	404.73						
PASW-04	4/26/2006	327.51	33.1	0.0044	0.006	0.009		
PASW-04	5/3/2006		24	0.0035	0.007	0.016		
PASW-04	5/11/2006	476.41	24.3	0.0035	0.005	0.009	0.01	0.01
PASW-04	6/21/2006	257.42						
PASW-04	6/22/2006	248.04						
PASW-04	6/23/2006	231.79						
PASW-04	6/24/2006	228.35						
PASW-04	9/18/2006	55.92						
PASW-04	9/19/2006	61.30						
PASW-04	9/20/2006	79.40						
PASW-04	9/21/2006	75.24						
PASW-04X	4/10/2006	141.73	38.6	0.005	0.007	0.008		
PASW-04X	4/14/2006	243.49	44.2	0.0056	0.010	0.024		
PASW-04X	4/20/2006		37.6	0.0049	0.006		0.020	
PASW-04X	4/21/2006		33	0.0044	0.007		0.022	
PASW-04X	4/22/2006		32.5	0.0043	0.006		0.018	
PASW-04X	4/23/2006		30.8	0.0041	0.007		0.013	
PASW-04X	4/26/2006		33.4	0.0044	0.007	0.011		
PASW-04X	5/3/2006		24.7	0.0035	0.007	0.017		
PASW-04X	5/11/2006		23.9	0.0035	0.005	0.009	0.009	0.010
PASW-04X	5/15/2006		21	0.0035	0.009		0.011	
PASW-04X	5/16/2006		20	0.0035	0.007	0.045	0.009	0.024
PASW-04X	5/17/2006		18.2	0.0035	0.007		0.012	
PASW-04X	5/18/2006		19.9	0.0035	0.006		0.012	
PASW-04X	5/24/2006		18.5	0.0035	0.002	0.006		
PASW-04X	6/2/2006	517.67	22.3	0.0035	0.003	0.004	0.005	0.007
PASW-04X	6/7/2006	490.17	18.9	0.0035	0.003	0.004	0.005	0.005
PASW-04X	6/21/2006		28.9	0.0037	0.002		0.009	
PASW-04X	6/22/2006		26.4	0.0036	0.002		0.009	
PASW-04X	6/23/2006		29	0.0039	0.002		0.011	
PASW-04X	6/24/2006		29.5	0.004	0.002		0.012	
PASW-04X	9/18/2006		43.6	0.0056	0.002		0.014	
PASW-04X	9/19/2006		37.8	0.0049	0.002		0.011	
PASW-04X	9/20/2006		36.7	0.0048	0.002	0.003	0.012	0.015
PASW-04X	9/21/2006		35.3	0.0047	0.002		0.012	
PASW-04	3/20/2007	141.98	31.8	0.0043	0.0046		0.0144	
PASW-04	3/27/2007	180.95						
PASW-04	4/3/2007	121.63						
PASW-04	4/10/2007	210.71						
PASW-04	4/16/2007	176.01						
PASW-04	4/17/2007	169.09						
PASW-04	4/18/2007	196.98						
PASW-04	4/19/2007	185.24						
PASW-04	4/24/2007	172.51						

Table 2b Select Water Quality Data for Panther Creek at PASW-04/04X

LOCATION	DATE	Flow	Hardness	Cu IWQS Chronic (CCC)	Dissolved Copper	Total Copper	Dissolved Cobalt	Total Cobalt
		cfs	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
PASW-04	5/2/2007	623.10						
PASW-04	5/7/2007	343.69						
PASW-04	5/22/2007	504.90						
PASW-04	9/20/2007	61.46						
PASW-04X	3/20/2007		31.1	0.0042		0.0067		0.0137
PASW-04X	3/27/2007		30.5	0.0041	0.0037	0.0085	0.0143	0.0190
PASW-04X	4/3/2007		36.4	0.0048	0.0040	0.0050	0.0120	0.0130
PASW-04X	4/10/2007		30	0.0041	0.0034	0.0064	0.0116	0.0120
PASW-04X	4/16/2007		32.5	0.0043	0.0030	0.0050	0.0190	0.0110
PASW-04X	4/17/2007		30	0.0041	0.0030	0.0050	0.0180	0.0090
PASW-04X	4/18/2007		30.1	0.0041	0.0030	0.0050	0.0130	0.0100
PASW-04X	4/19/2007		29.4	0.004	0.0030	0.0040	0.0180	0.0090
PASW-04X	4/24/2007		29.6	0.004	0.0030	0.0040	0.0100	0.0080
PASW-04X	5/1/2007	8.98	23.4	0.0035	0.0050	0.0160	0.0080	0.0160
PASW-04X	5/2/2007		17.9	0.0035	0.0040	0.0110	0.0130	0.0110
PASW-04X	5/7/2007		22.6	0.0035	0.0030		0.0110	
PASW-04X	5/8/2007		18.3	0.0035	0.0030		0.0060	
PASW-04X	5/9/2007		21.8	0.0035	0.0030		0.0080	
PASW-04X	5/10/2007		21.6	0.0035	0.0020		0.0080	
PASW-04X	5/15/2007		18.3	0.0035	0.0020	0.0030	0.0070	0.0060
PASW-04X	5/21/2007		18.2	0.0035	0.0020		0.0070	
PASW-04X	5/22/2007		18.7	0.0035	0.0020	0.0040	0.0050	0.0050
PASW-04X	5/23/2007		20.3	0.0035	0.0030		0.0090	
PASW-04X	5/24/2007		22.1	0.0035	0.0020		0.0100	
PASW-04X	5/29/2007		20.8	0.0035	0.0020	0.0030	0.0080	0.0080
PASW-04X	9/17/2007		40.9	0.0053	0.0020	0.0030	0.0150	0.0110
PASW-04X	9/18/2007		40.7	0.0053	0.0020	0.0030	0.0160	0.0120
PASW-04X	9/19/2007		40.1	0.0052	0.0020	0.0030	0.0200	0.0160
PASW-04X	9/20/2007		40	0.0052	0.0020	0.0040	0.0110	0.0130

calculated by Golder using standard methods

calculated by Tetra using standard methods

concentration below detectable limits ("1/2" of half the detection limit shown)

the result is estimated quantity

D= derived from a filtered sample

concentration is above IWQS Chronic Criteria

Table 3a Select Water Quality Data for South Fork Big Deer Creek at WQ-22

Location	Collection Date	Flow	Hardness	Chronic Cu Criteria	Dissolved Copper	Total Recoverable Copper	Dissolved Cobalt	Total Recoverable Cobalt
		cfs		mg/L	mg/L	mg/L	mg/L	mg/L
WQ-22	5/17/01	8.86	62.6	0.0076	0.077	0.194	0.0982	0.11
WQ-22	5/29/01	19.4	62.4	0.0076	0.0573	0.0875	0.0639	0.0655
WQ-22	6/10/01	12.6	76.7	0.0090	0.0653	0.0997	0.0901	0.0885
WQ-22	8/13/01	2.69	87.6	0.0101	0.0971	0.117	0.109	0.108
WQ-22	10/14/01		88.1	0.0102	0.0976	0.118	0.112	0.11
WQ-22	5/30/02	35.5	47	0.0060	0.0484	0.752	0.477	0.0938
WQ-22	6/14/02	28.8	63.8	0.0077	0.0676	0.153	0.0686	0.0702
WQ-22	7/9/02		75.6	0.0089	0.0667	0.164	0.0794	0.0927
WQ-22	8/12/02		79.9	0.0094	0.058	0.0783	0.0842	0.0869
WQ-22	10/15/02		83.9	0.0098	0.0757	0.0886	0.0888	0.0901
WQ-22	8/16/05	4.32	79	0.0093	0.0359	0.0431	0.0568	0.0549
WQ-22	10/5/05	2.66	82	0.0096	0.0396	0.0448	0.0559	0.0557
WQ-22	8/15/06	3.31	79	0.0093	0.0356	0.0396	0.0473	0.0478
WQ-22	9/27/06	3.28	81	0.0095	0.0393	0.043	0.0533	0.0533
WQ-22	5/22/07	16.4	51	0.0064	0.0134	0.0229	0.0158	0.0161
WQ-22	7/30/07	4.14	79	0.0093	0.0234	0.0602	0.027	0.027
WQ-22	9/26/07	2.31	78	0.0092	0.0251	0.0328	0.029	0.0266
				min (ug/l)	13	23	16	16
				max (ug/l)	98	752	477	110
				average (ug/l)	54.3	125.8	91.4	70.4

concentration is above IWQS Chronic Criteria

Table 3b Select Water Quality Data for South Fork Big Deer Creek at SFSW-01

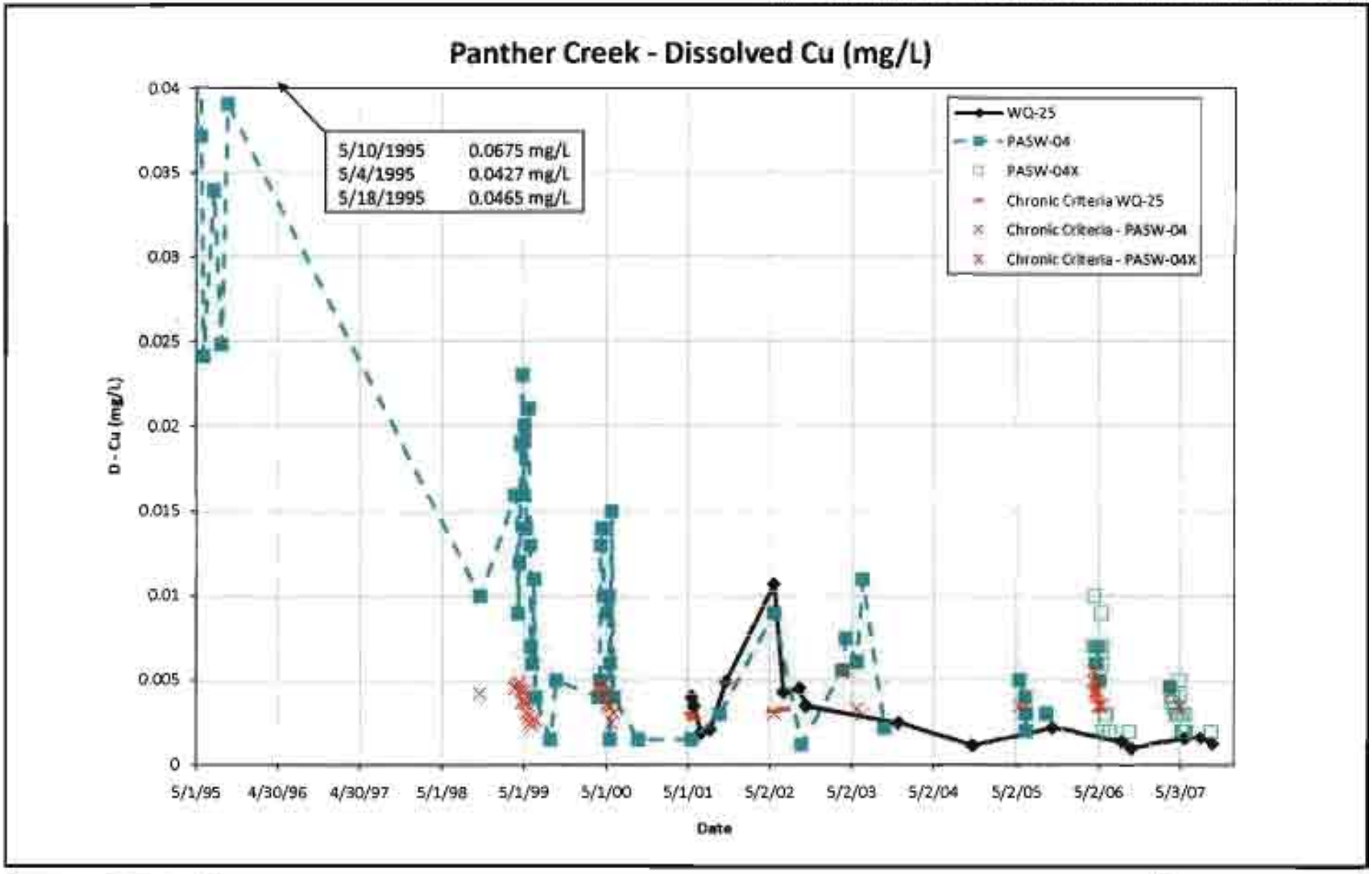
LOCATION	DATE	Flow	Hardness	Cu IWQS Chronic (CCC)	Dissolved Copper	Total Copper	Dissolved Cobalt	Total Cobalt
		cfs	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
SFSW-01	8/23/95				1.34	2.99	0.871	0.886
SFSW-01	9/19/95				0.23	5.87	0.533	0.794
SFSW-01	10/17/98		86.1	0.0100	0.414	0.787	0.367	0.342
SFSW-01	4/29/99		83	0.0097	0.24	0.374	0.220	0.216
SFSW-01	5/5/99		87.8	0.0102	0.297	0.416	0.245	0.225
SFSW-01	5/28/99		50.8	0.0064	0.351	0.713	0.185	0.166
SFSW-01	9/22/99		78.9	0.0093	0.123	0.154	0.099	0.098
SFSW-01	4/6/00		106	0.0119	0.155	0.172	0.075	0.067
SFSW-01	4/27/00		92.8	0.0106	0.129	0.14	0.085	0.07
SFSW-01	5/3/00		83.6	0.0097	0.111	0.127	0.057	0.054
SFSW-01	5/16/00		84.7	0.0098	0.129	0.132	0.089	0.079
SFSW-01	5/18/00		76.5	0.0090	0.118	0.141	0.068	0.066
SFSW-01	5/23/00		63.8	0.0077	0.086	0.128	0.038	0.033
SFSW-01	5/24/00		61.3	0.0075	0.086	0.105	0.039	0.036
SFSW-01	9/19/00		92.7	0.0106	0.12	0.126	0.060	0.059
SFSW-01	5/17/01		58.5	0.0072	0.08	0.369	0.098	0.11
SFSW-01	9/20/01		86	0.0100	0.092	0.146	0.108	0.105
SFSW-01	5/20/02		50	0.0063	0.043	1.63	0.037	0.124
SFSW-01	9/19/02		75.9	0.0090	0.076	0.108	0.089	0.086
SFSW-01	3/4/03		86.5	0.0100	0.0555	0.0745	0.075	0.0772
SFSW-01	4/11/03		90.3	0.0104	0.0693	0.151	0.131	0.131
SFSW-01	5/29/03		46.9	0.0059	0.040	1.90	0.025	0.127
SFSW-01	8/17/03		58.1	0.0071	0.046	0.063	0.056	0.055
SFSW-01	9/23/03		85.4	0.0099	0.0537	0.0622	0.076	0.0735
SFSW-01	5/19/2004	8.6	56.6	0.0070				
SFSW-01	5/9/2005	6.18	57	0.00702	0.029	0.444		
SFSW-01	9/14/2005	1.33	74.1	0.00879	0.043	0.051	0.070	0.06
SFSW-01	5/2/2006	8.85	58	0.0071	0.041	0.067	0.050	0.04
SFSW-01	5/20/2006	22.93	54.9	0.0068	0.026	4.73	0.021	0.114
SFSW-01	5/30/2006	10.87	58	0.0071	0.033	0.06	0.037	0.039
SFSW-01	10/20/2006	1.39	79	0.0093	0.033	0.039	0.041	0.041
SFSW-01	4/25/2007	2.7	82	0.0096	0.03	0.037	0.038	0.035
SFSW-01	5/8/2007	5.87	53	0.0066	0.023	0.029	0.027	0.024
SFSW-01	5/21/2007	11.91	48	0.0061	0.021	0.013	0.015	0.017
SFSW-01	10/8/2007	1.54	84	0.0098	0.023	0.027	0.027	0.025

calculated by Golder using standard methods

calculated by Teleetz using standard methods

concentration is above IWQS Chronic Criteria

Figures



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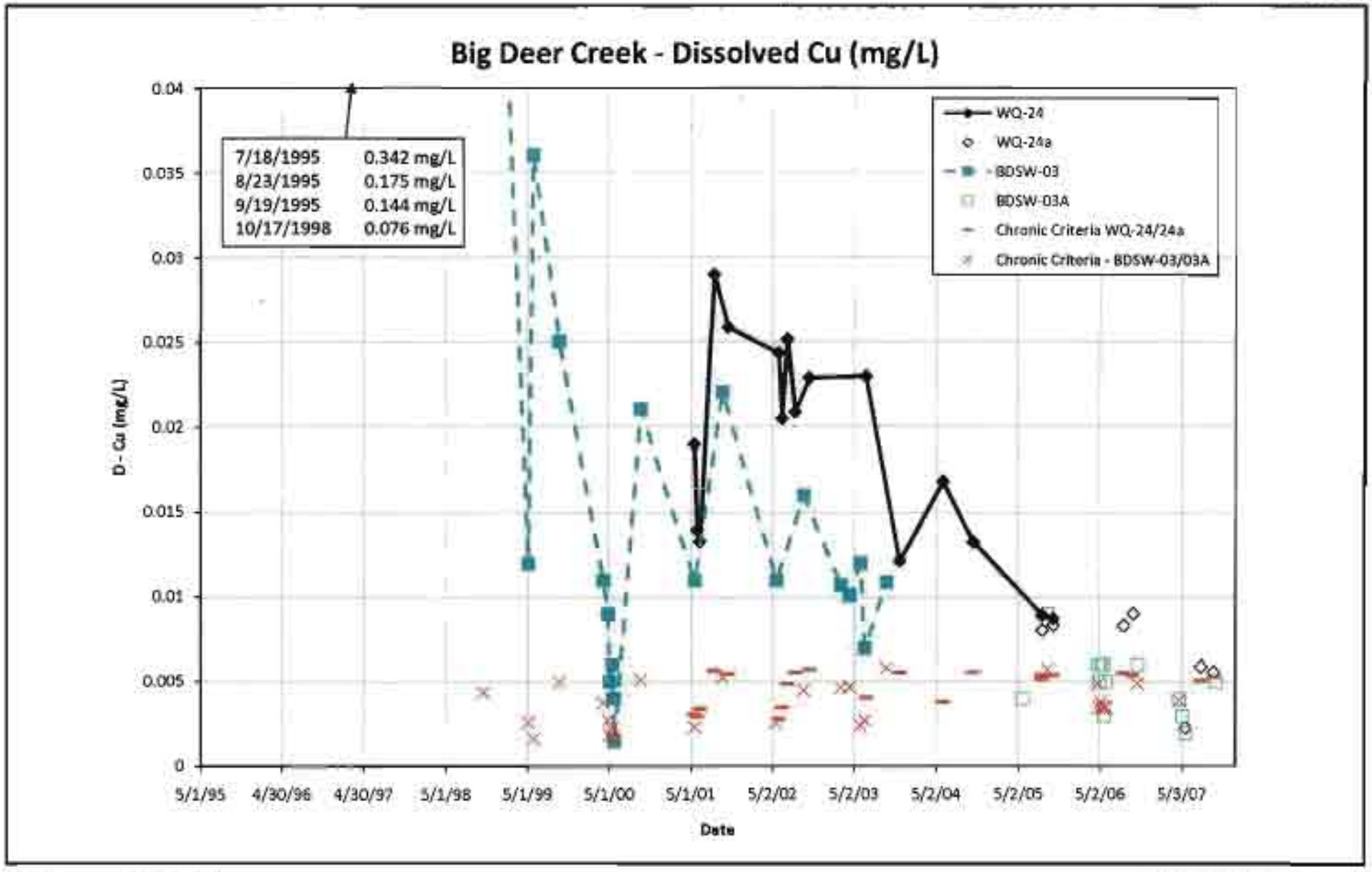
PREPARED BY: TELESTO

FIGURE 1
Dissolved Copper–Panther Creek (WQ-25 and PASW-04)

PREPARED FOR: Formation

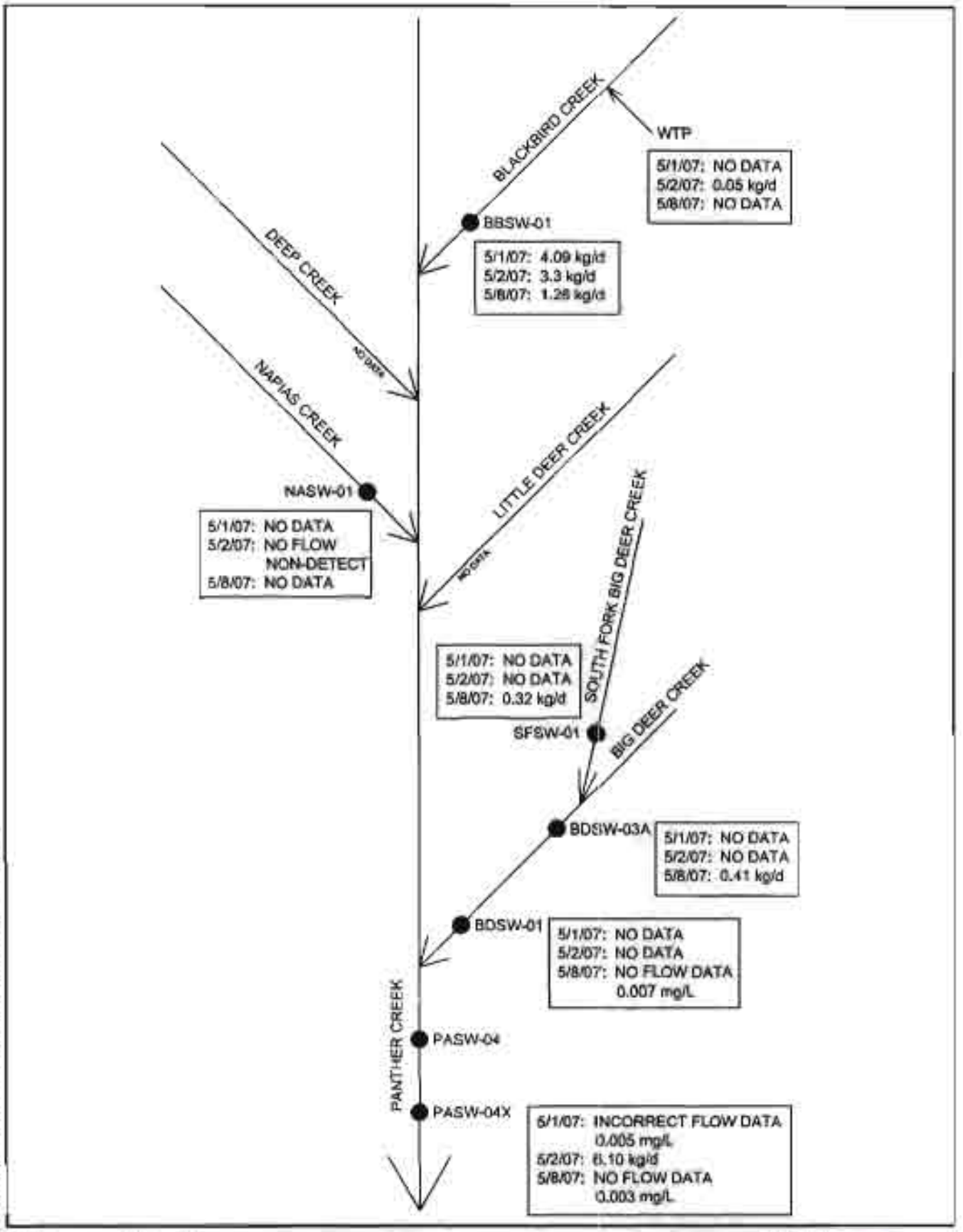


PROJECT: 222100 | TASK: 57

PREPARED BY: TELESTO

FIGURE 2
Dissolved Copper–Big Deer Creek (WQ-24/24a and BDSW-03/03A)

PREPARED FOR: Formation

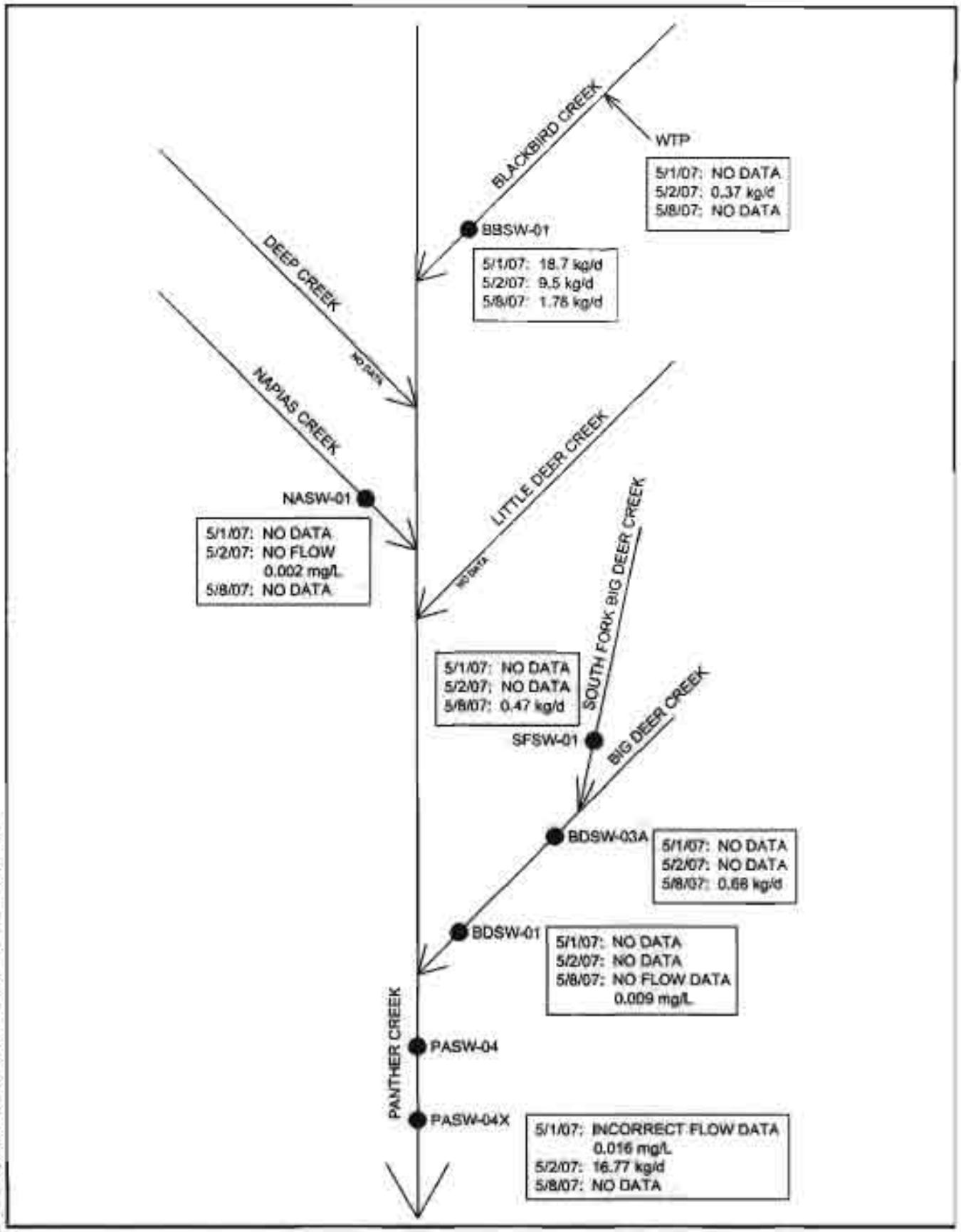


PROJECT: 222100 | PAGE: 57

PREPARED BY: TELESTO

FIGURE 3
DISSOLVED COPPER LOADINGS IN PANTHER CREEK BASIN

PREPARED FOR: Formation



PROJECT	DATE
322100	57

PREPARED BY: TELESTO SOLUTIONS INCORPORATED

FIGURE 4
TOTAL RECOVERABLE COPPER LOADINGS IN PANTHER CREEK BASIN

PREPARED FOR: Formation

Golder Report

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REPORT ON

TECHNICAL REVIEW OF THE IDAHO COBALT PROJECT DRAFT ENVIRONMENTAL IMPACT STATEMENT

Submitted to:

The Blackbird Mine Site Group

Submitted by:

Golder Associates Inc.
18300 NE Union Hill Road, Suite 200
Redmond, Washington 98052

May 23, 2007

943-1595-008.0502

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LIST OF ATTACHMENTS

Attachment A	Policy for Metal Leaching and Acid Rock Drainage at Minesites in British Columbia July 1998

LIST OF REFERENCE DOCUMENTS PROVIDED

Comparison of Prediction of Water Quality at Hard Rock Mines, The reliability of predictions in Environmental Impact Statements, J.R. Kuipers and A.S. Maest, December 2006.

ACRONYMS/ABBREVIATIONS

AGP	acid generation potential
AMD	acid-mine drainage
AOC	Administrative Order on Consent
ARD	acid rock drainage
As	arsenic
BCMEM	British Columbia Ministry of Energy and Mines
BMSG	Blackbird Mine Site Group
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Co	cobalt
Contaminant	contaminants of concern
Cu	copper
$CuFeS_2$	chalcopyrite
DEIS	Draft Environmental Impact Statement
DSM	dynamic system model
DRZ	damaged rock zone
EIS	Environmental Impact Report
EPA	Environmental Protection Agency
FCC	Formation Capital Corporation
gpm	gallons per minute
ICP	Idaho Cobalt Project
LBDC	Lower Big Deer Creek
mg/L	milligrams per liter
NEPA	National Environmental Policy Act
NPAG	non-potentially acid generating
NPDES	National Pollutant Discharge Elimination System
PAG	potential acid generating
ppb	Parts per billion
ppm	Parts per million
RO	reverse osmosis
su	standard units
TWSF	Tailings and Waste Rock Storage Facility
UAO	Unilateral Administrative Order
μg/L	micrograms per liter =ppb
USDA	United States Department of Agriculture
USFS	United States Forest Service
VMS	volcanogenic massive sulfide
ZLD	zero liquid discharge

EXECUTIVE SUMMARY

Formation Capital Corporation (FCC) proposes to exploit high-grade copper and cobalt-bearing massive sulfide mineral deposits by constructing two major underground mines and other facilities (the Idaho Cobalt Project [ICP]) on mining claims within the Salmon-Challis National Forest, Lemhi County, Idaho. The ICP is located in the watershed of Big Deer Creek, a tributary of Panther Creek and ultimately the Salmon River in central Idaho. The mining project will affect both groundwater and interconnected surface water. Because the ICP was identified as a major federal action, the ICP is being evaluated under the National Environmental Policy Act (NEPA) and the United States Forest Service (USFS) issued a draft environmental impact statement (DEIS) for public comment. These comments are submitted on behalf of the Blackbird Mine Site Group (BMSG) by Golder Associates Inc. and Geochimica Inc.

Introduction/The Idaho Cobalt Project

The ICP includes two underground mines that would be excavated, exposing rocks with acid-generating potential and contaminants of concern (contaminants) including copper, cobalt, and arsenic. Inevitably, oxidation and leaching processes will release contaminants from the mines. If these releases are not controlled both hydraulically or geochemically, groundwater flow will eventually carry them to local streams, including Big Deer Creek and Panther Creek.

The DEIS establishes that the proposed action without mitigation (and even with the mitigation identified in Alternative II) will result in water quality impacts in Big Deer Creek and Panther Creek that exceed water quality standards, even though the predicted impacts are based on excessively optimistic assumptions. Recognizing that serious water quality impacts would result, the DEIS proposes additional mitigation measures (Alternative IV). However, the effectiveness of the proposed mitigation actions are simply assumed, never demonstrated and, as shown below, there are serious flaws in the science concerning the proposed mitigation measures.

As a result of these deficiencies, the ICP, even under Alternative IV, will cause or contribute to an exceedence of water quality standards in Big Deer Creek and other local streams. Some of the releases will go undetected by the proposed monitoring of the proposed alternative and will not be captured. Approval of the FCC's proposed Plan of Operations by USFS would therefore have serious adverse impacts to water quality in Big Deer Creek and Panther Creek and to the BMSG, which has spent millions of dollars improving that water quality. The proposed ICP Ram and Sunshine mines are located upgradient from and on both sides of BMSG's permanent ground water and surface water collection and pumping systems in upper Bucktail Creek. The deficiencies in the DEIS and preferred alternative are described further in the following paragraphs and in the main body of this report.

The Blackbird Mine Remediation

Mining began near the ICP site in the late 19th century and expanded through the first half of the 20th century; full scale mining ceased in the 1960s. The BMSG has been conducting removal and remedial actions and restoring natural resources at the Blackbird Mine site since 1994 pursuant to a Consent Decree with the United States and State of Idaho, two Environmental Protection Agency (EPA) Administrative Orders on Consent (AOC) and an EPA Unilateral Administrative Order (UAO). The actions performed by the BMSG within the Bucktail Creek/Big Deer Creek drainage include extensive facilities for diversion, collection, storage, and treatment of waters impacted by past mining activities, but they are not yet designed to manage further degradation of water quality due to new activities within the drainage.

The response and remedial actions taken by the BMSG have resulted in large reductions in copper and cobalt concentrations in Big Deer Creek, Panther Creek, and tributary streams since 1995. The peak dissolved copper concentrations have been reduced by 97 percent and 95 percent in Big Deer Creek and Panther Creek, respectively.

The BMSG has spent approximately $70 million since 1994 in pursuit of established water quality standards. Although considerable progress has been made, the standards have not yet been achieved. The hardness-based water quality standard for copper, which is as low as 3.5 μg/L , is not consistently achieved in Panther Creek (during early periods of the spring snowmelt) and in Big Deer Creek (for most of the year). South Fork Big Deer Creek, which receives waters from Bucktail Creek and discharges to Big Deer Creek, also does not achieve the copper water quality standards at any time.

On page 4-6 of the DEIS, the assumption is made that the water quality standards in South Fork Big Deer Creek and Big Deer Creek will be met during the life of the ICP as a result of BMSG remedial actions. There is no valid basis for this assumption. It is not known when or if the copper water quality standard will ever be achieved consistently throughout South Fork Big Deer Creek or Big Deer Creek. Any increase in contaminant loading would contribute to violations of water quality standards and would impact the ongoing CERCLA cleanup activities.

The Idaho Cobalt Project Must Prevent Releases of Metals to Site Streams

The EPA proposed water treatment plant National Pollutant Discharge Elimination System (NPDES) discharge permit and the state of Idaho's draft certification of the permit stipulate that there will be no net increase in copper mass loading to Big Deer Creek watershed as a consequence of mining activity. Moreover, the DEIS states (page 4-86) that an agency objective associated with the ICP is to ensure no adverse impacts to the ongoing CERCLA cleanup activities at the Blackbird Mine site. Any increase in copper loadings to site streams would also adversely impact the BMSG cleanup activities. Therefore, the DEIS must clearly show, not merely assume, that the preferred alternative will achieve no net loading of pollutants to site streams.

The Draft Environmental Impact Statement Preferred Alternative

The DEIS establishes that the proposed ICP mine, without 100 percent effective mitigation measures, would lead to loadings of copper and other contaminants to Big Deer Creek that exceed water quality standards established by the EPA and the state of Idaho. To mitigate the anticipated impacts to water resources, FCC proposes water management and treatment options that are presented in the DEIS as Alternative II. The DEIS identified technical flaws in Alternative II, showing that it, too, would lead to loadings of copper to Big Deer Creek and to other receiving waters that exceed water quality standards. Therefore, the DEIS proposes three additional alternatives, and presents Alternative IV as the preferred alternative. Because it is preferred, this review focuses on Alternative IV, but the same issues arise with all the alternatives, except the No Action Alternative.

The DEIS describes that Alternative IV was developed "*...to ensure that the ICP does not contribute a net increase in metal loading to the South Fork Big Deer, Big Deer, Panther Creek system.*" (page 2-45) A series of interdependent mitigating activities and assumptions are incorporated into Alternative IV in an attempt to achieve this requirement including:

- The waste rock amendments will effectively buffer and control all groundwater affected by the mining activities to within a narrow range of pH and water quality;

- FCC will be able to precisely monitor the quality and quantity of water affected by the mine in order to calculate the mass loadings of metals and other constituents that must be collected by the capture systems;
- The capture systems will be capable of capturing 100 percent of the loadings calculated above; and,
- The treatment system will reliably and consistently achieve the permitted discharge limits.

Not surprisingly, the use of these optimistic assumptions in the dynamic systems model (DSM), which is used to predict water quality effects in the receiving streams, results in modeled simulations that indicate the future water quality in receiving streams will not exceed water quality standards. If more realistic ranges of the possible effectiveness and performance of the mitigation methods were used, the modeling of Alternative IV would show significant adverse impacts to water resources.

The Idaho Cobalt Project's Adverse Water Quality Impact (Absent 100 Percent Successful Mitigation)

All mining disturbs the ground and produces impacts on the local water resources. The impacts to water quality and consequently to the associated biological systems are especially severe when hard rock mining, like the ICP, exposes sulfide minerals that generate acid rock drainage (ARD) in a matrix with little or no neutralization capacity. Because mines must be essentially dry in order to remove and handle the ore and waste rock, the mining zone must be dewatered, which allows oxygen to enter the mine and diffuse readily along fractures and into the adjacent rock matrix. Sulfide minerals in contact with oxygen then begin to oxidize. Sulfide oxidation will release metals directly. Furthermore, acidic groundwater will dissolve metals in adjacent minerals and rocks.

Even though the ICP will use updated mining methods and employ mitigation techniques that were not available when the Blackbird Mine was created, the basic underground mining processes are still similar. Underground tunnels will be constructed by blasting through the rock, with a huge increase in surface area of exposed rock. Sulfides will be exposed to oxygen and water. There will be underground zones where explosives cause fractures in rock that were not intended or desired.

Contaminated water originates as groundwater in the mine and moves downgradient along paths of least resistance, or along preferential seepage paths. In a complex fractured system, such as the ICP, water moves primarily through openings in the rock, including man-made openings, such as adits when they are present, or through fractures in the rock when larger flow paths are not available. When flow occurs in fractures, it moves relatively quickly and along very complex pathways of interconnected fractures. Contamination will occur in some areas in high concentrations, while other areas will be free from signs of contamination. Eventually the contaminated waters will flow downgradient until they reach the local ground water system where it will commingle with other waters and flow into surface water drainages. These soluble metals, especially copper, at elevated levels are harmful to fish in an area where major efforts are underway to restore salmon and steelhead runs.

The ICP is within the Blackbird Mine zone of influence. Virtually all contamination sources from the ICP will flow into streams that are part of BMSG compliance requirements (see Figure ES-1). Contamination originating in the Sunshine or Ram mines, will flow downgradient to Bucktail Creek, through the groundwater systems to South Fork Big Deer Creek, or directly to Big Deer Creek. As shown in Section 2.4 of this report, the DSM used for the DEIS would predict a copper concentration of more than 50 µg/L in Big Deer Creek and approximately 8 µg/L in Panther Creek to result from the ICP without mitigation.

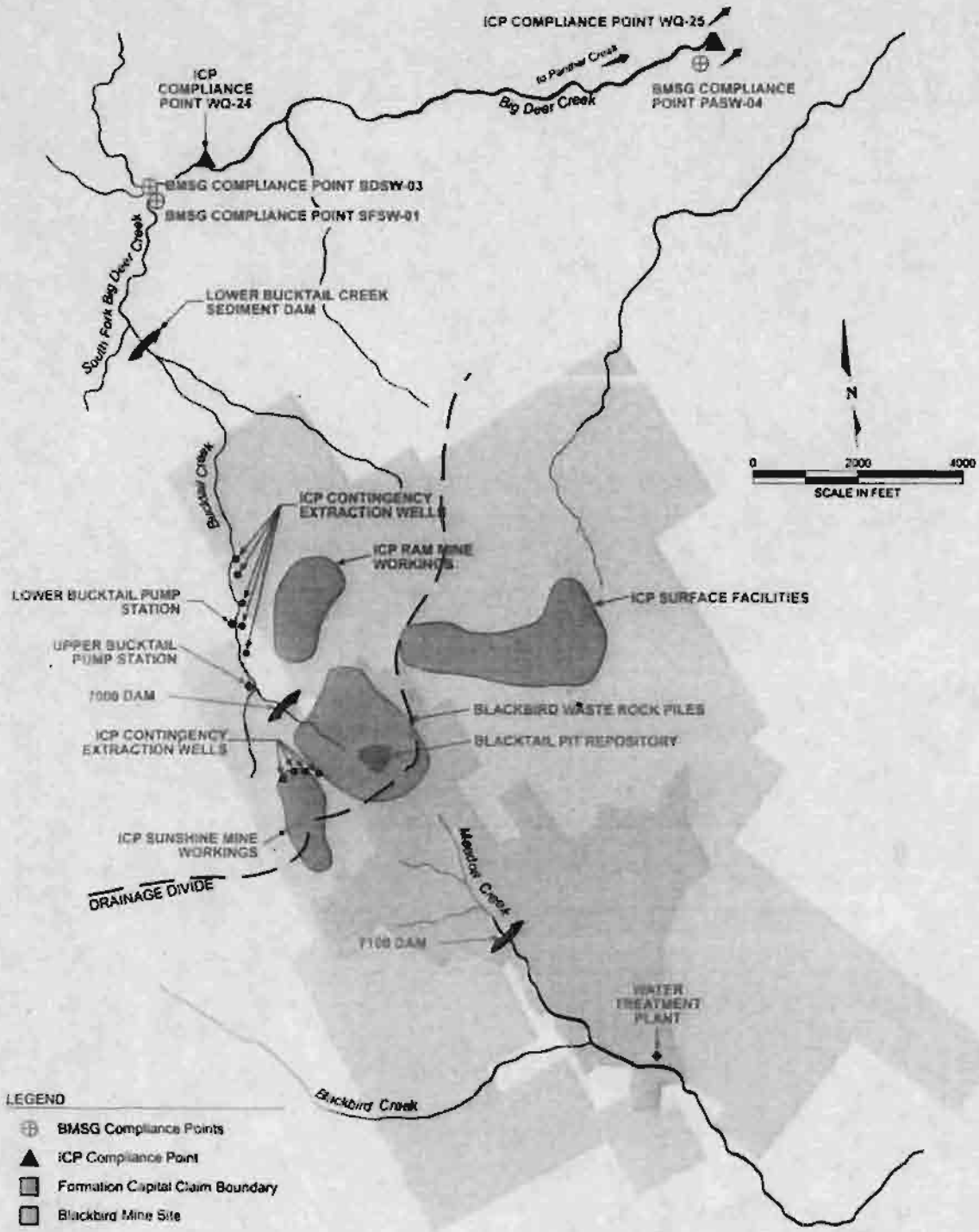


Figure ES-1 Schematic of Site Facilities and Surface Water Drainages

The Difficulty of Mitigation In A Fractured Bedrock System

The site hydrogeology is a fracture flow system in bedrock which makes monitoring and capture of contaminated groundwater especially difficult. The proposed ICP underground mine would be located almost entirely within bedrock. Groundwater flow through bedrock is highly variable and complex, but can only occur through open spaces (porosity) within the bedrock. It is not uncommon in fractured bedrock that the majority of groundwater flow occurs through a few discrete, highly transmissive fractures. In some weathered bedrock systems some of the fractures may be closed due to the presence of weathering products (clay or other materials that seal flow). This vastly complicates the problems for monitoring and capture.

Solubilized metals from mining will migrate along with the groundwater and eventually discharge to the receiving surface water. The actual path that groundwater and the solubilized metals will take depends on the fractures that are transmitting groundwater. Large continuous fractures or faults have the potential to transmit groundwater and solubilized metals at a high flow rates. Occurrence of the metals in the fractures is dependant on which fractures intersect source areas. Moreover, sources areas intersected by the fracture may have widely varying water quality.

Characterization of a fracture controlled bedrock system is extremely difficult. Wells placed just a few feet apart can have dramatically different groundwater flow rates and have different chemical concentrations from mine sources. The pump tests conducted for the ICP support characterization as a fracture controlled bedrock aquifer system and identify preferential directional groundwater movement. The pump test data together with the geologic terrain characterization show that a fracture-controlled bedrock aquifer exists near the Ram and Sunshine mines. Although, in some cases a fractured flow system can be treated as an equivalent porous media, an equivalent porous medium is not representative of aquifer conditions at the ICP.

Computer codes for modeling groundwater have been developed specifically for simulating porous media and other codes have been developed specifically for simulating fracture flow. In spite of the pump test results, FCC assumed that the bedrock aquifer system can be adequately characterized as an *equivalent porous media*. Equivalent porous media assumptions, especially for evaluating the performance of groundwater monitoring and capture systems, cannot be considered representative of the ICP bedrock aquifer behavior and cannot be used for reliable estimates of detecting and capturing contaminated groundwater.

The DEIS relies on a groundwater monitoring well network to observe and measure contamination that leaves the mine and to provide the data necessary to design a capture system to eliminate 100% of the impacted groundwater so as to ensure zero net loading to the receiving streams. The DEIS proposes that undefined "*performance-based approaches*" be used for monitoring during mine operations and a backup Bucktail alluvial groundwater capture system be installed and operated to supplement the bedrock groundwater capture system. The DEIS' proposed approach to monitoring and capture does not ensure that no net contamination load will occur because of the complex fractured bedrock aquifer system in which the Sunshine and Ram mines would be constructed.

Inadequacy of Mitigation for Acid Generation and Containment of Contaminants

It is unlikely to be technically feasible to achieve a perpetually buffered pH condition for the entire workings, including in the DRZ. Furthermore no argument is presented in the DEIS for how this buffered condition could be accomplished or what the reliability of the mixing method would be. The finite capacity of alkaline amendment implies that the DEIS must identify not only that the initial alkaline condition can be achieved, but that it can be perpetually maintained. Without a basis for showing that the pH-control can be achieved using a reliable demonstrated technology, there is no

manner in which to calculate potential costs for establishing and perpetually maintaining the chemical control that is hypothesized as the basis for the alternative. Further, due to a complete absence of any sort of consideration related to failure of the proposed approach, as well as a lack of discussion of corresponding contingency/mitigation measures, the DEIS is deficient in its presentation and evaluation of the alkaline buffering method as advocated under Alternative IV.

A failure to establish and maintain alkaline conditions in the underground mine workings will result in the presence and movement of mine water with a lower pH than predicted in the DEIS, and in correspondingly higher concentrations of contaminants, including copper. Such impacts would be most pronounced after mine closure, when the water table rebounds, the mine floods, and mine water discharges to groundwater and surface water. At that time it will be nearly impossible to retrofit a remedy to achieve alkaline conditions within the already backfilled mine.

Deficiencies of the Proposed Groundwater Monitoring System

The groundwater monitoring system proposed for Alternative IV (or any other ICP alternative) must be able to identify the contaminants in groundwater within the mine and the amount and direction of groundwater flow out of the mine. The DEIS describes a general concept for monitoring of contaminants from the mine, which assumes that the ICP will be able to detect all contaminant loads migrating from the underground mines. However, groundwater flow on the site is through fractured bedrock. Fracture controlled groundwater systems are fundamentally different from porous media. In such a fracture-controlled system, a given well or wells is likely to completely miss some zones of high transmissivity, located only feet away, because of zones of impermeable and unfractured rock between the wells and nearby fractures.

At the ICP site it is likely that groundwater containing contaminants will avoid detection by the monitoring systems because it will flow under relatively high hydraulic gradients through fractures. If FCC does not identify the contaminants flowing off site, they will not be able to design or implement a system for capturing those flows.

Deficiencies of the Proposed Groundwater Capture System

The proposed groundwater capture system has the same deficiencies as the monitoring system. Most daunting is the requirement that groundwater capture system must intercept and collect 100 percent of all contaminated flows moving away from the mine for many decades. To function properly, the collection of groundwater must include a complete understanding of the groundwater flow (through fractured bedrock) so that wells can be placed and screened in the appropriate places and intervals. It is unlikely that the proposed monitoring system can supply sufficient information to provide the knowledge necessary to allow design of an adequate collection system. Wells that completely miss zones with moving contaminants are not just possible, but they are likely, as BMSG has experienced in the past. The escape and discharge of contaminants from the ICP mines cannot be distinguished from other sources in surface water monitoring and capture systems. Therefore, the efficiency of the ICP capture systems to remove all contaminant loads cannot be verified.

The DEIS describes (page 2-46) a backup system of alluvial wells that would be installed if necessary to capture flow passing the primary capture well system installed in bedrock. The DEIS does not demonstrate that all of the contaminant load will discharge to the alluvium in Bucktail Creek. It is also possible that a portion of these contaminants will flow into the regional groundwater system and then into Big Deer Creek, the Blackbird Mine workings, and Meadow Creek.

Deficiencies in the Proposed Water Treatment System

The DEIS analysis for Alternative IV does not specify the technical details of an actual water-treatment system, nor does it specify details on how to meet the effluent limits proposed in the EPA NPDES permit. The DEIS and the agency's reclamation and closure cost estimate assume that a conventional alkaline precipitation system will be used for Alternative IV. However the effluent predicted in the DEIS for conventional precipitation would not meet the proposed NPDES limitations. The DEIS identifies possible contingent technologies, such as reverse osmosis (RO), that may be added to Alternative IV if determined to be necessary. However, if a membrane filtration system such as RO, it must first be demonstrated that the treatment system will meet NPDES discharge limits. Also there would be issues of disposal of a concentrate stream and related costs that have not been considered.

The Dynamic Systems Model Fails to Realistically Evaluate Impacts to Water Resources

The projected impacts from the ICP on Big Deer Creek and other streams are based on a DSM that includes a number of unsupported assumptions, most notably that alkaline amendment in Alternative IV are completely effective in preventing ARD conditions in the mine during the post closure period for every possible future scenario. These unsupported assumptions lead to unrealistic projections by the DSM in a number of ways. If inadequate mixing of amendments, the bypass of impacted groundwater through the damaged rock zone, or amendment consumption occur, low pH conditions and increased mass loading will result. The pH range assumed in the DSM is biased and reflects overconfidence in the proposed mitigation measures. If realistic "worst case" conditions are included in the pH range for Alternative IV, the potential impacts to Big Deer Creek will exceed water quality criteria.

Moreover, the small number of simulations performed for the stochastic analysis results in an underestimation of the reasonable worst case. The use of the 90th percentile value from the stochastic analysis to represent the "worst case" conditions is misleading given the relatively small number of realizations performed. A larger number of realizations is needed to better define the worst case estimate.

The results from the DSM are also very dependent on the assumption that BMSG remedial actions will result in attainment of water quality standards in the future in South Fork Big Deer, Big Deer Creek, and Panther Creek. There is no valid technical basis for this critical assumption in the DEIS. Furthermore, the DSM does not account for a failure of the monitoring system in fractured bedrock to detect all releases from the ICP. The predicted water treatment effluent concentrations are inconsistent in the DEIS and DSM. The concentrations of metals in the effluent predicted by the DSM for Alternative IV are lower than those stated in the DEIS.

The Financial Assurance Calculations Underestimate the Likely Cost of Reclamation

The financial assurances are inadequate because the projected annual operating and maintenance cost of $345,936 is significantly underestimated as a result of inadequate water treatment plant capacity (flow rate) and proposed water treatment equipment that is not adequate to achieve effluent standards. The operating costs are likely to be in the range of $750,000 to $1,250,000, an increase of more than a 100 percent to as much as 360 percent. In addition, capital expenditures for equipment replacement of close to $5,000,000 are required a minimum of twice during the anticipated 100-year operating life.

Summary

FCC and the DEIS team acknowledge that without mitigation, the proposed ICP would result in water quality impacts to surface and groundwater that exceed water quality standards. The DEIS is inadequate because, in evaluating the water quality impacts of the ICP, it makes unsupported assumptions regarding geochemistry, hydrogeology, and water treatment. Those empty assumptions drive the DEIS's analyses purporting to demonstrate that, under Alternative IV, the mine and its waste-management systems would perform adequately to protect the environment. Because the underlying assumptions are not supported by the DEIS or its accompanying documents and are inherently improbable, one must conclude that the ICP would result in an impermissible net increase in loading to receiving streams, including Big Deer Creek and Panther Creek.

Furthermore, the DEIS does not evaluate the impact of these loadings on fish or their underlying food chain in these receiving streams. Not only would mass loadings of copper and other contaminants violate the proposed NPDES permit and objective for Alternative IV stated in the DEIS, but because of the proximity of the remedial action at the Blackbird Mine facilities downgradient of ICP, such discharges would interfere with the BMSG's ability to meet Consent Decree and AOC requirements.

1.0 INTRODUCTION

BMSG has worked on the Blackbird Mine site for many years in an effort to reduce the impacts to water quality of past mining activities. Surface water compliance points have been established by the consent decree and UAO for the BMSG, see Figure 1-1. This work is continuing because, although great strides have been made, metals loadings have not yet achieved the water quality standards.

FCC proposes to exploit high-grade copper and cobalt-bearing massive sulfide mineral deposits by constructing two major underground mines and other facilities, termed the (ICP), on mining claims within the Salmon-Challis National Forest, Lemhi County, Idaho. The ICP is located in the watershed of Big Deer Creek, a tributary of Panther Creek and ultimately the Salmon River in central Idaho.

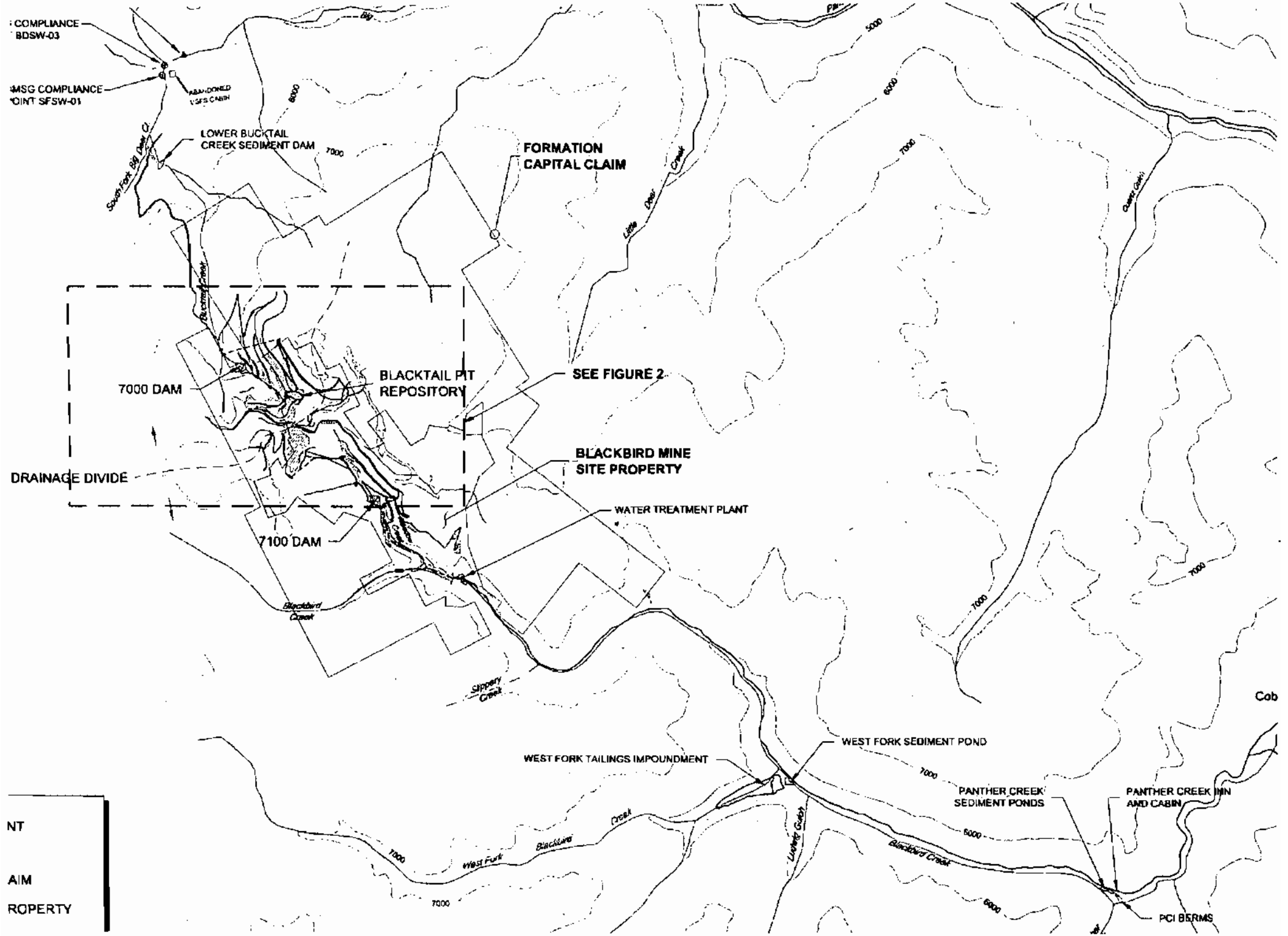
The Blackbird Mine and the ICP would be intimately entwined (see Figure 1-1), occupying the same mountain top location and involving the same geologic and hydrologic settings. Due to the location of the ICP and the obligations of the BMSG for improvement of water quality in the area, the BMSG has a strong interest in the ICP and its likely impacts to water quality downstream of the Blackbird Mine.

The ICP mining project will affect both groundwater and interconnected surface water. Because the ICP was identified as a major federal action, the project is being evaluated under the NEPA through a DEIS. The ICP was described in the DEIS, with the USFS as the lead agency. This technical review of the DEIS for the ICP was prepared on behalf of the BMSG by Golder Associates Inc. and Geochimica.

1.1 The Idaho Cobalt Project

The ICP is located in the watershed of Big Deer Creek, a tributary of Panther Creek and ultimately the Salmon River in central Idaho, as shown in Figure 1-2. The ICP includes two underground mines that would be excavated, exposing rocks with acid-generating potential and contaminants including copper, cobalt, selenium and arsenic. Sulfide oxidation and leaching will release metals directly; for example, copper is released from its solid, mineral structure when chalcopyrite is oxidized. Furthermore, acidic groundwater will dissolve contaminants in adjacent minerals and rocks, whether ore-grade or not. If these contaminants are not contained either hydraulically or geochemically, groundwater flow eventually will carry them to local streams, including Big Deer Creek. Groundwater from the Ram mine could discharge directly to BMSG facilities.

As shown in Figures 1-1 and 1-2, the ICP is directly adjacent to the Blackbird Mine site. Some of the surface runoff and groundwater impacted by the proposed mine will flow to the Blackbird Mine site, and eventually to the surface water compliance points. Given the location of the proposed ICP mine, and the fact that any contamination that bypasses the monitoring and capture system will inevitably impact water quality in Big Deer Creek, it is inevitable that the ICP will add metals loads to streams that are already exceeding established water quality standards. Because of the technical difficulty in distinguishing between sources of contamination from the intertwined Blackbird Mine and proposed ICP, impacts from the ICP may be presumptively and unfairly attributed to the BMSG. The efforts currently underway at the Blackbird Mine site are summarized below in Section 1.2.


COMPLIANCE
BDSW-03
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FORMATION
CAPITAL CLAIM
Little Deer Creek
Quartz Creek
7000 DAM
BLACKTAIL PIT
REPOSITORY
SEE FIGURE 2
DRAINAGE DIVIDE
BLACKBIRD MINE
SITE PROPERTY
WATER TREATMENT PLANT
7100 DAM
Blackbird
Creek
Slippery
Creek
WEST FORK SEDIMENT POND
WEST FORK TAILINGS IMPOUNDMENT
PANTHER CREEK
SEDIMENT PONDS
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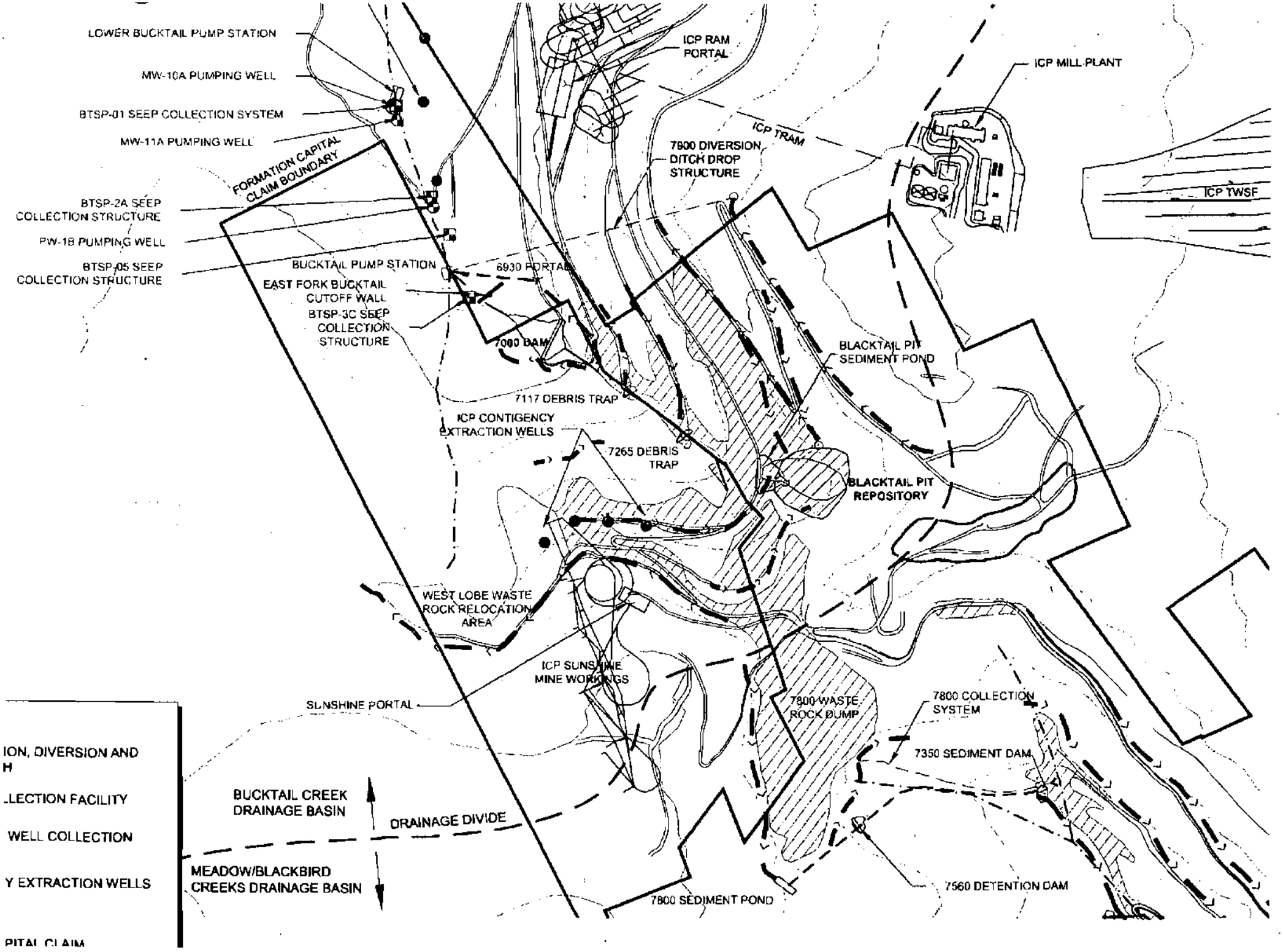
LOWER BUCKTAIL PUMP STATION
MW-10A PUMPING WELL
BTSP-01 SEEP COLLECTION SYSTEM
MW-11A PUMPING WELL
FORMATION CAPITAL CLAIM BOUNDARY
BTSP-2A SEEP COLLECTION STRUCTURE
PW-1B PUMPING WELL
BTSP-05 SEEP COLLECTION STRUCTURE
BUCKTAIL PUMP STATION
6930 PORTAL
EAST FORK BUCKTAIL CUTOFF WALL
BTSP-3C SEEP COLLECTION STRUCTURE
7000 DAM
7117 DEBRIS TRAP
ICP CONTIGENCY EXTRACTION WELLS
7265 DEBRIS TRAP
WEST LOBE WASTE ROCK RELOCATION AREA
ICP SUNSHINE MINE WORKINGS
SUNSHINE PORTAL
ICP RAM PORTAL
ICP MILL PLANT
ICP TRAM
7900 DIVERSION DITCH DROP STRUCTURE
ICP TWSF
BLACKTAIL PIT SEDIMENT POND
BLACKTAIL PIT REPOSITORY
7800 WASTE ROCK DUMP
7800 COLLECTION SYSTEM
7350 SEDIMENT DAM
7560 DETENTION DAM
7800 SEDIMENT POND
BUCKTAIL CREEK DRAINAGE BASIN
DRAINAGE DIVIDE
MEADOW/BLACKBIRD CREEKS DRAINAGE BASIN
ION, DIVERSION AND
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LECTION FACILITY
WELL COLLECTION
Y EXTRACTION WELLS
PITAL CLAIM

1.2 The Blackbird Mine Remediation

1.2.1 Setting

The site is located within Lemhi County, Idaho, approximately 13 miles south of the Salmon River, and 21 miles west of the county seat of Salmon. The site is also wholly within and surrounded by lands administered by the Cobalt Ranger District of the Salmon National Forest. The Blackbird site covers approximately 830 acres of private patented mining claims and additional areas which include unpatented claims.

The area is mountainous and varies in elevation from approximately 6,000 feet to 7,500 feet. The area surrounding the mine waste is a combination of forested slopes as well as unvegetated waste rock dump areas and other disturbed areas. The Blackbird site lies within two primary drainages: Bucktail/Big Deer Creek and Meadow/ Blackbird Creek drainages. Figure 1-1 shows the topographic features of the drainage areas. The Blacktail open pit was part of the Bucktail Creek drainage basin but now is a closed basin and drains to the underground mine workings.

Bucktail Creek drains an area of approximately 1.7 square miles, which includes the northern portion of the site and contains several sub-basins. The headwaters of Bucktail Creek originate just below the Blacktail Pit. From its headwaters, Bucktail Creek flows north and then east to its confluence with the South Fork Big Deer Creek. Over a distance of approximately 8,500 ft, the elevation drops more than 2,000 ft to an elevation of less than 5,500 ft.

Meadow Creek is the southern drainage of the mine site. This basin contains surface mine facilities and waste material from historical mining activities. Meadow Creek extends from the basin boundary near an approximate elevation 7,500 ft for 1.5 miles to its confluence with Blackbird Creek at 6,800 ft. The basin area is very steep as is the Meadow Creek channel which exhibits an 11 percent grade.

Blackbird Creek basin is composed of two drainages in the headwaters -- Meadow Creek and Upper Blackbird Creek. The two sub-basins merge within the mine site. The Blackbird Creek drainage covers approximately 23 square miles, which also includes the Meadow Creek and West Fork Blackbird Creek. Much of the forest within the Bucktail/Big Deer and Upper Blackbird Creek drainages was destroyed by fire in 2000.

1.2.2 History

Mining at the Blackbird Mine first began in the 1890s by the Blackbird Copper-Gold Mining Company until 1907. The Haynes-Stellite Company mined and milled approximately 4,000 tons of ore from 1917 to 1920. Mining activity slowed until 1938 when the Uncle Sam Mining Company reopened two old tunnels and built a 75-ton flotation mill. The Calera Mining Company purchased the Blackbird site property in 1943. Full-scale mining activity was initiated in 1949 and at the request of the U.S. government, was expanded during the 1950s. Production peaked in 1959 and demand for cobalt decreased after termination of the U.S. government contract for cobalt in 1959 (Golder, 1995).

The Calera Mining Company sold its interest in the Blackbird site area to Machinery Center Company in 1959, who in 1967, sold controlling interest to the Idaho Mining Company, a subsidiary of the Hanna Mining Company. For the next few years the Idaho Mining Company engaged in an exploration program on the property and initiated meetings with state and federal agencies to obtain authorizations to reopen the mine (Salmon National Forest, USDA 1991).

In 1977, Noranda Exploration entered into an Option Agreement with the Idaho Mining Company allowing Noranda to explore and acquire interest in the mine property. In December 1979, Noranda Mining Inc. and Hanna Services Company created the Blackbird Mining Company, a limited partnership, wherein Noranda Mining became the general partner. During this same time period, Idaho Mining Company sold all its real and personal property to Hanna Services Company. Noranda conducted limited exploration activities from 1978 to 1982.

Noranda Exploration and Noranda Mining conducted activities in accordance with a Compliance Schedule Order issued by the Division of Environment of the Idaho Board of Health and Welfare in 1980 and a National Pollutant Discharge Elimination System permit issued by the EPA.

Noranda proposed full-scale operation of the mine and an environmental impact statement was completed in 1982 which evaluated options for operating the mine site. A preferred alternative for full-scale operation of the mine at 1,200 tons per day was selected in 1982 by the Salmon Forest Supervisor (USFS, 1991). However, in 1982, Noranda suspended all operations at the Blackbird Mine. Poor market conditions were identified as the reason full-scale operation of the mine, as approved in the environmental impact statement, was never initiated. (Golder, 1995)

1.2.3 Mining Facilities

Mining activity at the Blackbird site resulted in construction of approximately 15 miles of underground workings (12 levels with more than 15 adits and portals) and an 18-acre open pit mine (See Figure 1-2). Additionally, the mine site includes graded roads, numerous piles of waste rock, and a tailings impoundment. The Calera Mill has been removed. Electrical power is supplied by a 69 kV power line originating from Salmon, Idaho. A water treatment plant was placed in service in 1980 to treat mine see page from the 6850 adit.

1.2.4 The Blackbird Mine Site Group

The BMSG, consisting of PolyOne Corps (formerly known as M.A. Hanna Company and Rojet Enterprises, Inc.), Noranda Mining, Inc., Noranda Exploration, Inc., and Blackbird Mining Company Limited Partnership (collectively referred to as "Noranda"), and Intalco Aluminum Company (referred to as "Intalco"), have been conducting environmental response actions at the Blackbird Mine site since 1994. The environmental work is being conducted pursuant to a November 1994 AOC with the EPA for a Remedial Investigation/Feasibility Study, an April 1995 Consent Decree with the United States and the State of Idaho for response actions and restoration of natural resources, a June 1995 AOC with EPA for implementation of early removal actions, and a July 2003 EPA UAO for implementation of remedial actions.

The BMSG has conducted extensive remedial actions at the Blackbird Mine site and constructed permanent facilities for diversion, collection, storage and treatment of impacted waters. Key facilities within the Bucktail Creek drainage are shown in Figure 1-2. The actions have included major work on both private and national forest lands within the Bucktail Creek/Big Deer Creek drainage where the proposed ICP operations would be located. The proposed ICP Ram and Sunshine mines are located upgradient from and on either side of permanent ground water and surface water collection and pumping systems in upper Bucktail Creek. These actions and facilities, which the BMSG is required to maintain and operate for the foreseeable future, include the following:

- Drains in the bottom of the Blacktail Pit to ensure any contaminated water drains to the underground mine workings;
- Debris flow and waste rock removal and disposal in the Blacktail Pit;

- Diversion systems, drop structures and pipelines to keep upgradient snowmelt and surface runoff from contacting waste rock or entering the mine;
- A series of collection ditches, debris and sediment traps, a diversion dam, and a new tunnel (the 6930 Portal and Adit) to convey contaminated waters into the Blackbird mine for storage and treatment on the Blackbird Creek side of the mountain;
- French drains, seep collectors, and a cutoff wall to collect and convey contaminated groundwater to an "upper" pump station;
- An elaborate series of spring and seep collectors and pumping wells located below the upper pump station to convey water to a "lower" pump station; and,
- A piping and pumping system to convey waters from the pump stations to the mine and treatment system on Blackbird Creek.

Additional extensive diversion, collection and conveyance systems, a 49 acre feet (ac-ft) reservoir and the water treatment plant are located in the Blackbird Creek drainage. The BMSG has spent approximately $70 million since 1994 in pursuit of established water quality standards; although considerable progress has been made, the standards have not yet been achieved.

The BMSG actions have resulted in dramatic reductions in copper and cobalt concentrations in Panther Creek and tributaries since 1995. In Panther Creek, the peak dissolved copper concentration has been reduced from 218 microgram per liter (µg/L), measured in 1995, to 11 µg/L, measured in 2006, a reduction of 95 percent. The peak dissolved cobalt concentration on Panther Creek has been reduced from 273 µg/L measured during 1995 to 49 µg/L measured in 2006, a reduction of 82 percent. In Big Deer Creek, the peak dissolved copper concentration has been reduced from 342 µg/L measured in 1995 to 11 µg/L measured in 2006, a reduction of 97 percent. The peak dissolved cobalt concentration in Big Deer Creek has been reduced from 110 µg/L to 11 µg/L, a 90 percent reduction.

As a result of these efforts, EPA's site-specific water quality standard for cobalt of 86 µg/L is now consistently achieved in both Panther Creek and Big Deer Creek. However, despite the extensive remedial actions performed by the BMSG, the hardness-based water quality standard for copper, which is as low as 3.5 µg/L, is not consistently achieved in Panther Creek (during the spring snowmelt) and Big Deer Creek throughout the year. Copper concentrations in South Fork Big Deer Creek, which receives waters from Bucktail Creek and discharges to Big Deer Creek, are several times higher than in Big Deer Creek, thus South Fork Big Deer Creek also fails to achieve the copper water quality standard year round.

Golder Associates conducted extensive investigations subsequent to completion of the Remedial Investigation Report (Golder, 2001) to evaluate continuing sources of copper loading to Bucktail Creek and Big Deer Creek. These studies include the following:

- Investigations to determine sources of metals loading and design remedial actions to collect contaminated water in upper Bucktail Creek (Golder, 2004b, 2004d, 2005a)
- Investigations to evaluate sources of metals loading in Big Deer Creek, especially during spring snowmelt runoff (Golder, 2004a, 2004c, 2004e, 2005b, 2006, and 2007).

The investigations in upper Bucktail Creek resulted in design of remedial actions (constructed during 2005 and 2006) with the objective of collecting very small amounts of water (as little as 1 to 2 gallons per minute (gpm) for some of the capture systems) containing elevated concentrations of copper that were not captured by systems installed during the previous 10 years (1995 through 2004). These

extensive investigation and remediation efforts demonstrated how complex the pathways of contaminant transport are, and how difficult it is to detect and capture small releases that can impact ability to achieve downstream water quality standards.

1.3 It Is Not Valid to Assume that Streams Will Meet Water Quality Standards

A fundamental assumption in the DEIS (page 4-6) is that water quality standards in Big Deer Creek and South Fork Big Deer Creek will be consistently met during the life of the ICP as a result of the BMSG actions. No scientific basis is presented in the DEIS for this assumption. Based on the extensive site monitoring and studies conducted at the site by the BMSG, there is no valid basis for this assumption for copper. Moreover, the DEIS (Tables 4-8, 4-9, B-3g-i) appears to assume not only that the copper water quality standard will be met, but that it will be consistently maintained at 3.1 µg/L, which is actually lower than the minimum copper water quality standard of 3.5 µg/L. There is no basis presented for this assumption of a water quality "cushion."

In spite of years of study, there are still undefined sources of metals loadings discharging into Bucktail Creek and Big Deer Creek. It is not possible to distinguish the source of these loadings. Although some of the sources that contribute to copper concentrations in Big Deer Creek are expected to diminish over time through processes referred to as natural attenuation, it is not known when or if the copper water quality standard will ever be achieved consistently and throughout South Fork Big Deer Creek or Big Deer Creek.

With specific reference to South Fork Big Deer Creek, the DEIS (pages 4-6 and 4-11) assumes that the Bucktail Creek diversion pipeline ("BT-5 diversion"), will be installed in 2009. The BT-5 diversion would divert the Bucktail Creek water into a pipeline and bypass an approximately one-half mile reach of South Fork Big Deer Creek before releasing the water into Big Deer Creek. South Fork Big Deer is a small stream of roughly 2 to 3 feet in width under normal flow conditions. The BT-5 diversion was included in the Record of Decision by EPA (EPA, 2003) in an effort to further reduce copper loadings to South Fork Big Deer Creek and potentially achieve the copper water quality standard in the stream. However, as currently scheduled, EPA will not make a final determination on whether or not the BT-5 diversion will be installed until 2009, but if installed, it would not be built until 2010.

The water quality predictions in the DEIS (Tables 4-8 and 4-9) assume that installation of the BT-5 diversion would result in a copper concentration in South Fork Big Deer Creek of 2 µg/L. This would require the BT-5 diversion to be essentially 100 percent effective at diverting the mass copper loading associated with Bucktail Creek into the diversion pipeline. To meet water quality standards, it must be assumed that there will be no redissolution of metals from the sediments in the channel below the diversion. It is clearly unreasonable to assume that the diversion will be 100 percent effective and that water quality standards can be met. Evaluations performed by the BMSG for EPA provide no basis for such an optimistic assumption, and no basis is presented in the DEIS. Indeed, there is no valid basis to assume that the remedial actions will achieve EPA's water quality standard in South Fork Big Deer Creek, much less the 2 µg/L copper concentration assumed in the DEIS.

The BMSG is not in favor of constructing the BT-5 diversion, in part because it would have no beneficial effect on water quality in Big Deer Creek, where the only significant aquatic habitat in the drainage exists. Surface flows in Bucktail Creek greater than the capacity of the pipeline would discharge into South Fork Big Deer Creek. The discharge of groundwater associated with Bucktail Creek or other sources could prevent the achievement of water quality standards in South Fork Big Deer Creek. In fact, natural pre-mining conditions in South Fork Big Deer Creek likely exceeded the copper standards. No environmental benefit would be gained by attempting to achieve water quality goals in South Fork Big Deer Creek. Fish sampling performed by the BMSG found that South Fork

Big Deer Creek is poor habitat, because natural physical barriers (log jams and water falls) inhibit the colonization of fish. Disturbance of the Bucktail Creek drainage as a result of installing the Bucktail pipeline would likely be more harmful than keeping the status quo. Moreover, placing the pipeline might increase copper concentrations in Big Deer Creek. South Fork Big Deer Creek historically acted as a sink for dissolved copper that was released from Bucktail Creek. Natural processes such as precipitation and adsorption onto sediments or organic materials historically resulted in a net loss of dissolved copper in South Fork Big Deer Creek. These natural processes would not occur to any significant extent in a pipeline that would convey Bucktail Creek water to Big Deer Creek.

1.4 The Idaho Cobalt Project Must Prevent Releases of Metals to Site Streams

To avoid contributing copper to streams that are not in compliance with water quality standards, the ICP would be required to maintain a zero net copper loading to South Fork Big Deer Creek and Big Deer Creek. This requirement is contained in EPA's draft surface water discharge permit for the ICP which states: "*Prior to the commencement of discharge, the permittee must provide a written demonstration to EPA and IDEQ that there will be no net increase in copper mass loading to the Big Deer Creek watershed as a consequence of mining activity.*"

Because Big Deer Creek does not currently achieve state water quality standards, EPA and the state determined that the Idaho water quality standards (IDAPA 58.02.02.054.04) (Page 11 of 51, NPDES Fact Sheet) require that no discharge can be authorized unless it is demonstrated that there will be no net increase in pollutant loading. The DEIS states (page 2-45), "*The Bucktail capture system would allow collection of additional groundwater and contaminants of concern (contaminants) from the Ram and Sunshine mines and would allow capture and treatment of additional metal load to ensure that the Idaho Cobalt Project does not contribute a net increase in metal loading to the South Fork Big Deer, Big Deer, Panther Creek system.*" Therefore, the DEIS must demonstrate that the preferred alternative will cause no net loading of pollutants to site streams.

Because the BMSG must meet rigorous remedial action levels for surface water conditions in the area immediately downgradient hydraulically of the proposed ICP mining disturbances, it is imperative that no additional loading of metals, especially of copper, occur to Big Deer Creek or other portions of the Panther Creek drainage. The DEIS states (page 4-86) that an agency objective associated with the ICP is to ensure no adverse impacts to the ongoing CERCLA cleanup activities at the Blackbird Mine site. Any increase in copper loadings to site streams would adversely impact the BMSG cleanup activities.

1.5 The Draft Environmental Impact Statement Preferred Alternative

FCC first submitted their proposed Plan of Operations for the ICP in January of 2001. Based on initial feedback from agency reviewers, revisions to the initial Plan of Operations were developed with a final revision in June of 2006. The USFS determined that preparation of an Environmental Impact Statement (EIS) was required to allow determination of whether the proposed Plan of Operations is adequate, or whether modifications are required.

The DEIS concludes that, without substantial and 100 percent effective mitigation measures, the proposed mining would lead to loadings of copper and other contaminants to Big Deer Creek that exceed water quality standards established by the EPA and the state of Idaho. To mitigate the anticipated impacts to water resources, FCC proposed water management and treatment options that are presented in the DEIS as Alternative II. The third-party review team for the DEIS identified technical flaws in Alternative II, showing that it also would lead to loadings of copper to Big Deer Creek and to other receiving waters that exceed water quality standards. Therefore, the DEIS proposes three additional alternatives, and presents Alternative IV as the preferred alternative.

The five alternatives evaluated in the DEIS are summarized briefly below:

- Alternative I – This alternative includes mining with no mitigation measures.
- Alternative II – This is the FCC proposed alternative that includes development of two underground mines, a mill utilizing conventional flotation technology to produce cobalt, copper and gold concentrate, disposal of mill tailings in a dry stack waste storage facility, backfilling a portion of the underground with paste as a part of the mining process, and collection and treatment of excess mine water with a reverse osmosis system and discharge to Big Deer Creek. The water discharge would impact a small area of jurisdictional wetlands.
- Alternative III –This alternative includes agency modifications to the FCC proposal including relocation of the tailings and waste rock storage facility to avoid isolated wetlands, utilization of a land application water treatment and disposal system (to replace RO), addition of amendments to waste backfilled in the underground mine to reduce risks to water quality of ground and surface water, addition of long-term mine dewatering rather than groundwater capture to reduce impacts to water quality, modifications to reclamation techniques to include native plant species, the addition of improvements to the waste storage facilities, upgrades to access roads, and expanded monitoring.
- Alternative IV –This alternative includes agency modifications to the FCC proposal including reducing the size of the tailings disposal facility to match existing ore reserves and avoid direct impacts of isolated wetlands, addition of a backup groundwater capture system to provide post closure groundwater capture, utilization of an alternative water treatment system that will reduce the volume of waste products, the addition of amendments to mine waste backfill to improve geochemical stability of backfill and rerouting of the water discharge pipeline to avoid impacts to a cultural site.
- Alternative V – This alternative is similar to Alternative IV; however, it includes utilization of the existing Blackbird Mine water treatment plant for ICP water treatment requirements.

Because Alternative IV has been selected as the preferred alternative, this review focuses on Alternative IV, but the same issues arise with all the alternatives except the No Action Alternative.

The DEIS describes that Alternative IV was developed "*...to ensure that the ICP does not contribute a net increase in metal loading to the South Fork Big Deer, Big Deer, Panther Creek system.*" (DEIS page 2-45) That is a very difficult goal, but as described above, it is a required objective for this mining project. A series of interdependent mitigating activities are incorporated into Alternative IV in an attempt to achieve this requirement including the following:

- "*Waste rock (slash) left underground in the Ram and Sunshine mines would be amended with lime or cement to provide alkalinity to reduce potential metals leaching*". (DEIS page 2-47);
- A post-closure bedrock groundwater monitoring and capture system would be installed downgradient of the mines and would be tested during mine operation (DEIS page 2-45);
- If testing indicated that that bedrock wells could not capture enough of the metals load, an additional groundwater capture system consisting of an interception trench or series of wells across Bucktail Creek alluvium would be installed downgradient of the Ram mine (DEIS page 2-46).

A limited amount of additional detail is included in the DEIS to described the proposed procedures for amendment of waste rock and the proposed bedrock monitoring and capture systems. The DEIS does not present test results or otherwise demonstrate that those measures will be effective. The third bullet above is the full extent to which the alluvial capture system is described in the DEIS. Rather than

demonstrate the effectiveness of the proposed mitigation measures, the DEIS relies on a series of assumptions that those systems will be effective, including the following:

- The waste rock amendments will effectively buffer and control all groundwater affected by the mining activities to within a narrow range of pH and water quality;
- FCC will be able to precisely monitor the quality and quantity of water affected by the mine in order to calculate the mass loadings of metals and other constituents that must be collected by the capture systems;
- The capture systems will be capable of capturing 100 percent of the loadings calculated above; and,
- The treatment system will reliably and consistently achieve the permitted discharge limits.

Not surprisingly, the use of these unrealistic and/or biased assumptions in the dynamic systems model, which is used to predict water quality effects in the receiving streams, results in a model output of no net loading. But the conclusion relies on the assumptions, which are either not true or not demonstrated. For this reason the conclusions are not true.

1.6 Format of the Draft Environmental Impact Statement Review

Section 2 of this report describes in general water resources impacts due to mining, starting with development of acid rock drainage, potential pathways for contamination, and the receiving environment. To assist the reader in understanding the important of the subsurface conditions, Section 3 describes why mitigation at this site is made difficult by the fracture flow setting.

The comments contained in this document are based on our review of Alternative IV of the DEIS, review of supporting documentation that is a part of the public record, and our understanding of the physical setting and known resource impacts that can be expected due to mining, Section 4 of this document defines the four areas of technical comments on the DEIS including the following:

- Inadequacy of mitigation for acid generation and containment of contaminants (Section 4.1),
- Deficiencies of the proposed groundwater monitoring system (Section 4.2);
- Deficiencies of the proposed groundwater capture system (Section 4.3); and,
- Deficiencies in the proposed water treatment system (Section 4.4).

Section 5 describes how the DSM fails to account for the deficiencies described in each of the subsections in Section 4, and therefore does not realistically evaluate the impacts to water resources.

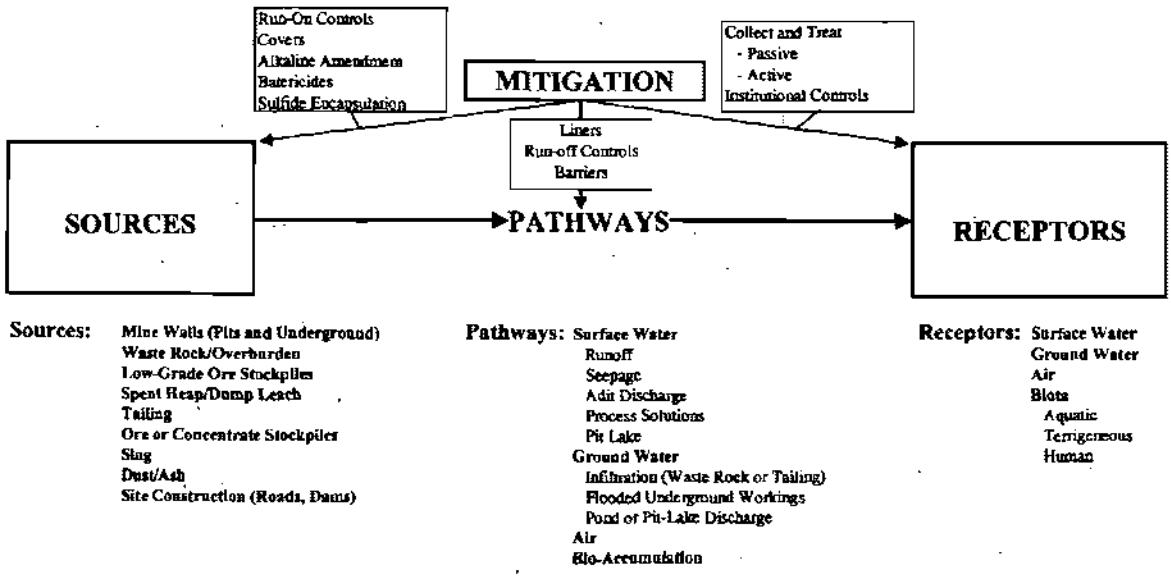
Section 6 documents that unrealistically low annual water treatment costs are used in the reclamation cost estimate for bonding purposes.

Section 7 summarizes the findings of the review.

2.0 ABSENT 100 PERCENT MITIGATION, THE IDAHO COBALT PROJECT WILL HAVE A SIGNIFICANT ADVERSE IMPACT ON WATER QUALITY

It is well known that hard-rock mining can adversely affect water resources; the remedial projects at the Blackbird Mine adjacent to the proposed ICP shows the relevance of the issue to the proposed ICP. The mining industry understands that project planning and design must include assessment of geochemical conditions and ultimately predictions of the evolution of water quality from pre-mining baseline conditions through final closure and reclamation in order to understand the risks to water resources. One common way of conceptualizing a mine site that relates to subsequent risk assessment methods is depicted in Figure 2-1.

Figure 2-1. The Source-Pathway-Receptor Paradigm for Water-Resources Impacts at Mine Sites



This evaluation of potential for impacts to water resources will follow the Source – Pathway – Receptor paradigm, focusing in Section 2 on water quality impacts that would be expected absent mitigation. Issues associated with ICP's proposed mitigation processes are discussed in Section 3 below.

2.1 Formation of Acid-Rock Drainage

The basic geochemistry of acid-rock drainage (ARD) and the water-quality impacts associated with it are well-established (e.g., Nordstrom and Alpers, 1999). The ICP would exploit volcanogenic massive sulfide (VMS) ores, formed at high temperatures and pressures at the ocean floor, in the presence of hydrogen sulfide. Sulfide minerals in ores formed at high temperature under strongly reducing conditions are chemically unstable at the earth's surface, where oxygen comprises 21 percent of the air. Water-quality studies compiled by the US Geological Survey show that ARD and elevated levels of dissolved metals are typical for VMS deposits (e.g., Plumlee et al., 1999). This widespread experience with water-quality impacts from ARD and metals leaching at VMS deposits is confirmed locally, based on water-quality conditions currently being addressed at the Blackbird Mine site.

Sulfide minerals [such as pyrite (FeS_2), chalcopyrite ($CuFeS_2$), or cobaltite ([Co, Fe)AsS)] react with molecular oxygen (O_2) in air and water (H_2O) to produce solutions of sulfuric acid (H_2SO_4) and

dissolved metals. These reactions will occur in several areas, for example in development-rock stockpiles, tailings impoundments, or in mined walls, including underground. The process can be illustrated by the initial step in the abiotic oxidation of pyrite, the most common sulfide mineral in Earth's crust as follows:

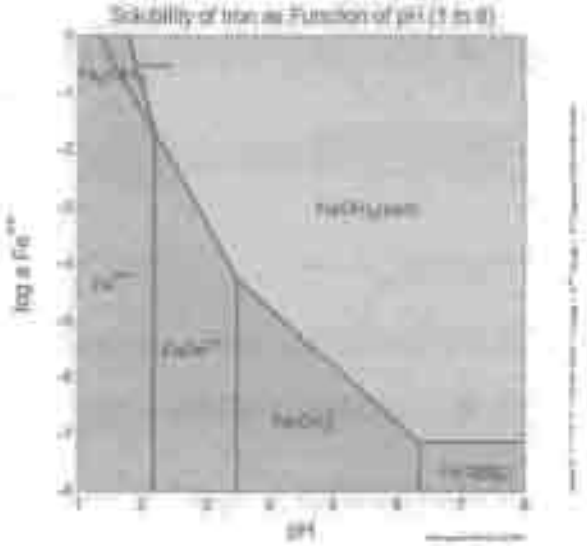
$$FeS_2 + 7/2\ O_2 + H_2O \rightarrow Fe^{2+} + 2\ SO_4^{2-} + 2\ H^+ \qquad \text{(reaction 1)}$$

Equivalent reactions can be written for chalcopyrite, cobaltite and many other sulfide minerals. As discussed in the DEIS, cobaltite and chalcopyrite produce fewer moles of hydrogen ions per mole of sulfide mineral than does pyrite, but are nonetheless acid-generating minerals. All sulfide oxidation reactions relevant to ICP produce solutions of sulfuric acid or battery acid; this is H_2SO_4, the equivalent of the dissolved sulfate (SO_4^{2-}) and hydrogen ion (H^+) shown on the right hand side of reaction (1).

In mining systems in which there is more potential to generate acidity than to neutralize it , such as the ICP, waters draining mine wastes can be highly acidic, with low pH. In low-pH waters, metals are highly soluble (as illustrated for iron in Figure 2-2), and the high acidity, generated by oxidizing sulfide minerals also produces high concentrations of dissolved sulfate. The sulfate ions in solution must be balanced by metal cations derived from the acidic leaching of other minerals in the rock mass. The result is an effluent with low pH, high total dissolved solids, including elevated sulfate and dissolved metals (Plumlee et al., 1999). Such solutions are classically called acid-rock drainage (ARD) or acid-mine drainage (AMD); the terms are synonymous when applied to mines.

Figure 2-2: Solubility of Iron as Function of pH

[Brown area is solid mineral phase (ferrihydrite); Blue areas are aqueous fields. Log a Fe^{++} =-7 = 5.6 E-06 g/L; Log a Fe^{+++} =0 = 56 g/L]



Some mines do not generate acidic drainage because of carbonate buffering capacity in the host rocks[1]. However, the ICP host rocks are essentially devoid of buffering potential[2], and therefore zones with reactive sulfides will generate acidic drainage.

All mining disturbs the ground and produces impacts on the local water resources. An important, and often neglected, aspect of mining geochemistry is that the mining process inevitably fractures rocks, exposing surfaces, and total surface areas that are hundreds to millions of times greater than would have been exposed had the rock not been blasted (e.g., Morin and Hutt, 1995). The impacts to water quality and consequently to the associated biological systems are especially severe when hard rock mining, like the ICP, exposes sulfide minerals that generate ARD in a matrix with little or no neutralization capacity. Because mines must be essentially dry in order to remove and handle the ore and waste rock, the mining zone must be dewatered. This step generates unsaturated conditions in the rock within the drawdown zone, and under unsaturated conditions, oxygen will diffuse readily along fractures and into the adjacent rock matrix (Plumlee, 1999. Ritchie, 1994). Because sulfide minerals are not thermodynamically stable in the presence of atmospheric oxygen, they must begin to oxidize. Sulfide oxidation will release metals directly; for example, copper is released from its solid, mineral structure when chalcopyrite ($CuFeS_2$) is oxidized. Furthermore, acidic groundwater will dissolve contaminants in adjacent minerals and rocks, whether ore-grade or not, through the underlying chemical processes outlined above (reaction 1). Regardless of origin, these soluble contaminants, especially copper, are particularly toxic to fish in an area where major efforts are underway to restore salmon and steelhead runs.

The details of sulfide oxidation, metals leaching, and the fate of metals such as copper released are very complex, depending on specifics of mineralogy, geochemical and biogeochemical conditions along the source - flow-path system, and both groundwater and watershed hydrology. Consequently, geochemical predictions are very difficult and subject to substantial uncertainties, even when they are performed considering the actual chemical and physical processes. To develop water-quality predictions without explicit consideration of the technical details is not standard scientific or mining-industry practice.

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[1] In some systems, for example in carbonate-hosted base-metal deposits, there may be enough calcite or dolomite present to neutralize the acidity generated by the oxidation of the sulfides. The carbonate minerals (e.g., calcite, $CaCO_3$, the principal mineral of limestone) react with acidity to neutralize the solutions as follows:

$$CaCO_3 + H^+ \rightarrow Ca^{2+} + HCO_3^- \qquad \text{(reaction 2)}$$

It is critically important to understand that the presence of carbonate minerals in mined rock or tailing does not prevent the sulfides from oxidizing. The alkaline minerals simply neutralize some of the acidity produced. In this case, the pH of the mine drainage may remain in the near-neutral to slightly alkaline range, and the name "acid-rock drainage" seems poorly posed because the effluent is not acidic. However, such neutral mine drainage may still have elevated dissolved solids, notably sulfate, and it may also have elevated concentrations of some dissolved metals and metalloids (e.g., cadmium (Cd), cobalt (Co), manganese (Mn), nickel (Ni), selenium (Se), and zinc (Zn)). These metals are released during the initial oxidation step but are not solubility-controlled to low concentrations at near-neutral pH values.

[2] Typical oxidation and dissolution rates for the common sulfides such as pyrite and chalcopyrite are around 10^{-7} $mol.m^{-2}.s^{-1}$ to 10^{-8} $mol.m^{-2}.s^{-1}$, respectively (Rimstidt et al., 1994). These rates are a million times faster than the rates of reaction for silicate minerals. The only common minerals capable of reacting in the same time frame as pyrite oxidizes are calcite and dolomite, the double carbonate [$CaMg(CO_3)_2$]. This fact has extremely important consequences for the evolution of ARD: the only effective neutralization potential in mined rocks or tailing will be provided by carbonate minerals. The rocks that ICP proposes to mine are essentially devoid of carbonates. Therefore zones within the ICP mine that contain sulfides will generate acidic drainage.

2.2 Pathways

Contaminated water that could report to the surface-water system will originate as groundwater in the mine or from waste rock piles. All ICP waste types will come into contact with subsurface waters. Some portion of the local precipitation will infiltrate, via the ground surface, into the underground workings. This can be minimized by surface-water controls at the mine, but it cannot be prevented. When pumping ceases at the conclusion of mining, the groundwater table will rebound; re-saturate the previously unsaturated workings, and mined rock, including sulfide-bearing mined rock that has been undergoing ARD reactions for years. Groundwater will contact some zones in which ARD has generated soluble secondary phases, thereby contaminating the flow system. Therefore, the water accumulating in the underground voids after mining will become contaminated (see Section 2.1 for more details).

When the water table has recovered, groundwater will begin to flow laterally, away from the workings and toward the lower-elevation streams, as a saturated-flow groundwater system. Driven by gravity, the contaminated groundwater originating in the re-saturated mine workings will move downgradient along paths of least resistance, including preferential seepage paths. In a complex fractured system, such as the ICP, water will move primarily through openings in the rock, including man-made openings (i.e., adits) when they are present, or through fractures in the rock when larger flow paths are not available. When flow occurs in fractures, it can move relatively quickly and along very complex pathways of interconnected fractures. The contaminated groundwater from the mine workings will flow downgradient until it reaches and commingles with the local uncontaminated groundwater system that surrounds the mine, and eventually discharges to surface water drainages. The surface water system acts as a drain to carry away groundwater and surface water runoff. During baseflow (periods of low flow) conditions there is little direct runoff of precipitation and snowmelt. Essentially all stream flow is composed of groundwater that discharges through the stream bed and from seeps and springs. Unless all of the contaminated groundwater is captured and treated, there will be an increase in contaminant loadings to the receiving streams, namely Bucktail Creek, South Fork Big Deer Creek, Big Deer Creek and Panther Creek, as discussed below.

2.3 Receiving Environment

The surface water system that will be receiving groundwater from the ICP includes Bucktail Creek, South Fork Big Deer Creek, Big Deer Creek and Panther Creek. The surface water system is illustrated in Figure 1-1. Bucktail Creek flows into South Fork Big Deer which, after a distance of about 0.5 mile, flows into Big Deer Creek, and eventually flows into Panther Creek. As explained in Section 1.3, water quality standards are exceeded in these streams. Any additional copper loading from the ICP will contribute to and increase the magnitude of those exceedences. In sufficient amounts, the copper and other contaminants released from the ICP will result in toxic conditions to fish and the macro-invertebrates on which the fish depend.

The ICP surrounds and is upgradient of the Blackbird Mine zone of influence. Virtually all contamination sources from the ICP will flow into streams that are part of BMSG's compliance requirements. The rocks and mineralization that the ICP will disturb developed at the same time and by the same geologic processes as those at the Blackbird Mine and are subject to sulfide oxidation and subsequent metals leaching just as were those at the Blackbird Mine. Contamination originating in the Sunshine or Ram mines will flow downgradient commingling with groundwater affected by the Blackbird mine and discharged to Bucktail Creek. Some of the groundwater from the Ram mine may flow more northward and discharge directly to South Fork Big Deer Creek or directly to Big Deer Creek. As described in Section 3.4, some contaminated groundwater from the Sunshine mine may migrate and discharge to the Blackbird mine workings and/or to Meadow Creek.

2.4 Impacts of the ICP without Mitigation

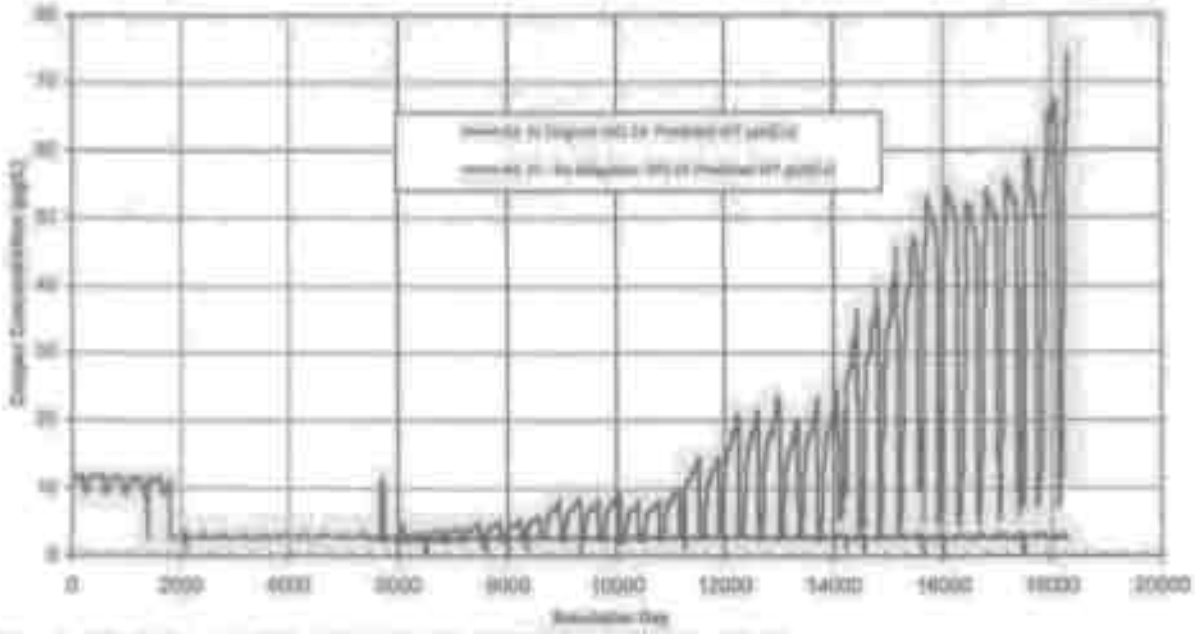
Before evaluating the various alternatives, it is important to understand the water quality impacts that will occur if there is no mitigation or if the proposed mitigation is not successful at the ICP. The DSM used by the USFS was used to evaluate the impact of the ICP on Big Deer Creek and Panther Creek assuming the mitigation measures were ineffective. All the input values[3] were unchanged except the groundwater capture efficiency was set to 0 percent and the pH in the Ram Slash and Backfill was set to 5.5, which is representative of moderately acidic conditions. A pH of 5.5 is less acidic than the pH 4.5 drainage that was observed within the 6930 portal at the Blackbird Mine. A pH of 5.5 or lower could be reached within the ICP mines if the proposed mitigation (amendments of the backfill) is unsuccessful.

The impact to Big Deer Creek as a function of time is shown in Figure 2-3. The predicted impact from the original Alternative IV simulation (Realization 12) is shown for comparison. Following mine closure, the underground workings flood as the groundwater levels in the area gradually recover (rise) and reach the pre-mining conditions. The low pH in the slash and tailings backfill areas results in a high concentration of copper in the mine water. As contaminated groundwater flowing through the mine begins to reach Big Deer Creek around Simulation Day 6000, the copper concentration in the creek begins to increase. Eventually the water quality in Big Deer Creek reaches over 50 µg/L by Day 16000 in the simulation when the groundwater flow rate through the mine area reaches the maximum rate. These concentrations are within the range of historical copper concentrations in Big Deer Creek from Blackbird mine impacts prior to reclamation and closure activities.

The associated impact to Panther Creek at WQ-25 is shown in Figure 2-4. The concentrations predicted from the original DSM simulation for Alternative IV (Realization 12) are shown for comparison. The trend of gradually increasing copper concentration with time is identical to the trend for WQ-24 (Figure 2-3) since the only difference is the addition of dilution flow from down stream drainages. The concentration at WQ-25 is predicted to exceed 8 µg/L under the no mitigation assumption. A comparison of the copper concentration predicted for about day 18,000 (year 50) in Big Deer and Panther Creeks to the water quality standard for copper is shown in Figure 2-5.

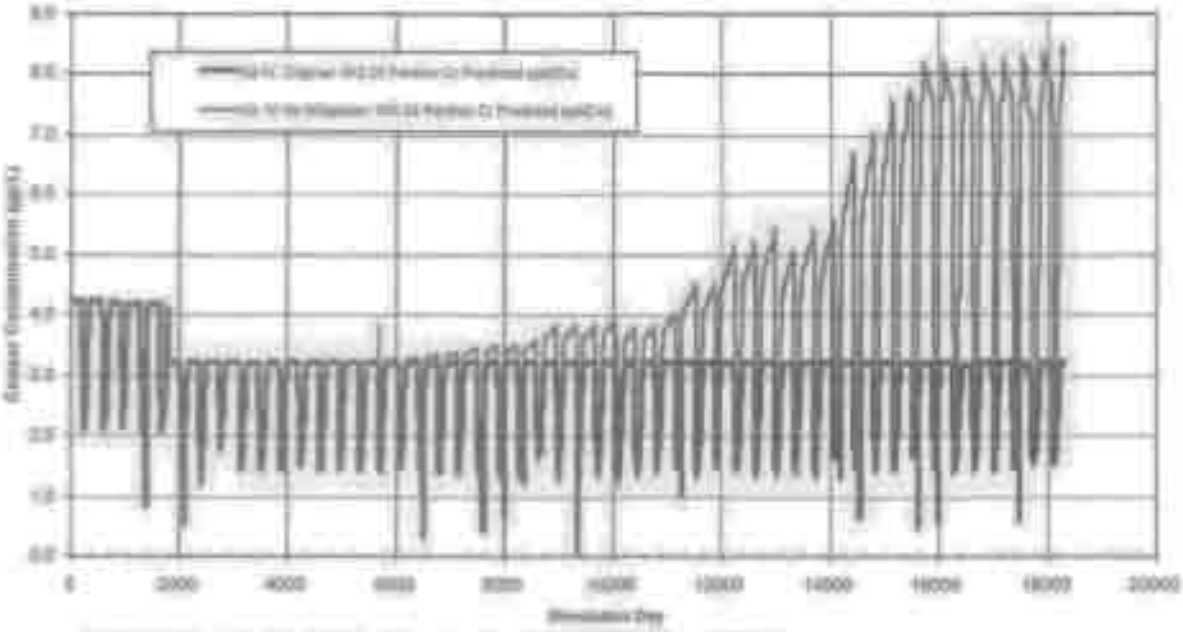
[3] A single realization from (#12) from the DEIS stochastic analysis for Alternative IV was used. A realization is a single simulation of the life of the mine using the DSM. Realization 12 was used because the efficiency of the capture system was approximately the expected value in Table 2-9 of the DEIS. The actual results for other realizations could be higher or lower, depending on the hydrologic/climatic data and the parameter sampled for the realization.

Figure 2-3 Predicted Copper Concentrations in Big Deer Creek



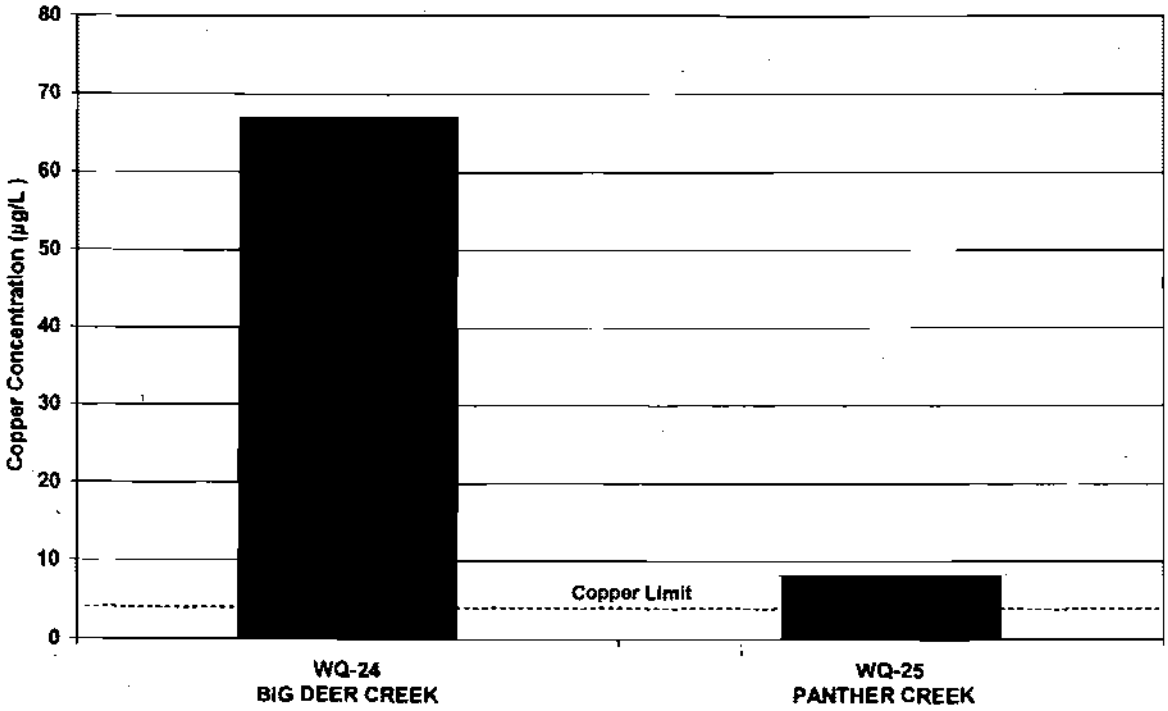
Notes: No Mitigation assumes constant pH and flow Backfill pH of 5.5 and GW Capture Eff = 0%
Original includes variable pH and flow pH and GW Capture Eff = 77.74%

Figure 2-4 Predicted Copper Concentrations in Panther Creek



Notes: No Mitigation assumes constant pH and flow Backfill pH of 5.5 and GW Capture Eff = 0%
Original includes variable pH and flow pH and GW Capture Eff = 77.74%

Figure 2-5 Predicted Maximum Copper Concentrations at Compliance Points



3.0 MITIGATION AT THE SITE IS MADE DIFFICULT BY THE FRACTURE FLOW SETTING

3.1 General Principles

The proposed ICP underground mine would be located entirely within bedrock, except for access portals and ventilation shafts through the surficial unconsolidated colluvium. A portion of both the Ram and Sunshine mines would be above the bedrock water table in the unsaturated zone (called the vadose zone). The remainder of the Ram and Sunshine mines would be below the regional water table. During active mining operations, the Ram and Sunshine mines would be dewatered through active pumping so that the workings are not inundated. Once the active mining operations and mine dewatering cease, the water table will rise eventually to the pre-mining levels and re-saturate those portions of both mines that were below the original regional water table.

Groundwater flow through bedrock is highly variable and complex, but can only occur through open spaces (porosity) within the bedrock, either through the rock matrix itself, through fractures in the rock structure, or through man made openings, when such openings exist. Bedrock matrices are comprised of mineral grains that have some, but low, porosity between the individual grains (interstitial porosity). This interstitial porosity absorbs groundwater, and typically does not contribute significantly to groundwater flow. Most of the groundwater flow through bedrock is through fractures in the bedrock matrix, and depends on the degree that fractures have open space for groundwater flow to occur. It is not uncommon in fractured bedrock that most of the groundwater flow occurs through a few discrete, highly transmissive fractures. In these types of bedrock systems, groundwater is fracture controlled.

While some fractures are open and provide conduits for flow, other fractures are in-filled with secondary minerals that precipitated from flowing groundwater or clay-type materials that weathered along rock surfaces in the fractures over geologic time. Fractures that are completely in-filled transmit very little water. Other fractures with open space may represent "dead ends" because they are not connected to other fractures or have been hydraulically isolated from other fractures by infilling a portion of the fracture as mentioned above. Groundwater in "dead end" fractures can be stored, but with little movement and little contribution to overall groundwater flow.

An aquifer system within soils and sediments is described as a porous media aquifer. Groundwater flow occurs through open spaces (the porosity) between the sediment particles. Most pores in a porous media are highly interconnected and contribute to groundwater flow (i.e., open space network between stacked pebbles). The ability for groundwater to be transmitted through a porous media depends on the size of the interconnected pores. The solid particles of porous media can vary in size resulting in various sized pore spaces (Bear, 1972). The major difference between fracture controlled aquifers and porous media aquifers is the interconnectivity among the open spaces that actually contribute to groundwater flow. Groundwater typically behaves more predictably and uniformly in porous media aquifers; therefore they are less complex and easier to model than fracture flow systems.

Fractured bedrock aquifers can behave as an "equivalent porous media" on very large scales such as an entire drainage basin even though the actual process involves flow through fractures. In the context of an entire basin and without the need to consider the sources of flow within the basin groundwater deviation from porous media behavior caused by flow through fractures is small and insignificant to the overall groundwater movement within the entire basin. If a fractured rock aquifer is observed from a great distance and water levels and flows are measured on a large scale as well, the aquifer can appear to behave in a manner which is "equivalent" to a porous media system. This is commonly assumed in groundwater modeling for an entire bedrock basin because porous media models are simpler and require much less field data than detailed modeling of fracture flow, and the results can be essentially

the same as results from a more rigorous fracture flow model under the right conditions. When the basin scale and fracture density are appropriate, a fractured flow system can be treated as an equivalent porous media. However, as discussed in Section 3.3 below, the conditions at the ICP are not appropriate for the assumption of equivalent porous media. Although it is mathematically convenient to treat a fractured rock system as if it can be represented by a porous medium at large scales, bedrock flow systems that are considered to be fracture controlled are highly heterogeneous at smaller scales, with the flow occurring in discrete fractures. Some of these fractures are more open (wider aperture) and carry much more groundwater flow than others. Individual fractures may be separated and isolated by competent rock that transmits essentially no water. On a smaller scale where individual sources or areas of contaminated flow must be identified and captured, an inappropriate assumption of equivalent porous media could lead to a failure to monitor and capture groundwater flow. In some weathered bedrock systems some of the fractures may be closed due to the presence of weathering products (clay or other materials that seal flow). This vastly complicates the problems for monitoring and capture, as discussed in more detail in Section 4.2, because any given well may not detect flows through significant fractures.

While some groundwater systems can be adequately described using "equivalent porous media" when the scales are appropriate, the monitoring and capture systems proposed for the ICP are not such systems. The greater the distances between fractures containing significant groundwater flow, the more difficult it is to properly locate them. In such circumstances, it is unlikely that a monitoring well system will be able to detect and characterize all contaminated groundwater from an underground mine in a fracture controlled bedrock system.

3.2 Metal Migration in a Bedrock Aquifer

Solubilized metals from mining will migrate along with the groundwater and eventually discharge to the receiving surface water. The actual path that groundwater and the solubilized metals will take depends on the fractures that are transmitting groundwater. Large continuous fractures or faults have the potential to transmit groundwater and solubilized metals at a high flow rates. Occurrence of the metals in the fractures is dependant on which fractures intersect source areas. Moreover, sources areas intersected by the fracture may have widely varying water quality.

Fractures and the interstitial porosity (between mineral grains) can store and retard the movement of groundwater and associated solubilized metals. Specifically, because "dead end" fractures contain stored groundwater, solubilized metals could get stored within "dead end" fractures, but released from the "dead end" fractures slowly over time. Although flow may not be occurring through the bedrock matrix porosity, solubilized metals can get trapped or stored within the interstitial porosity by diffusion and also be slowly released to the more conductive fractures transmitting groundwater over time.

Characterization of a fracture controlled bedrock system is extremely difficult. Wells placed just a few feet apart can have dramatically different groundwater flow rates and have different chemical concentrations from mine sources. Golder has witnessed this fractured bedrock condition in our investigations in the upper Bucktail drainage that were preformed in connection with the Blackbird Mine remediation. We were attempting to characterize the upper portions of the bedrock rock aquifer to find and intercept groundwater having elevated metals content. One boring (BMW-6B) was moved about eight feet from its pilot core-hole, but we found significantly different groundwater yields (production rate) and significantly different copper concentrations when compared to the original pilot core-hole (Golder, 2004b). This illustrates the difficulty in detecting the movement of contaminates in a fractured bedrock system (see Section 4.2 for more details).

3.3 ICP Bedrock Aquifer Characterization Data

The ICP conducted a limited characterization of the bedrock hydrogeology of the site as was reported in the ICP Baseline Hydrology Report (Shaw, 2004). The geologic structural presentation of faulted and fractured bedrock and the results of pump tests show that groundwater movement is controlled by fractures. The pump tests conducted by FCC in 2000 involved pumping borehole MH-04 for about 915 minutes and 300 minutes (repeated tests) and observing groundwater responses in MH-03, MH-06, and MH-07 (observation boreholes). All boreholes were in the area of the Ram mineralized deposit. The radial distance of the observation boreholes from the pumping borehole varied between 110 and 138 feet (very similar). The observation boreholes were all north of the pumping borehole (NNW to NNE). After pumping, MH-03 had 92.25 feet of drawdown while the other observation boreholes had very little drawdown (MH-06 had 0.16 foot and MW-07 had 0.87 foot). These pump test results clearly show a highly anisotropic system (note: an anisotropic system transmits groundwater more easily in one direction than another as opposed to an isotropic system that transmits water nearly equally in all directions) and that bedrock fractures are not highly interconnected (Shaw, 2004). The Baseline Hydrology Report states that the "trend of high-flow anisotropy" of groundwater based on these pump test results is toward the north (Shaw, 2004, Figure 4.36).

The only other pump tests found in the Baseline Hydrology Report (Shaw 2004) were conducted in 2001 and were single well tests of relatively short duration (~100 minutes). The report stated that the hydraulic conductivity decreased with depth, but the test results again indicated that the calculated hydraulic conductivity varied even in the shallow portions of the fractured bedrock by about an order-of magnitude. Although these were single well tests of short duration, they indicate significant variability in permeability that can be caused by groundwater flow within fractures to which the wells are hydraulically connected.

The pump tests conducted for the ICP support a fracture controlled bedrock aquifer system and identify preferential directional groundwater movement. Although porous media can exhibit anisotropy (variations of hydraulic properties in different directions), it is rarely observed to this degree in the horizontal dimension and over such a small radial change of direction (NNW to NNE). The pump test data together with the geologic terrain characterization show that a fracture-controlled bedrock aquifer exists near the Ram and Sunshine mines. An equivalent porous medium is not representative of aquifer conditions.

Computer codes for modeling groundwater have been developed specifically for simulating porous media and other codes have been developed specifically for simulating fracture flow. In spite of the pump test results, FCC assumed that the bedrock aquifer system can be adequately characterized as an *equivalent porous media*. FCC predicted groundwater behavior from the ICP and for capture of contaminated groundwater by modeling using TWODAN and MODFLOW codes, which are porous media groundwater flow codes and are unable to model fracture controlled groundwater flow. Contrary to their own pump test results an aquifer characterization having high–flow anisotropy (Shaw, 2004, Figure 4.36), the input parameters for these porous media models assumed isotropic (equal permeability in all directions) for the fractured bedrock aquifer. The adoption of an *equivalent porous media* assumption for evaluation and modeling of groundwater flow and capture for the ICP is a fundamental flaw in the DEIS analyses and estimates. Equivalent porous media assumptions, especially for evaluating the performance of groundwater monitoring and capture systems, cannot be considered representative of the ICP bedrock aquifer behavior and cannot be used for reliable estimates of detecting and capturing contaminated groundwater.

3.4 Draft Environmental Impact Statement Assessment of the Bedrock Aquifer

The DEIS recognizes the bedrock aquifer system is probably fracture-controlled (DEIS, page 3-13). The DEIS states: "------. *However, on a localized scale of a few tens to hundreds of feet, detailed groundwater flow paths may deviate significantly from this simplified model (equivalent porous media for previous sentence), with groundwater flow potentially occurring perpendicular to generalized groundwater flowpaths assumed for the EPM (equivalent porous media). Furthermore, major bedrock structures such as faults and shear zones have the potential to cause groundwater flowpaths to deviate from the generalized model over larger distances."*

Additionally the DEIS (page 3-11) states *"One example of where the EPM (equivalent porous media) may not be applicable is in evaluating potential contaminant transport pathways through the bedrock aquifer, where individual fractures may cause particle transport pathsways to deviate on a local scale-----."*

And in the following paragraph *"Groundwater flow through the bedrock aquifer is also influenced by a number of significant bedrock structures (referred to as shear zones and faults) identified in the ICP area."*

Although the DEIS recognizes that groundwater flow may deviate significantly from an equivalent porous media on scales of tens to hundreds of feet and larger distances if controlled by major bedrock structures, the DEIS relies on a groundwater monitoring well network to observe and measure contamination that leaves the mine and to provide the data necessary to design a capture system to eliminate 100 percent of the impacted groundwater so as to ensure zero net loading to the receiving streams. The above quote from the DEIS acknowledges a fundamental lack of site understanding and ability to make meaningful predictions of groundwater behavior, groundwater monitoring representativeness and contaminated groundwater capture to ensure that the ICP will not add any contaminant load to the receiving streams.

Although the bedrock aquifer behaves as a fracture controlled groundwater system, the USFS did not conduct independent investigations of the bedrock aquifer system to understand the viability of the proposed systems. The effectiveness of the bedrock groundwater monitoring and capture system was estimated in the DEIS from professional judgment (DEIS page 4-24) and knowledge of the localized hydrogeology, but the only existing data is from work conducted by BMSG and FCC. As stated earlier, FCC assumed the bedrock aquifer system is behaving as an equivalent porous media. The FCC modeling of the system assumes effective capture of contaminated groundwater using wells that are spaced about 450 feet; this is not consistent with the above DEIS quote that groundwater flow may deviate significantly from an equivalent porous media on scales of tens to hundreds of feet and larger distances because well spacing spans areas of significant groundwater variation.

The DEIS recognizes the bedrock aquifer will be fracture controlled and a bedrock GW capture system will not be able to capture all contaminated groundwater (DEIS page 4-25). Consequently the DEIS proposes that undefined "performance-based approaches" be used for monitoring during mine operations and a backup Bucktail alluvial groundwater capture system be installed and operated to supplement the bedrock groundwater capture system (DEIS page 4-38). The DEIS assumes that these additional measures included with Alternative IV will ensure that there is no net contaminant load increase to receiving streams. A monitoring system used in the "performance-based approach" during mining operations will only be representative for the fractures being monitored. There are no assurances that the "performance based approaches" will be able to remove uncertainty in the bedrock aquifer system and to identify groundwater impacts in areas not being monitored. Our experience at the Blackbird Mine indicates that is virtually assured that some contaminated groundwater flow paths

from the ICP mines would go undetected and contaminant load capture would be based on incorrect contaminant load calculations.

As discussed further in Sections 4.2 and 4.3, the direction of groundwater migration for the ICP mines and the location where the groundwater will discharge is uncertain. The DEIS recognizes that a portion of the impacted groundwater from the Ram Mine will discharge into BMSG's Bucktail Creek capture system. Some groundwater contaminated by the Ram Mine may preferentially flow north due to major bedrock structural features and discharge to South Fork Big Deer or Big Deer Creeks (DEIS page 2-60) (Shaw, 2004, Figure 4-36). The DEIS also does not consider or demonstrate that all contaminated groundwater from the Sunshine mine will migrate to the north toward the BMSG capture systems and Bucktail Creek. Some groundwater may migrate eastward and discharge to the Blackbird Mine workings (from Figure 4, Telesto, 2006a) or migrate to the south and discharge to Meadow Creek, based on the location of the Sunshine mine workings and site topography (Figure 1-2) . An alluvial GW system in Bucktail Creek would not capture any of these contaminant loads.

4.0 EVEN WITH THE PROPOSED MITIGATION MEASURES, THE ICP WILL RESULT IN ADDITIONAL LOADINGS TO STREAMS

Although modern mining methods, when controlled by experienced mining engineers and their quality-control staff, may serve to reduce releases of contaminants compared to historical practices, all mining-industry experience shows that some release of contaminants to the environment will occur. Because of the requirement for no-net loading, the mitigation measures proposed for the ICP must be 100 percent effective for both expected ("average") conditions and anticipated reasonable worst case conditions. The DEIS assumes no net load for Alternative IV. To show no net load, a series of assumptions were made in the modeling and analysis of the water quality impacts. As we will demonstrate in the Sections 4.1 through 4.4, there are flaws with the assumptions made, and therefore, with the results of the analyses. Because of the flawed assumptions and unsupportable conclusions, the DEIS fails to demonstrate that the proposed mitigation methods will be effective and that there will be no net loading of contaminants to Big Deer Creek.

4.1 Inadequacy of pH Buffering as Mitigation for Acid Generation and Containment of Contaminants of Concern

The DEIS is deficient because it does not provide a technical basis for the premise that alkaline conditions can be achieved and maintained in the underground mines. Alternative IV in the DEIS envisions that the mined-out underground areas of the Ram mine would be backfilled with paste tailings. These tailings would have cement added to increase backfill strength as well as to provide alkalinity that would reduce metals mobility in the backfill (DEIS page 2-11). Tailings backfill is not proposed for the Sunshine mine. In addition to use of amended paste tailings in the Ram mine, waste rock ("slash") left underground in the Ram and Sunshine mines would be amended with cement or lime to also provide alkalinity to reduce potentials for metal leaching (DEIS page 2-47). Waste rock and tailings would be tested throughout the life of the mine to evaluate the potential for acid generation and metals leaching. However, there is insufficient information in the DEIS to understand how the alkaline amendment process would be implemented or to judge the long-term reliability of the mitigation measures.

Data summarized in the DEIS demonstrate that when acidic conditions occur in sulfide-bearing rocks of the deposit, elevated concentrations of solutes (specifically including but not limited to copper) would be generated. Using available test data, the DEIS concludes that if the pH of the underground system could be maintained at a pH near 8 standard units (su), copper concentrations would be limited, and impacts to the creeks would not have the potential to become significant, even if worst case conditions were to occur (DEIS page 4-7).

A crucial aspect of this analysis, implied but not discussed in the DEIS, is that not only must the pH be initially elevated to 8 su, but it must be maintained at this value throughout the spatial domain of the mine and its adjacent, sulfide-bearing walls and over all future time. The control of pH in a narrow range is technically referred to as "buffering", and buffering requires that there be a sufficient mass of the reactive alkaline amendment to overcome all potential acid-generating reactions. Buffer strength and capacity are formal chemical concepts that require availability of representative data and specific technical analysis to support. The DEIS makes no demonstration, nor even an analysis, that the system could be buffered at a pH near 8 su. Instead, the DEIS merely ***assumes*** alkaline conditions could be established and persist during operation and post closure. Based on these unsupported premises and without any theoretical underpinning, additional data or geochemical evaluation (other than development and use of an empirical relationship between pH and dissolved metal concentration), the

DEIS concludes that releases of contaminants from the mine would be sufficiently small to result in minimal impacts to surface water quality (DEIS page 4-7)[4].

In addition to failing to adequately evaluate the acid-base chemistry needed for its underlying assumption of strong control on pH, the DEIS ignores the prospect that the amendments would not be effective in maintaining the near- or long-term alkaline conditions in the Ram and Sunshine mines. This optimistic and "success-based" approach is evident in the narrow range of pH conditions included in the DSM used to project long-term impacts to Big Deer Creek. As a result, the model predicts an extremely narrow range of possible impacts from mines with complex hydrologic and geochemical conditions.

Although establishing and maintaining alkaline conditions in the underground mine is critical to meeting ICP performance criteria as presented in the DEIS, no supporting evidence is provided to demonstrate that this could be achieved. Several conditions that would interfere with ICP's supposed performance are readily identifiable, including the following:

- Inadequate mixing of amendments, resulting in an inability to achieve the required buffering
- Bypass of impacted groundwater through the DRZ, thereby avoiding contact with the amended backfill
- Amendment consumption, resulting in depletion of the buffering capacity over time
- The pH buffer does not prevent sulfide oxidation and control all metals, some of which are mobile under alkaline conditions (e.g., As, Co)

These conditions or events and the manner in which they would lead to adverse water-quality impacts are discussed in more detail in Sections 4.1.1 through 4.1.5 below.

4.1.1 Inadequate Mixing of Amendments

The DEIS includes no substantive information concerning application methods and requirements. In addition to requiring an adequate total acid-neutralizing capacity to provide a chemical buffer on pH, if alkaline amendment is not thoroughly mixed and not in intimate contact with the sulfide source minerals, the necessary buffering pH would not be achieved. Ample evidence exists that effective blending is a challenge (e.g., MEND, 1998), and requires extensive characterization and testing of the mine waste/amendment blends, including across the full range of particle sizes in the waste being neutralized.

The MEND report, which is a compilation of case histories on use of alkaline amendments, indicates that blending did not reduce sulfide oxidation rates in the potentially acid generating material unless highly reactive neutralizing material (limestone) was applied and the blending was near ideal. Perfect mixing was generally only possible on a laboratory scale, such as in column or humidity cell tests, and was not considered feasible at field scale. On occasion, blending and layering were effective in delaying the onset of acidic effluent, but prevention of acidic effluent from the blended materials did not necessarily prevent dissolved metal levels from being problematic. The reviewed metal mine case studies did not identify safe waste rock blends which would prevent ARD and metal leaching at those sites.

[4] Even with this assumption-laden approach, the DEIS concludes that Alternative IV could result in increases in metal concentrations in groundwater near the ICP mines that could add metals loadings to the surface-water system, even though the DEIS predicts that no water quality standards would be exceeded (DEIS page 4-7).

Before one can rely on blending of acid generating and acid consuming mine wastes, further investigation into the application and practice of this method is required. Specifically, more information on large scale, controlled field studies is needed. At issue is what portion of alkalinity is available to neutralize the acidity produced by sulfide oxidation and the fact that alkaline and acid producing mine waste must be thoroughly blended (MEND, 1998). As a result, significant caution and conservatism must be applied when evaluating this technology for mine planning. Such conservatism was not applied to the predicted effectiveness of this technology in the DEIS.

An example of information and design requirements with the use of alkaline materials is provided in a policy document by the British Columbia Ministry of Energy and Mines (BC MEM, 1998 – Attachment A). While the BC MEM document focuses on blending of potential acid generating (PAG) wastes with non-potentially acid generating (NPAG) wastes, the guidance also applies to use of "materials with excess neutralization potential", such as alkaline amendments.

None of the information and design requirements mentioned in the BC MEM policy document is addressed to an acceptable degree in the DEIS. This includes an evaluation of neutralization effectiveness, considerations regarding drainage reduction and placement of the amended mine waste, material characterization, compatibility with the mine plan, and identification of interim and contingency prevention/mitigation measures in case alkaline conditions are not achieved. Although characterization of waste rock and tailings was conducted and its results are summarized in the DEIS, very little work was done on the proposed amended materials, and the approach used to calculate ARD potential is considered questionable (see Section 4.1.3 below on amendment consumption for more detail). Chapter 5.0 in Schafer (2006b) refers to the need to develop a "Mine Waste Alkaline Amendment Plan" and "Operational Geochemical Monitoring Program", which are to address issues related to type of amendment, application rate, application methodology and performance monitoring during operation. Neither the Schafer report nor the DEIS offers an actual plan for how alkaline amendment could be accomplished as a matter of practicable engineering for waste rock left underground, nor do they provide any data or data-based calculations to show that physical amendment could achieve the required pH buffering of the entire system. In particular for the Sunshine mine, where discharge from the amended waste rock will only account for 5 percent of the total mine flow, with the remainder of the flow (95 percent) represented by open workings (Schafer, 2006a, Table 4), it is not clear how pH buffering is to be realized in the entire underground mine, including the damaged rock zone. Five percent represents a small portion of the mine and the alkalinity from the amended slash is not likely to become fully mixed in the mine.

The proposed approach presented in the DEIS, successful implementation of an alkaline amendment, which is an underlying assumption of all water-quality modeling in the DEIS, consists entirely of prospective steps described only vaguely. The actual plan that will form the basis for successful implementation of this strategy is to be completed sometime after the EIS has been approved (Schafer, 2006b). The DEIS description and the technical report on which it is based cannot fail to provide a technical basis for showing that the underlying assumption of the Alternative IV calculations can be met.

4.1.2 Contamination and Subsequent Bypass of Impacted Groundwater Through the Damaged Rock Zone

The DEIS does not address the damaged rock zone (DRZ) or possible alkaline amendment of the DRZ. The DRZ is an "envelope" of fractured rock always found surrounding the mine workings (Evans, 1987; Pusch, 1989; Toran and Barbury, 1988; Morin and Hutt, 1995). This fractured envelope is the result of the blasting activities and subsequent stress relief of the bedrock. According to Siskind and Fumanti (1974), who did extensive experimental work on the damage occurring around an explosive

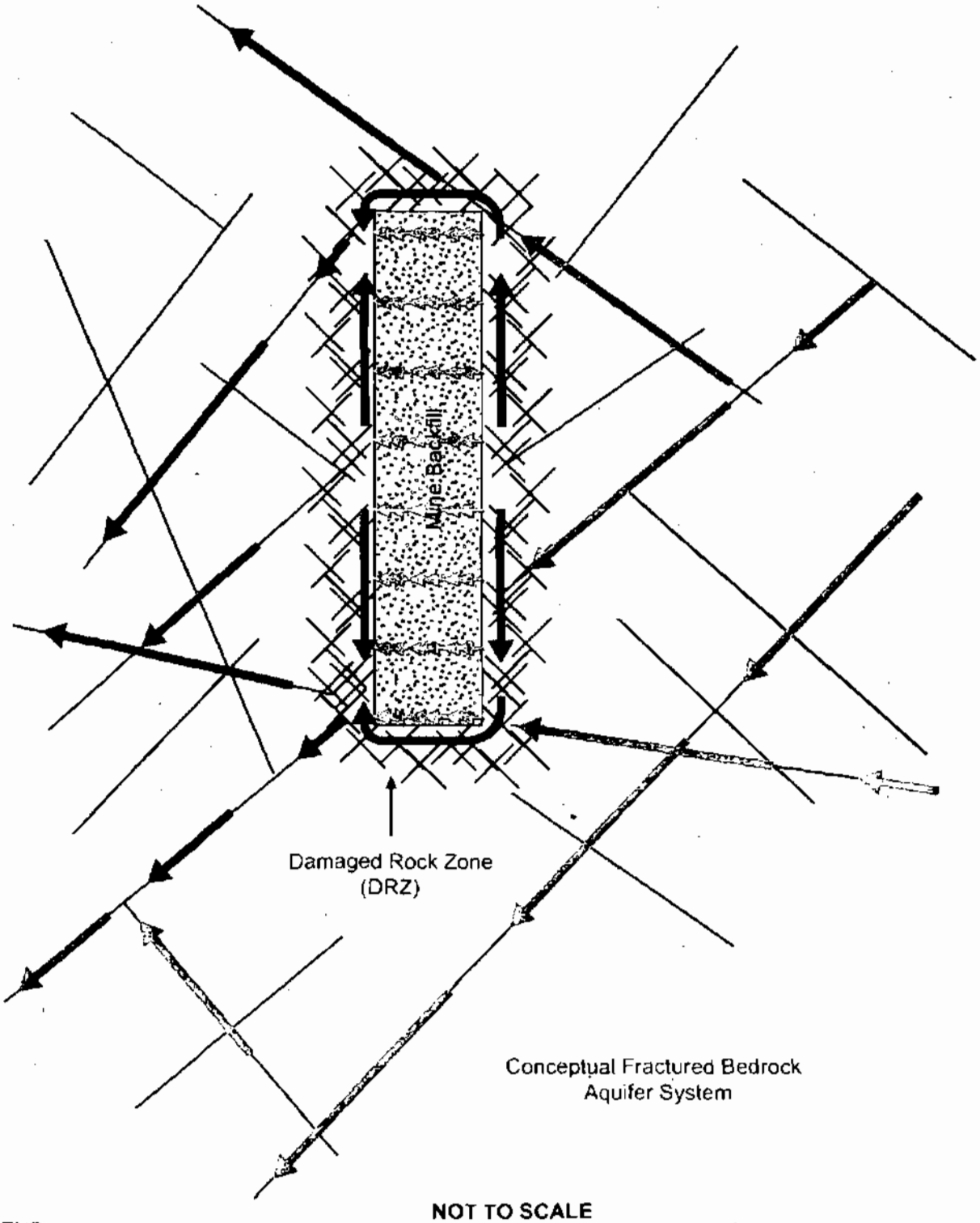
detonation in rock, four distinct zones can be identified. Nearest the explosive charge, there is a shocked and crushed zone, followed by a highly fractured volume. Outside this highly fractured zone, the rock contains radial and minor circumferential fracturing and microfracturing, transitioning into a region generally free of blast-produced fractures.

In general, due to the enhanced fracture density, the DRZ is commonly a zone of higher permeability than non-fractured rock, cemented paste backfill, and cemented rockfill. As a consequence, the DRZ tends to act as a conduit and preferential pathway for groundwater and mine water. Portions of the groundwater flow through the fractured bedrock will bypass the amended tailings and slash backfill and preferentially flow through the DRZ as conceptually illustrated in Figure 4-1. Groundwater by-passing the mine backfill through the DRZ would not benefit from the cement or limestone amendments for neutralization in the backfilled tailings and slash. Due to its fractured nature, the chemical reactivity of the DRZ is significantly elevated relative to that of undisturbed rock because the fractures greatly increase (often orders of magnitude higher) surface area and exposures compared to unblasted rock. The result of the increased reactivity and the larger zone of influence is that metals concentrations in the mine zone would be higher than assumed in the DEIS modeling. Based on the DSM methodology, higher concentrations in the source zone would inevitably lead to higher metals loadings than the DEIS assumes could exist in the bedrock aquifer and arrive at the streams.

As described in Section 4.2.1 of Schafer (2006a), a thickness of 1.5 feet is assumed for the "depth of oxidation in the DSM". However, typically, the depths of damaged rock zones average 1 meter or even more beyond finished walls. For example, observations by Siskind and Fumanti (1974), who conducted a study on blast-produced fractures in granite, further demonstrate that the DRZ could extend beyond 1.5 feet. Figure 4-2 is a graph reproduced from their manuscript presenting the effect of blasting on wall rock porosity. It shows that the effects of blasting extend to a thickness of approximately 80 to 90 centimeters or approximately 3 feet. In some mining systems, the DRZ effects extend very much farther yet. Morth et al. (1972) found reactive fracture surfaces that extended as far as 15 meters from open pit mine walls. Also, visual observations at a large open-pit mine during a pushback of a pit wall revealed fractures oxidized as far back as 10 meters from the wall (Morin and Hutt, 1995).

In the DSM, the assumed thickness of the DRZ is not considered in forecasts of trace metal concentrations because the DSM modeling assumes that pH everywhere is 8 and that trace metal concentrations in mine water depend entirely on expected pH. However, modeled sulfate concentrations in the DSM are linked directly to the lateral extent of the DRZ. Because the DEIS underestimates the extent of the DRZ, predicted sulfate concentrations are probably underestimated, and most importantly, if alkaline amendment cannot be applied across the DRZ in a manner that permanently buffers pH, then there is no basis for assuming that metals would be solubility controlled in the entire mining zone. A thicker DRZ than assumed in the DEIS also implies that preferential flow through the DRZ and effective alkaline amendment of the DRZ, both of which are not explicitly addressed in the DEIS, could represent significant concerns.

Mining will not remove all sulfide minerals from the rock, especially in strataform or stratabound deposits., such as ICP, where sulfide mineralization grades gradually into host rocks. Reactions taking place in the DRZ commonly include sulfide oxidation and mineral dissolution because residual sulfides remain in the back and ribs. These reactions result in accumulation of stored reaction products during periods when flow through the DRZ is low (for instance, during operation when the mine is being dewatered). When flow is restored to the system (for instance, during rebound of the



NOT TO SCALE

LEGEND

- Direction of Low Flow Through Low Permeability Mine Backfill
- Fracture Controlling Groundwater Flow
- Fractures
- Damaged Rock Zone (High Permeability Zone)
- Backfilled Mine Workings
- Unimpacted
- High Contaminated
- Low Contaminated

FIGURE **4-1**

CONCEPTUAL GROUNDWATER FLOWS BYPASSING MINE BACKFILL THROUGH THE DAMAGED ROCK ZONE

BMSG/WR CAP O&M/ID

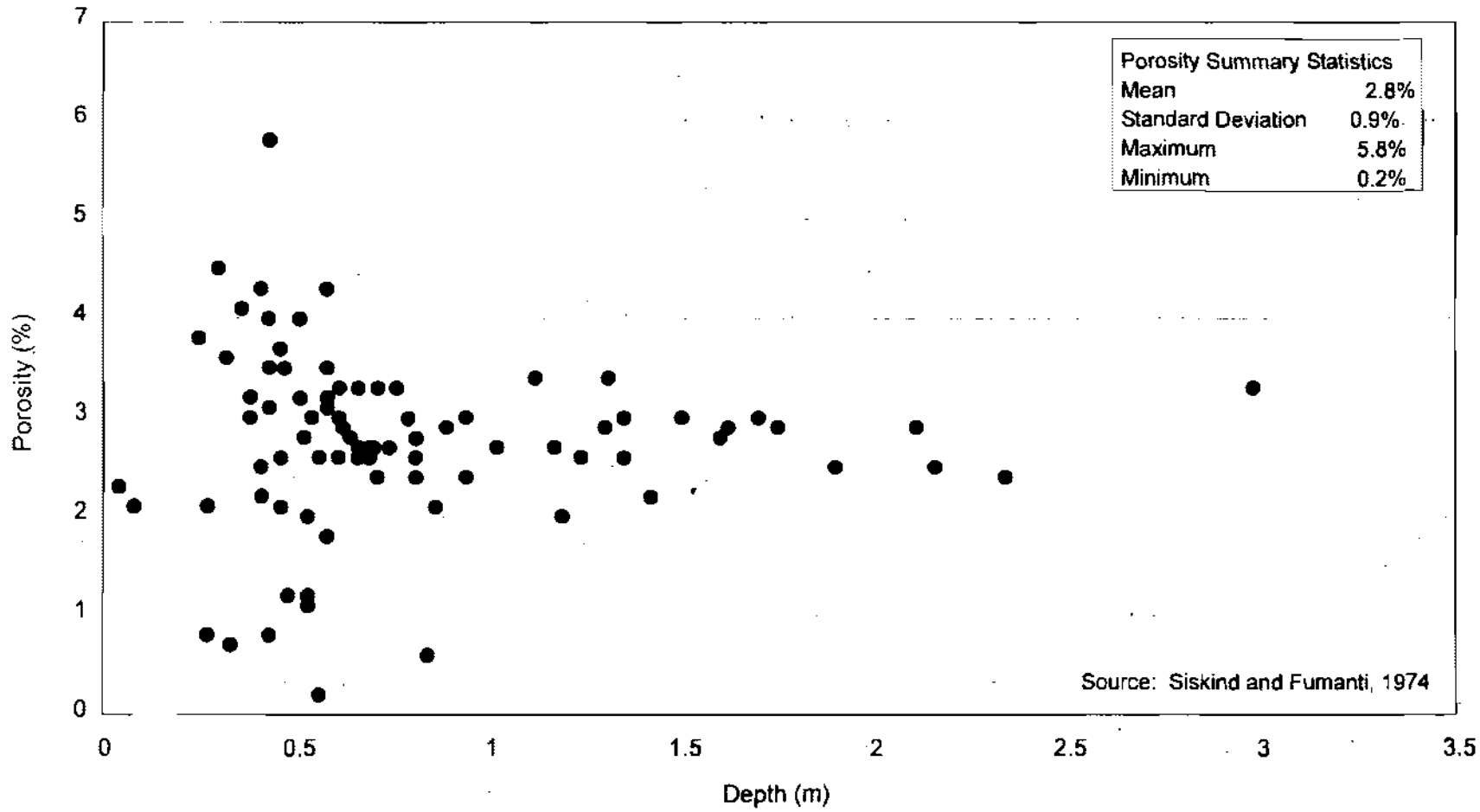


FIGURE **4-2**

GRANITE DAMAGED ROCK ZONE (DRZ) POROSITY (AFTER SISKIND AND FUMANTI)

BMSG/WR CAP 08 MID

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Golder Associates

water table after cessation of mining or during infiltration through unsaturated portions of the mined ground after pumping has ceased), the DRZ can represent a significant reservoir of soluble salts, which would be released upon contact with water. After complete resaturation, the mined zone would again become a flow-through system, reporting ultimately to the local surface-water systems. The poor-quality water resulting from the rinsing of the DRZ would be displaced through the groundwater system and discharge, probably years or decades after mining ceased.

It is likely that, due to its proximity to the mineralized areas of economic interest, the DRZ in the Ram and Sunshine mines contains reactive sulfide minerals. The fact that such relationships have not been addressed in the site characterization is another deficiency of the DEIS. Therefore, metal loading from the DRZ needs to be accounted for in the water quality component of the DSM. However, although evaluated for sulfate, metals loadings from the DRZ have not been evaluated in the DEIS. Furthermore, it is highly unlikely that the alkaline conditions assumed to prevail in the underground mine working would extend to the DRZ. Certainly, co-mingling alkaline solids with slash or tailing would not introduce any excess alkalinity into the DRZ. Effective amendment of the DRZ seems technically impracticable because there is no way to deliver solid alkaline materials to the fractured rock that exposes sulfide minerals within the DRZ of the mine walls. This leaves diffusion as the principal process by which alkalinity would be transported from amended mine waste to the DRZ. Since diffusion-controlled transport is extremely slow, conditions in the DRZ would therefore be less alkaline than in the backfilled workings, resulting in higher metal concentrations for any given source-term mineralogy than assumed in the DSM. This would generate additional loading to the receiving surface water and groundwater system that is not accounted for in the DEIS water quality evaluation.

The concern is not theoretical. A good example of possible water quality originating from an unamended DRZ is provided by water quality results from the 6930 Adit in the Blackbird Mine. According to Telesto (2004, page 5-3), the 6930 Adit has "...similar mineralogy to the quartzite rock generated by the ICP exploration activities...". At the time of monitoring, the adit walls had been exposed for over four years. The pH of the 6930 Seep was approximately 4.5, and the seep water contained some of the highest cobalt, nickel, sulfate and iron levels observed during the ICP geochemical characterization program (Schafer 2006b, Figures 20, 22, 24, 25). Analytical results for minewall washing stations in the 6930 Adit indicated similarly acidic conditions. If such water exits the DRZs of the Ram and Sunshine workings and remains unmitigated, significant impacts on receiving surface water and groundwater would result. The DEIS does not address this source of loading despite readily available and relevant data from the Blackbird Mine.

4.1.3 Amendment Consumption

All potential alkaline amendments are readily soluble in water (they must be to react in such a way as to buffer the pH), and so they would be consumed and displaced out of the mine workings over time. The potential buffer would be lost if this happens before all sulfides are oxidized. If alkaline amendments are consumed, the predicted impacts to groundwater and surface water in Alternative IV would be identical to those in Alternative II (i.e., the contaminant concentrations exceeding the water quality limits). Evaluation of relative rates of reaction and careful dosing of the paste tailings and waste rock are therefore required to ensure that sufficient amendment is available to maintain the alkaline buffer in perpetuity. If that buffer is not maintained, then pH would fall and copper concentrations would rise, likely beyond the assumptions of the DEIS even for Alternative II.

The DEIS contains no references to calculation of amendment requirements. Generic calculations at a conceptual level are provided in Schafer (2006b), but the manner in which this approach could be implemented as a matter of practicable engineering is not described or discussed. This represents a significant deficiency because all predictions of mine water quality and surface water and groundwater

impacts are based on an assumption of alkaline conditions in the underground working. The deficiency cannot be remedied within the framework of this DEIS because practical demonstration of the putative control has been deferred until after the EIS process.

Although alkaline requirements are not quantified, the DEIS does contain statements regarding the ARD potential of the waste rock and tailings (DEIS pages 3-30 and 3-31). To calculate ARD potential, a modified conversion factor would be used to derive the acid generation potential (AGP) (AGP, in kg $CaCO_3$/ton) from the sulfur content (in weight percent). The modified factor is 15.6, which is half the standard value. The rationale for this reduced value is that, according to the DEIS (page 3-2), the ICP mineralogy is dominated by chalcopyrite and cobaltite, which produce one-half as much acidity as pyrite. The DEIS and its supporting documents do not provide sufficient justification that chalcopyrite and cobaltite are the dominant sulfides. If there is pyrite present, which produces more acidity than chalcopyrite and cobaltite, then the ARD potential of the waste rock has been underestimated, which would lead to an increased requirement for alkaline amendment that has not been considered in the DEIS. The resolution of the proper value for calculating the ARD, based on actual mineralogical data distributed spatially across the entirety of the two deposits, would be needed before subsequent calculations could be reliable. If this is not addressed properly in the DEIS, then there may be water-quality impacts long after mining, when there no longer is any way to mitigate the source-term chemistry that was underestimated.

4.1.4 The pH Buffer Does Not Control All Metals

The proposed pH buffer would not prevent oxidation of sulfides, so release of trace metals due to sulfide oxidation (e.g., arsenic [As], cobalt [Co], copper [Cu]) is expected even in the presence of alkaline amendment. Maintaining pH values near 8, were it achievable in practice, might control concentrations of certain constituents to acceptable levels, but would not control the solubility of some other contaminants to values that meet water-quality criteria. In fact, the pH vs. arsenic trend presented in Schafer (2006b) suggests that arsenic concentrations increase with pH above a pH value of approximately 6. Additionally, minewall washing effluents from the 6930 Adit showed highly elevated Co concentrations. Alkaline amendment would not control sulfate concentrations to low values, and indeed would increase total dissolved solids due to dissolution of the alkaline amendment that were used. Therefore, the DEIS does not show for Alternative IV that establishing and maintaining a pH buffer (if that were indeed possible) is a panacea for the entirety of the water-quality concerns. If the approach could be instituted successfully, its effectiveness would still need to be evaluated on a parameter-by-parameter basis for all contaminants.

4.1.5 Mine Water Quality Prediction

The DEIS is deficient because it does not provide a valid technical basis and justification for the mine water quality predictions. In the DEIS, mine water quality was predicted using a DSM. Parameters included in the evaluation were aluminum, arsenic, cadmium, copper, iron, lead, mercury, nickel, nitrate, selenium, sulfate, and zinc. With the exception of nitrate and sulfate, only an empirical relationship based on pH, was used for predicting metal concentrations. For the Ram Mine, the cement tailings paste was assumed to provide an abundance of alkalinity such that the pH of backfill contact waters would remain alkaline in perpetuity and buffer the pH near 8 standard units. In addition, the use of alkaline amendments for the waste rock was assumed to further reduce the risk of acid contact waters from waste rock and control the pH within the entire mine (including DRZ) for all future time. Based on these assumptions, these alkaline waters were predicted to contain relatively low metal concentrations and have negligible environmental effects (DEIS page 4-37). Waste-rock contact water in the Sunshine mine also was expected to remain neutral to slightly alkaline due to the use of alkaline amendment.

As stated in the DEIS (page 4-10), mine water pH determines the metal levels in mine water, based on empirical equations developed from geochemical tests and monitoring results. The DEIS further states that this approach could overestimate or underestimate metal levels if chemical conditions in the mine water differ from the conditions of the sample tests (DEIS page 4-10), and the empirical relationship used in the DEIS presumes that the pH of mine water after closure is known or can be predicted.

Rather than use site-specific data or underlying chemical principles, the DEIS team elected to use best professional judgment, to predict long-term pH trends based on acid rock drainage risks and the presence of presumed alkaline amendments. However, the DEIS team recognized that actual pH trends might differ from estimates (DEIS page 4-10). Therefore, a sensitivity analysis was conducted by varying the pH in their subsequent calculations. The range of values used in the analysis was extremely narrow (pH 7 to 9) and does not account for the real possibility that the alkaline amendment could be locally ineffective in the near-term, due to the presence of the DRZ and consumption in major flow paths through the slash, or largely absent in the long term.

Even with the narrow range assumed, the results of the DSM sensitivity analysis indicated that predicted metal concentrations were highly sensitive to assumptions regarding pH, and that therefore long-term pH trends were critical to prediction of potential impacts. As stated in Schafer (2006a, page 105), "...the assumptions used to describe mine water pH and the pH governing equations will have an overwhelming influence on predicted impacts." The DEIS text asks reviewers to pay particular attention to predicted pH trends in mine water, while monitoring programs should assess actual pH trends during mine operation and post closure (DEIS page 4-10). Of course, by the time the monitoring data could show that the assumed ranges are incorrect, there would be a significant volume of groundwater that already would have been affected, and the DEIS offers no analysis of how long it would be before the true situation could be identified, nor a contingency plan for how such impacts might be addressed.

The figures presented in Schafer (2006b) that illustrate empirical relationships between metal concentration and pH (Figures 19 through 26) show concentration ranges varying by orders of magnitude over relatively small pH ranges (i.e., 1 to 2 pH units). This accords with common geochemical experience in mining settings. Under acidic conditions (i.e., pH <6) for certain parameters (in particular copper) very minor changes in assumed pH (i.e., 0.5 pH unit or less) could result in parts per million (ppm) level changes (i.e., milligrams per liter [mg/L]) in predicted copper solubility. However, the water quality predictions need to be accurate at the single-digit ppb level (i.e., micrograms per liter [μg/L]) for water management purposes, in this case, where the copper cleanup level is as low as 3.5 μg/L. Based on the empirical relationship between copper and pH (the "expected solubility line") presented in Figure 87 of Schafer (2006b) for pH values less than 7.5, when copper solubility is approximately 10 μg/L, a difference in pH of 0.03 su results in a difference in predicted copper solubility of 1 μg/L. As the pH decreases and copper solubility increases, the difference in pH required to generate a difference in copper solubility of 1 μg/L decreases exponentially. For instance, when copper solubility is approximately 1,000 μg/L, a difference in pH of 0.0003 su results in a difference in predicted copper solubility of 1 μg/L. When pH 5.5, the expected case, the solubility line in equation figure 87 (Schafer 2007a) would predict a copper concentration of 8,900 ug/L. These examples demonstrate that exceedingly small (and non-measurable) changes in pH correspond to changes in predicted copper concentrations that are within the accuracy range required for surface water quality monitoring and compliance with water quality standards.

The calculations presented in the DEIS did not consider available data that showed copper concentrations higher than the best-fit empirical relationship, but rather relied on non-conservative assumptions about the effect of pH on copper concentrations. Therefore, the uncertainty in Cu concentrations given plausible pH ranges is on the order of 100 to 1,000 times the required precision of

the predictions. Given the very large range of uncertainty in predicted mine water quality, it is impossible to predict impacts to surface water and groundwater with the accuracy and precision assumed in this DEIS, including with respect to the apparent accuracy of the DSM calculations presented in of Alternative IV for this DEIS.

As discussed in previous comments, by the DEIS' own admission, predicted water qualities are highly sensitive to assumptions regarding the pH of the mine water (DEIS page 4-10). The water quality predictions (and associated water quality impacts) are unreliable because no technical basis is provided for the supposition in the DEIS that alkaline conditions can be achieved and maintained in the underground mines.

4.1.6 Summary of Inadequacy of pH Buffering as Mitigation for Acid Generation and Containment of Contaminants of Concern

It is unlikely to be technically feasible to achieve a perpetually buffered pH condition for the entire workings, including in the DRZ. Furthermore no argument is presented in the DEIS for how this buffered condition could be accomplished or what the reliability of the mixing method would be. Without a basis for showing that the pH-control can be achieved using a reliable demonstrated technology, there is no manner in which to calculate potential costs for establishing and perpetually maintaining the chemical control that is hypothesized as the basis for the alternative. Further, due to a complete absence of any sort of consideration related to failure of the proposed approach, as well as a lack of discussion of corresponding contingency/mitigation measures, the DEIS is deficient in its presentation and evaluation of the alkaline buffering method as advocated under Alternative IV.

A failure to establish and maintain alkaline conditions in the underground mine workings will result in the presence and movement of mine water with a lower pH than predicted in the DEIS, and in correspondingly higher concentrations of contaminants, including copper. Such impacts would be most pronounced after mine closure, when the water table rebounds, the mine floods, and mine water discharges to groundwater and surface water. At that time it will be nearly impossible to retrofit a remedy to achieve alkaline conditions within the already backfilled mine.

4.2 Deficiencies of the Proposed Groundwater Monitoring System

Alternative IV in the DEIS includes monitoring wells to delineate the extent of groundwater impacts from the Ram and Sunshine mines. The monitoring network for Alternative IV is not described in any detail but is portrayed as being similar to the proposed bedrock monitoring well network in Alternative III (DEIS page 2-47 Water Monitoring) that relies on a so-called "performance-based approach". The Alternative IV monitoring approach differs from Alternative II by installing monitoring wells at the start of mining operations and includes additional monitoring wells to the north of the Ram mine along the trend of the bedrock structures and faults (DEIS page 2-60). The DEIS does not specify the number, spacing, or the location of the monitoring wells for Alternative IV.

The DEIS states that for Alternative IV, a groundwater capture system would be operated to remove the equivalent load of contaminants released from the mines following closure to prevent adding contaminant load to the receiving streams (DEIS page 4-42). The magnitude of the contaminant load to be removed would be calculated (DEIS page 4-46). Therefore, the adequacy of the capture system would depend on the accuracy of the contaminant load calculation. According to the DEIS, the basis for the calculation would be the groundwater concentrations observed in the monitoring system and the estimated groundwater flux (amount of groundwater such as gallons per minute) through the Ram and Sunshine mines (DEIS page 2-46). The groundwater flux would be based on the mine dewatering rate during full mine development. Without providing any detail on how the calculation would be made,

the DEIS assumes that removal of the calculated contaminant load would be sufficient to prevent any contaminant load increases to Big Deer Creek. However, the fracture controlled hydrogeologic conditions at the site and the variability in groundwater quality and quantity present during the post-closure period make it highly likely that contaminant load increases would occur to Big Deer Creek.

The DEIS is deficient because it does not provide a technical basis for the premise that the bedrock groundwater monitoring network would accurately define the nature and extent of potential groundwater impacts from the Ram and Sunshine mines required to be captured and treated before discharging to receiving streams. The groundwater monitoring systems described in the DEIS is deficient for the following reasons:

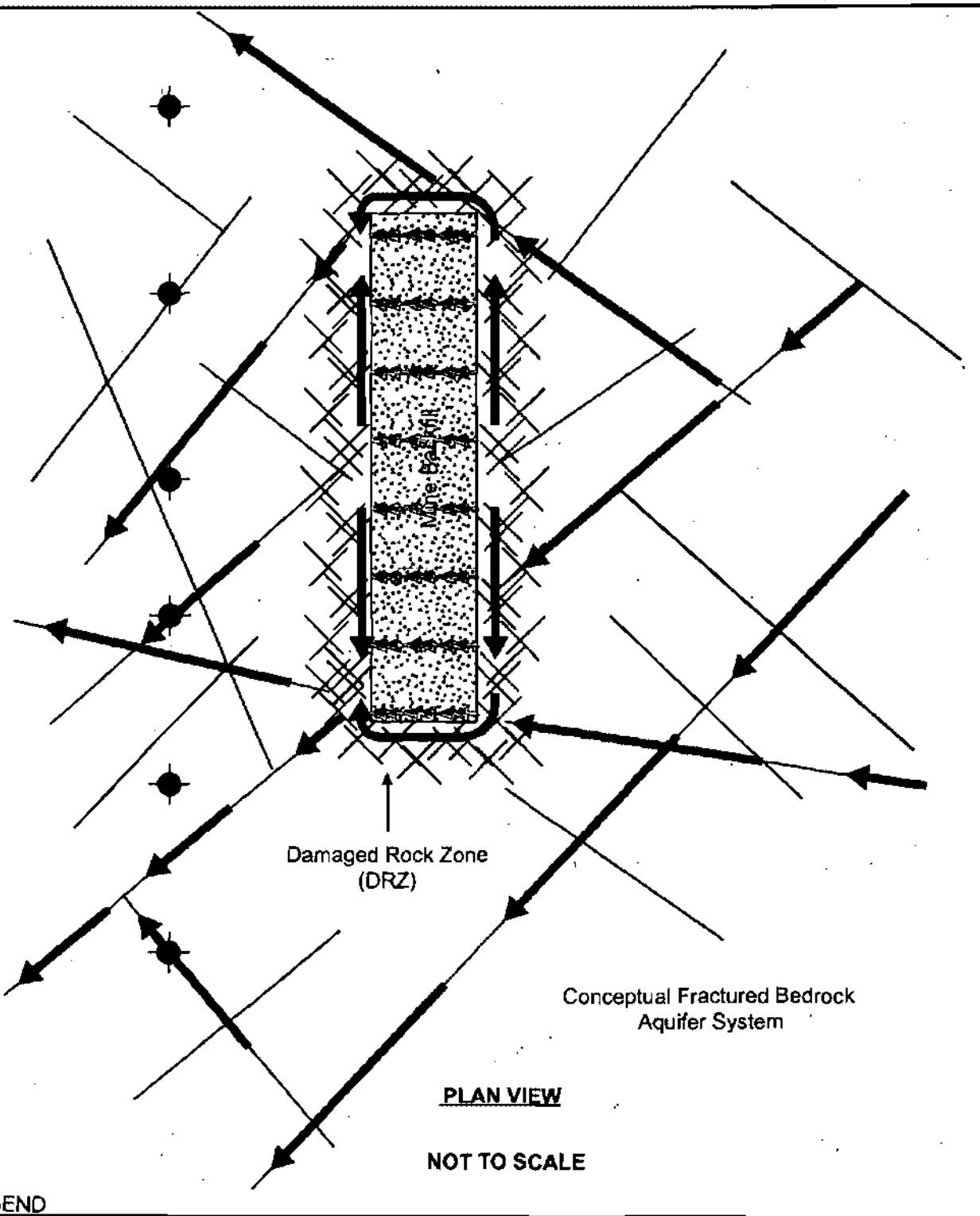
- Underestimating contaminant loads flowing from the ICP Mines;
- Impacted groundwater by-passing the active mine dewatering system and not being detected in the groundwater monitoring system; and
- Variation in contaminant concentrations over extended periods of time.

These potential deficiency modes are discussed in more detail in Sections 4.2.1 through 4.2.3 below. Although discussion of these deficiencies is focused on Alternative IV, the points apply to Alternatives II, III, and V with respect to groundwater monitoring systems in a fracture controlled bedrock aquifer.

4.2.1 Underestimating Contaminant Loads Emanating from the Idaho Cobalt Project Mines

As noted in the DEIS (see Section 3.4), the Ram and Sunshine mines would be located in a fractured controlled bedrock aquifer system. The reliability of a monitoring well network in fractured controlled system depends on whether the wells are located within the fractures that are representative of dominant groundwater pathways emanating from the mines. The DEIS does not provide information on the number of wells required or how the primary pathways would be identified. The DEIS states that the monitoring well network would be developed from a "performance-based approach", but fails to provide information how the adequacy of the monitoring system would be verified, except that a monitoring plan would be prepared prior to initiating mining operations. If pathways conveying impacted groundwater are undetected, the calculated contaminant load requiring capture could be underestimated, resulting in contaminant load increases to the receiving streams.

Characterization of a fracture controlled bedrock system is extremely difficult. Wells placed just several feet apart can have dramatically different groundwater flow rates and have different chemical concentrations from mine sources and mixing with other groundwaters. Figure 4-3 conceptually illustrates how groundwater concentrations will vary spatially due to the fracture controlled flow and the randomness of placing monitoring wells in the right locations. Figure 4-4 conceptually shows the influence that a major transmitting structural feature such as a fault could have on the same monitoring well system as illustrated in Figure 4-3. Golder has witnessed this condition in our investigations in the upper Bucktail drainage. We have been working to characterize the upper potions of the bedrock rock aquifer to find and intercept groundwater having elevated metals content. One boring (BMW-6B) was moved about eight feet from its pilot corehole, but we found significantly different groundwater yields (production rate) and with significantly different copper concentrations



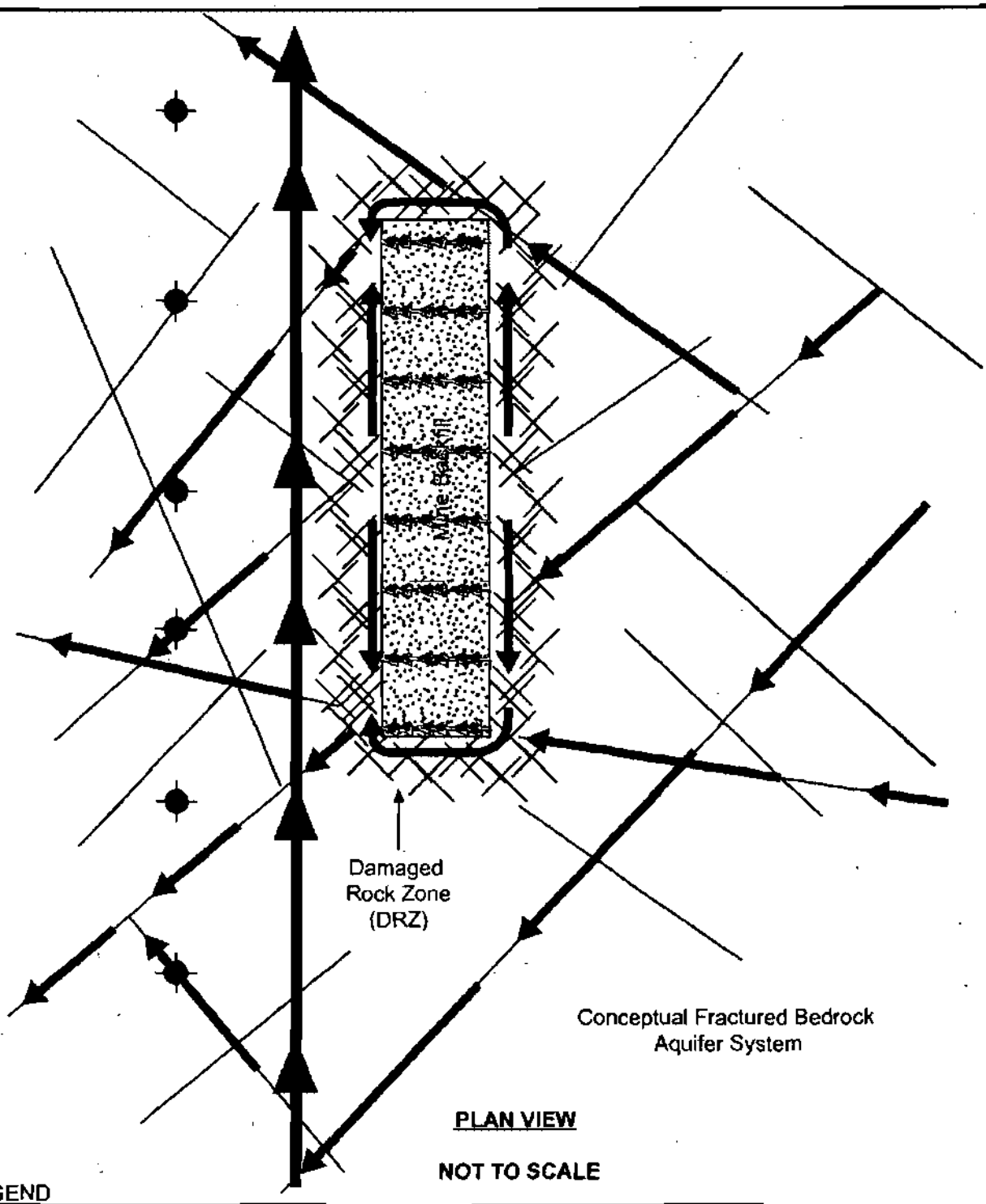
LEGEND

- Direction of Low Flow Through Low Permeability Mine Backfill
- Fracture Controlling Groundwater Flow
- Fractures
- Damaged Rock Zone (High Permeability Zone)
- Backfilled Mine Workings
- Unimpacted
- High Contaminated
- Low Contaminated
- Assumed Monitoring Well Locations

FIGURE **4-3**

CONCEPTUAL MONITORING WELL NETWORK WITHIN FRACTURED CONTROLLED BEDROCK AQUIFER

BMSG/WR CAP O&M/D



LEGEND

- Direction of Low Flow Through Low Permeability Mine Backfill
- Fracture Controlling Groundwater Flow
- Fractures
- Damaged Rock Zone (High Permeability Zone)
- Backfilled Mine Workings
- Unimpacted
- High Contaminated
- Low Contaminated
- Assumed Monitoring Well Locations
- Major North South Fault Transmitting Groundwater

FIGURE **4-4**
CONCEPTUAL FAULT INFLUENCIAL SYSTEM
BMSG/WR CAP O&M/D

(Golder, 2004b). Our investigations encompassed an area of about 6 acres in upper Bucktail Creek. Investigations included several sophisticated geophysical survey techniques to locate water transmitting fractures, installation of 18 wells, and conducting two long-term pump tests (about 1.5 to 2 month pumping durations, respectively) with daily monitoring of pumping wells, observation wells and the creek to better understand the system. The objective of these investigations was to locate groundwater with high metal content for capture before it discharges to the Bucktail Creek. By contrast, the Ram and Sunshine mines encompass about 70 acres and 20 acres, respectively. The difficulty in characterizing these systems is increased by the ICP study area relative to the size of the BMSG study area. However, only one pump test using observation wells was performed by FCC for a duration of less than one day.

The method for calculating contaminant load from the monitoring data is not specified in the DEIS, but rather is deferred to a later groundwater monitoring plan to be prepared before mining operations commence. Presumably, the monitoring system would consist of a series of wells in bedrock where the flow of groundwater is controlled by one or more fracture networks that are hydraulically connected to the mine workings. The contaminant concentrations are likely to vary significantly between the monitoring wells because the fracture pathways will intersect different portions of the mine with dissimilar hydrologic and geochemical conditions (for example, groundwater passing through the DRZ and bypassing the amended backfilled tailings). Many of the fracture pathways carrying contaminated groundwater from the mines may not be intersected by the monitoring wells. The DEIS does not specify how the contaminant concentration will be determined (i.e., how many wells will be sampled and whether the contaminant concentration used for calculating load will be based on the average values, maximum values, or what statistical analysis will be used to determine reasonable worst case concentrations). Based on our experience in the Bucktail drainage, groundwater contaminant concentrations are expected to be variable both spatially and temporally in the bedrock aquifer. In addition, the accuracy and precision associated with the sampling procedures and laboratory analytical results would add to the variability and uncertainty in the requisite calculated contaminant load.

The DEIS states that "*an additional load could be captured above the calculated required load reduction. . . . . to assure that the entire mine related load is captured*" (DEIS page 2-46). However, given that the monitoring system may not intersect pathways with the highest concentration or flows (metal loads), one cannot determine how much additional load would need to be captured. As discussed in Section 4.1.5, relatively small changes in the source water pH can result in order of magnitude changes in metal concentrations. Failure of the monitoring system to detect flow from a concentrated localized source area, such as a reactive DRZ, would have a dramatic effect on the loading. Alternative IV does not propose a method to verify the contaminant load calculation (see Section 4.3.1 for more details on verification).

4.2.2 Impacted Groundwater By-Passing the Active Mine Dewatering System

The DEIS assumes all bedrock groundwater that comes in contact with mine DRZ, or inactive mined zones would discharge to the active mining areas and be captured by the mine dewatering system. Alternative IV mining plan would initially develop the Ram mine at the lower levels of the targeted ore zone and proceed to mine the ore zone in an upward direction using the cement amended tailings backfill as a stable working surface and platform. The backfilled cemented tailings is anticipated to have a hydraulic conductivity of 10^{-6} centimeter per second (cm/sec) (DEIS page 2-11). Specific bedrock fractures and the DRZ are expected to have a much higher hydraulic conductivity than the backfilled tailings. If bedrock groundwater that contacts the DRZ or inactive potions of the mine (but does not report to the mine dewatering system due to preferential fracture flow), impacted groundwater would impact receiving streams during the active mining operations.

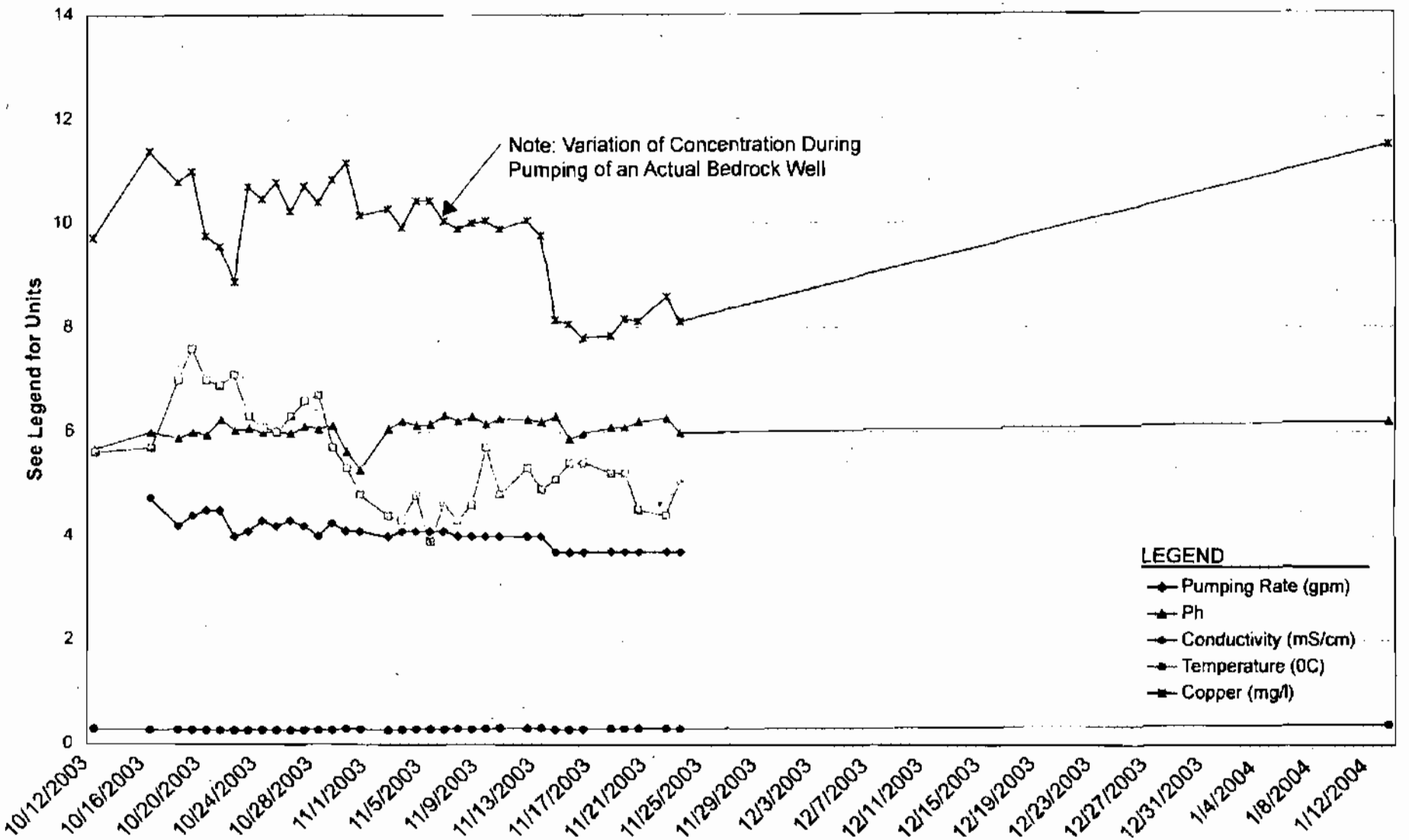
The DEIS does not provide sufficient information to support the conclusion that the mine dewatering system would capture all impacted groundwater during operation nor does it address how the failure of the system would be mitigated. In the description of Alternative III, the Water Resources Technical Report for the ICP states that some groundwater is anticipated to escape the Ram mine dewatering/capture system during mine dewatering after mining operation have ceased "due to flow path complexities created by the presence of backfill" (Hydrometrics, 2006, Section 4.4.3, Page 4-32). Since Alternative III keeps the mine dewatered in a similar fashion for Alternatives II, III, IV, and V during the active mining, the "complexities created by the presence of backfill" should also be anticipated during the active mining period. The DEIS estimate of only five percent escaping the mine dewatering system for Alternative III is not demonstrated. Only a five percent escape of mine impacted water during active mining operations could cause an increase in contaminant load to receiving streams if the amendments do not function as anticipated or groundwater by-passes the backfill via the DRZ (see Section 4.1).

Telesto performed groundwater modeling to determine the capture zone and quantity of groundwater inflow to the mine (Technical Memorandum #2, June 5, 2006b). The model assumed the mine was operational and the bedrock aquifer was responding as an equivalent porous medium. Fracture controlled bedrock aquifers can have dominant groundwater flow pathways that do not hydraulically respond in the same manner as porous media. The model predicts the dewatering of the mine during operation would create a hydraulic sink for groundwater. Subsequent backfilling of lower portions of the mine with a low permeability cemented tailings backfill can hydraulically isolate portions of the mine from the dewatering system. The fractured controlled bedrock aquifer could enhance hydraulic isolation allowing groundwater to contact the DRZ along preferential pathways and bypass collection in the mine dewatering system. If DRZ contacted groundwater is not detected by the monitoring system, impacted groundwater would discharge and increase contaminant load to the receiving streams (Bucktail, South Fork Big Deer, and Big Deer creeks) during the active mine operational period.

4.2.3 Contaminant Concentrations Will Not Be Constant Over Extended Periods of Time

The monitoring and capture system described in the DEIS would result in periodic impacts to receiving streams. The capture rate would be based on the results of samples collected at some frequency (e.g., most likely once a month [DEIS page 2-46]). As is typical of aquifers in fractured bedrock, contaminant concentrations would be variable at monitoring locations downgradient of the mines. In addition to fluctuations in groundwater movement within the fractures, the load of contaminants would vary as the contribution of contaminants fluctuates. For example, surface recharge following rainfall and snow melt interact with reactive rock in the vadose zone of the mine and could result in periodic increases in contaminant loads and variations in the groundwater flow rate. Golder's experience conducting long-term pump tests in the upper Bucktail Creek drainage, showed variations in copper concentrations during the test as shown in Figure 4-5 (fromFigure 4-12b, Golder, 2004b).

The calculated contaminant load to be captured and treated to prevent net increases in Big Deer Creek would be based on periodic sampling of groundwater quality. Therefore, the rate at which contaminants are removed between sampling events would apparently be held constant. As noted above, the actual concentration of contaminant in the groundwater would fluctuate over this period of time and, therefore, the actual contaminant loads would be greater or less than the calculated load. During the periods when the calculated load is less than the load actually being released from the mine, there would be periodic releases of contaminant to surface waters greater than pre-ICP mining



Source: Golder, 2004, Figure 4-12b

FIGURE **4-5**

WELL PW-1B FIELD PARAMETERS

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Golder Associates

conditions. This situation is unacceptable because any additional load to the receiving waters would result in violation of established water quality standards.

The DEIS proposes to use a contaminant "load offset" approach. The flow rate and groundwater concentrations would be used to calculate the equivalent mass of contaminant that must be captured and treated. Presumably, systems would be constructed and operated to capture and treat the computed loads. In order to implement the load offset method above, the contaminant concentration in the capture system must also be monitored, i.e., samples would have to be collected from both the bedrock and alluvial capture systems. In order for the contaminant load from the mine to be offset, the capture system (alluvial and bedrock) must recover an equivalent mass, which can be computed as follows:

$$Q_m \times C_m = P_a \times C_a + P_b \times C_b$$

where Q_m =groundwater flow rate through the re-flooded mine workings;

C_m =concentration in the alluvial pump back system;

P_a =pumping rate in the alluvial pump back system;

C_a =concentration in the alluvial pump back system;

P_b =pumping rate in the bedrock pump back system;

C_b =concentration in the bedrock pump back system;

The bedrock system will presumably be operated at whatever maximum rate the wells can produce, and at some monitored concentration. Therefore, the rest of the mass must be recovered by the alluvial system which can be estimated by rearranging the above equation:

$$P_a = \frac{(Q_m \times C_m - P_b \times C_b)}{C_a}$$

The DEIS states that the metals load requiring capture would be determined, "most likely", on a monthly basis (DEIS p. 2-46). Therefore, every 30 days, the pumping rate in the capture system, P_a, would be adjusted in order to offset the calculated metal load being released from the Ram and Sunshine mines ($Q_m \times C_m$) minus whatever load is recovered from the bedrock pump back system ($P_b \times C_b$). The capture system will continue to be operated at that level until the next sample is collected and analyzed.

Figure 4-5 from the 2003 Upper Bucktail Creek Investigation Report (from Figure 4-12b, Golder, 2004b) shows the copper concentration in pumping well PW-1B at the Blackbird Mine site. The well was sampled 36 times over the three-month period shown in the chart. The data exemplify the variability that is typical in pumping wells in the bedrock along Bucktail Creek and illustrate a deficiency in the "load offset" approach discussed in the DEIS. Assume the copper concentration shown in the chart represents the concentration in the mine system. Because the monitoring program collects a sample once a month, it does not "see" the intermittent daily and weekly changes. For example, if a sample was collected on October 12, 2003, the calculated load would be based on a concentration of approximately 9,750 µg/L copper. The alluvial pump back system would provide water based on that estimate for one month until a new sample was collected on November 13. However, during this time, the actual copper concentration in the mine water is predominantly at a

higher concentration than when the sample was collected. Therefore, the actual mass load from the mine exceeds the load being collected in the pump back system resulting in a net impact to Big Deer Creek and an exceedance of water quality standards. Of course other times the opposite would occur (i.e., the actual concentration in the mine water will be below the sample concentration and the alluvial system will remove more mass than required). Nonetheless, this dynamic is unacceptable. If the concentration in Big Deer Creek is sampled when the load being recovered is too low, an increase in concentration and likely an exceedance of the water quality standard would be detected. Because the DEIS approach would assume that all load was being recovered from the ICP, the increased concentration in the receiving stream would apparently be assumed by the ICP to originate from the Blackbird Mine.

4.2.4 Summary of Monitoring Deficiencies

The ICP will not know what is occurring in places not being monitored. Because the bedrock is fractured, it is virtually impossible for a monitoring well system to detect and characterize all contaminate loadings, even though this would be necessary under the agency's Alternative IV. The DEIS goal of no net contaminant increase from the ICP mines to the receiving streams, namely Big Deer Creek and Panther Creek cannot be assured due to the complexities of the fracture flow. The monitoring system must be able to completely characterize the contaminant concentrations emanating from the ICP mines to calculate the contaminant load that must be captured by the bedrock aquifer and alluvial capture systems. The adequacy of the contaminant load calculation cannot be verified by surface water quality observations because of the multiple contaminant sources already in the receiving streams and over-bank deposits. Groundwater from the Sunshine mine may not even discharge to Big Deer Creek or its tributaries.

The DEIS implies that all impacted groundwater will not be collected by the mine dewatering system during active mining operations. Escape of groundwater contacting the DRZ or areas of the mine having elevated contaminant concentrations will likely go undetected by the monitoring system during the active monitoring period.

Moreover, because contaminant concentrations fluctuate in monitoring well and extraction wells among monitoring events, any capture rate that does not account for groundwater concentrations fluctuations will allow contaminant loads to be discharged to the receiving streams. The DEIS does not provide details on the method for calculating contaminant loads from the groundwater monitoring or the capture systems that will ensure that all contaminant loads will be captured and treated at all times.

As conceptualized in the DEIS, it is apparent that any failure of the monitoring system to fully detect loadings from the ICP mines would result in a misallocation of those loads to the Blackbird Mine and not the ICP.

4.3 Deficiencies of the Proposed Groundwater Capture System

The proposed groundwater capture system has the same deficiencies as the monitoring system. Most daunting is the requirement that groundwater capture system must intercept and collect 100 percent of all contaminated flows moving away from the mines. Alternative IV in the DEIS envisions a bedrock groundwater capture system that does not remove all contaminated groundwater emanating from the ICP mines. The DEIS estimates bedrock groundwater capture efficiencies to be 90 percent for the Ram mine (DEIS page 4-24) and 75 percent (DEIS page 4-25) for the Sunshine mine. The captured groundwater would be pumped up to the water treatment plant for treatment before discharge to Big Deer Creek. The Alternative IV bedrock groundwater extraction system includes extraction wells and

ancillary storage, pumps and pipelines to handle and convey the captured groundwater to the water treatment plant. The Ram mine would have as many extraction wells as needed for meeting estimated the capture efficiencies (DEIS page 4-24) installed along the east side of the Ram mine and the north side of the Sunshine mine, if needed. The location and spacing of the extraction wells would initially be based on groundwater modeling of capture zone analysis by Telesto (Technical Memorandum #2, June 5, 2006b), but will be modified based on the refinement of the hydrogeologic model developed during bedrock aquifer monitoring and testing that is assumed to be conducted by FCC during mining operations (DEIS, page 4-25). The DEIS states that the calculated contaminant loads from each mine would represent the amount of contaminant load that would be extracted from the groundwater to ensure that the ICP would not result in a contaminant load increase to the receiving streams. The calculated contaminant load would be derived from a bedrock groundwater monitoring system for each mine (see Section 4.2 on Groundwater Monitoring).

In order to recover the contaminant load not captured by the bedrock extraction wells, Alternative IV proposes to install and operate an alluvial groundwater backup extraction system along lower Bucktail Creek. The DEIS assumes the bedrock and alluvial capture systems would prevent increased contaminant loads from the Ram and Sunshine mines from discharging into receiving streams. For this to occur, the groundwater flow rates and contaminant concentrations associated with the ICP must be well defined and the capture and treatment systems must function continuously. The DEIS does not consider the likely prospect that one or more of the systems to mitigate mine impacts to Big Deer Creek would not perform as envisaged. These DEIS deficiencies can be readily identified, and include the following:

- Incorrect calculation of contaminant loads emanating from the mines after cannot be verified (also see Section 4.2.1 on Groundwater Monitoring)
- Ineffectiveness of the bedrock capture system
- The alluvial backup system is not detailed for evaluation
- The operational reliability of the capture systems is not addressed.
- Application of a Safety Factor to the Capture Rate is not an Adequate Solution

These DEIS deficiencies are discussed in more detail in Sections 4.3.1 through 4.3.4 below. Although discussion of these deficiencies is focused on Alternative IV, the points apply to Alternatives II, III, and V for groundwater capture systems in a fracture controlled bedrock aquifer.

4.3.1 Incorrect Calculation of Contaminant Loads Emanating from the Mines Cannot be Verified

The proposed basis for calculating the contaminant load for the mines is the product of the rate at which groundwater is pumped from the mines during operation and the contaminant concentrations in the bedrock monitoring network. The DEIS provides no details on the method of calculating contaminant loads from variable water quality data and variable mine groundwater inflow data. In the absence of details, the DEIS assures that the calculation would be representative of contaminant loads emanating from each ICP mine. The adequacy of the bedrock monitoring network to characterize contaminant concentrations in the bedrock fractured controlled aquifer becomes critical to estimating the required contaminant load for capture. The DEIS is deficient in demonstrating that the calculated contaminant loads from the ICP mines will be accurate both spatially and temporally (see Section 2.3.1 on Groundwater Monitoring for more details).

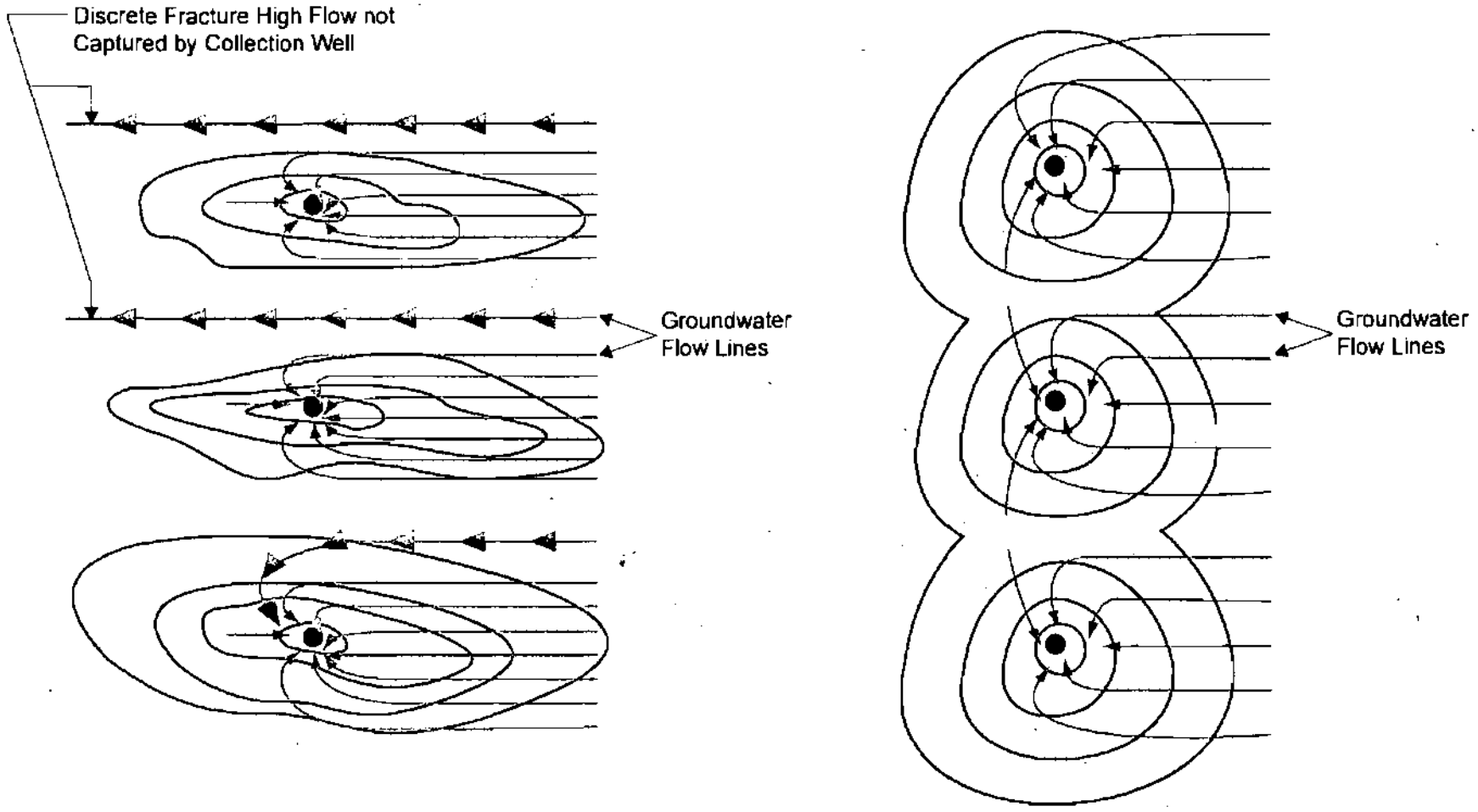
Adequate removal of the contaminant load required for removal by the ICP cannot be verified by surface water monitoring. Most proposed mines can verify removal of contaminant loads emanating from a mine by surface water monitoring of the receiving streams, because the background contaminant levels are low and below water quality standards. Verification of the ICP groundwater contaminant load capture from surface water monitoring is not viable for the ICP because the receiving streams already contain sources of contaminants and surface water quality fluctuates throughout the year. Some of the identified sources of contaminant to the area surface waters include: contaminants within the suspended water column, stream bed sediments, hyporheic zone, wetted perimeter, and over-bank deposits. Because these contaminant sources exist along Bucktail, South Fork Big Deer, Big Deer and Panther creeks, surface water quality not only fluctuates during the year, but also changes along the length of the streams (Golder 2007- Lower Big Deer Creek 2006 Field Investigations). A new source originating from the ICP would not be distinguishable from multiple existing sources within the streams. Therefore stream monitoring cannot be used to verify that all ICP contaminant load has been captured and treated. Based on the conceptual approach in the DEIS, the underestimated calculation of the contaminant load emanating from the ICP that is required for capture would go unnoticed and jeopardize compliance by BMSG at the Blackbird Mine CERCLA Site.

4.3.2 Ineffectiveness of the Bedrock Capture System

The DEIS has not demonstrated that the bedrock aquifer capture systems would be able to capture contaminant-impacted groundwater at the DEIS estimated efficiencies, 90 percent for the Ram mine and 75 percent for the Sunshine mine (DEIS, pages 4-24 and 4-25). The DEIS bases the predicted effectiveness of the proposed bedrock groundwater capture systems on professional judgment and on knowledge of the local hydrogeology. This local knowledge must be from the data and modeling results of Telesto capture zone modeling (Technical Memorandum #2, June 5, 2006b) using isotropic "equivalent porous media" assumptions to represent a complex fractured controlled aquifer system because the DEIS authors have not conducted independent characterizations or modeling of the bedrock aquifer system. Although the DEIS identifies the bedrock aquifer as a fracture controlled aquifer (see Section 3.4), it fails to explain the inadequacy of Telesto's capture zone modeling that assumes the bedrock behaves as an "equivalent porous medium". Figure 4-6 conceptually illustrates the difficulty in capturing contaminated groundwater in a fracture controlled bedrock aquifer as compared to within a porous media. The DEIS judgment of the effectiveness of the proposed bedrock groundwater capture system in a fracture controlled aquifer is speculative and unknown.

Based on our experience in the Bucktail drainage, bedrock wells operated by BMSG typically extract only 1 to 6 gpm in shallow weathered bedrock for extended periods of time. Alternative II assumed that 9 wells for capture would be sufficient. If groundwater capture rates of 75 and 14 gpm (DEIS page 2-35) or more are required for the Ram and Sunshine mines, respectively, to remove contaminated groundwater on a continual basis, the number of bedrock wells may need to be greater than assumed. Pump tests conducted by FCC were operated for short periods of time and did not determine long-term sustainable yields. Thus, the DEIS has not demonstrated that the bedrock aquifer capture systems would be able to affect capture of the contaminant-impacted groundwater at the DEIS estimated efficiencies.

The DEIS addresses the uncertainty in the bedrock aquifer capture efficiency for Alternative IV by proposing to (1) install the bedrock capture system lower in the valley for the Ram mine where the hydraulic gradient is lower, and (2) installing monitoring wells before mining begins



FRACTURED CONTROLLED AQUIFER CAPTURE

POROUS MEDIA AQUIFER CAPTURE

LEGEND

- Pumping Well
- Groundwater Flow
- Water Level Drawdown

FIGURE **4-6**

CONCEPTUAL COMPARISON OF GROUNDWATER CAPTURE IN A FRACTURE CONTROLLED AND POROUS MEDIA AQUIFER

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(DEIS page 2 45) and testing capture efficiency. Although the lower hydraulic gradient may improve capture efficiency in a fracture controlled bedrock aquifer, the further distance from the mine will allow contaminated groundwater to be more widespread and mix with cleaner groundwater; thus making capture efficiency more difficult.

The DEIS envisions testing of the monitoring well network during the initial mining operations to determine whether the capture well system can capture impacted groundwater. Additional monitoring required for all alternatives would include monitoring groundwater inflow quantity and quality during operation of the mine (DEIS page 2-60). The DEIS does not provide details on the location or spacing of the monitoring system or the testing details (except that some wells will be located also to the north of the Ram workings) nor does it provide the methods that would be used to make a determination on groundwater monitoring or capture effectiveness. Such an approach could provide information about the hydraulic connectivity to the mine in the immediate vicinity of the monitoring wells, but provides no information about the conditions beyond the zone of influence of the wells. Because aquifer testing would be conducted during mine dewatering operations, the capture efficiency of a bedrock capture well system in a fracture controlled aquifer will be questionable and may be indistinguishable from the influences of mine dewatering. As shown from the 2000 and 2001 pump tests conducted by FCC (Shaw, 2004), the well hydraulic responses were dramatically different over relatively short distances within the bedrock aquifer and hydraulic conductivity was highly variable. Based on our experience in the Bucktail drainage, the capture efficiency of an extraction well system in a fractured controlled bedrock aquifer is highly uncertain even when extensively monitored with observation wells (Golder, 2004b, 2004d, 2004f, and 2005a). Because the contaminant load calculation and the efficiency of the groundwater capture systems cannot be verified (see Section 4.3.1), discharges of contaminant loads from the ICP will not be known.

4.3.3 The Alluvial Backup Pump System Is Not Detailed for Evaluation

The proposed alluvial backup pump system is conceptualized in the DEIS and is an important constituent of Alternative IV. Without the alluvial backup system, the DEIS predicts that Alternative IV would capture 90 percent and 75 percent of the contaminant loads from Ram and Sunshine mines, respectively, in the bedrock capture systems (DEIS pages 4-24 and 4-25). The alluvial backup groundwater capture system is an important mitigation in the DEIS to achieve no net increase in contaminant loads discharging to receiving streams.

The DEIS lacks information on the specifics of the system needed to assess its effectiveness and reliability. Details on the system components and operation are necessary to understand potential failure modes and the associated environmental impacts. The DEIS states that the entire ICP contaminant load to groundwater "could be captured from surface water alone during spring runoff" (DEIS page 2-46). This DEIS statement also implies that the alluvial system might not be able to capture sufficient contaminant load during all times of the year and the difference would be made up with by the collection of surface water. However, this statement may not be correct, if contaminants were to impact the groundwater at higher than predicted concentrations (see Section 4.1 on Mine Water Quality Predictions) and if a portion of the ICP impacted groundwater does not discharge into Bucktail Creek . During low flow periods, the flow at the mouth of Bucktail Creek has been measured by FCC to be as low as 14 and 40 gpm during the last several years. At copper concentrations (200 to 250 μg/L) that are currently being observed in Bucktail Creek, the entire creek flow does not offer much potential copper load capture at these low flow rates. The DEIS does not demonstrate that the alluvial backup system would be able to capture and makeup contaminant loads (emanating from the Ram and Sunshine mines) and escaping the ICP bedrock capture systems at all times.

The DEIS identifies that a portion of the uncaptured contaminant loads from the Ram and Sunshine mines will discharge to the Blackbird Mine groundwater capture systems and be treated by BMSG (DEIS, page 4-88). The uncaptured contaminant loads from the ICP mines reporting to the BMSG Bucktail Creek groundwater/seep capture systems will not discharge to Bucktail Creek. The possibility also exists that some Ram mine impacted groundwater may preferentially flow north due to major bedrock structural features and discharge to South Fork Big Deer or Big Deer Creeks (DEIS, page 2-60) (Shaw, 2004, Figure 4-36). The DEIS does not identify or consider that a portion of the Sunshine mine could also migrate and discharge to the Blackbird Mine workings (from Figure 4, Telesto, 2006a) or to Meadow Creek (see Figure 1-2 topographic divide). Because a portion of the uncaptured contaminant load in the bedrock from the ICP mines may not discharge to Bucktail Creek, the alluvial backup capture system would be dependent on "load offsets" by capturing contaminant loads remaining in the Bucktail Creek. However sufficient contaminant load from the Blackbird Mine or elsewhere may not be available within Bucktail Creek to offset the deficiency at all times in the future.

4.3.4 The Operational Reliability of the Groundwater Capture Systems Is Not Addressed

The reliability of the systems depends on all groundwater capture systems operating continuously throughout the year. Examples where operational reliability is vulnerable include, but are not limited to: utility damage from sever weather, colluvium landslides breaking the piping/distribution system, debris flows from heavy rain-on-snow events, and pump failure from scaling/fowling. The DEIS fails to address the operational reliability of the proposed capture systems or the manner that they would maintain continuous groundwater capture. Backup system components are not specified nor are the down-time intervals determined that would result in escape of contaminants from the capture systems. Each system should have a time period determined in which the system would not lose capture of the contaminant plume. This is especially critical for the alluvial backup system where the time for groundwater to discharge to the streams is short. The DEIS is deficient in assessing potential environmental impacts because it does not identify and address the reliability of the capture systems.

4.3.5 Application of a Safety Factor to the Capture Rate is not an Adequate Solution

The DEIS (page 2-46) suggest that a safety factor may be added to the capture rate: "*An additional load could be captured above the calculated required load reduction (i.e. capture of greater then the calculated chemical load) to assure that the entire mine related load is captured.*" However this approach will not provide assurance that all of the ICP loading is captured. In order to establish and justify a safety factor, it would first be necessary to determine the error range for the loading from the mine. This has not been done in the DEIS and, due to the monitoring issues described in Section 4.2, is not likely to be possible. Selection of a safety factor based on engineering judgment has no assurance of being protective or possible to achieve. If the selected safety factor were too small, a net increase in loading would occur to site streams. If it is too high, it could result in a capture requirement that is impossible to achieve.

As explained in the DEIS and in Section 4.1.5 of these comments, copper concentrations are highly influenced by pH. Based on Figure 87 of Schafer (2006a), the "expected" copper solubility at pH 5.5 is 1000 times greater than at pH 7.5. Therefore, a small flow of acidic (e.g. pH 5.5), metal laden, groundwater would have an overwhelming effect on the metals loading from the ICP even if the majority of the groundwater flow from the ICP was successfully buffered to a neutral pH and therefore contains much less copper. If the acidic water, such as acid rock drainage from a DRZ containing reactive sulfides, evades detection in the monitoring system, the resulting copper loading would not be factored into the capture requirement. The DEIS presents no rationale for how such loadings could be reliably factored into a safety factor for a capture rate that would "assure that the entire mine related load is captured".

4.3.6 Summary of Groundwater Capture Deficiencies

The DEIS estimate of groundwater capture efficiencies is speculative and unsupported. The data presented in the DEIS, the Summary Hydrologic Report (Hydrometrics, 2006) and previous FCC reports (i.e., Shaw, 2004) do not provide sufficient characterization of the bedrock aquifer to estimate groundwater capture efficiencies for each mine. The groundwater capture system efficiency was estimated using professional judgment, but the only quantitative evaluation for the bedrock aquifer system was done assuming isotropic "equivalent porous media" to represent the fractured controlled bedrock aquifer, which is a fundamental flaw. In addition the DEIS does not demonstrate that the actual groundwater discharge locations are known from the Ram and Sunshine mines, which would be required to propose groundwater capture systems and to estimate capture efficiencies. The DEIS proposed solution includes unspecified additional monitoring wells, observation of well responses to active mine dewatering and pump testing to better understand the bedrock aquifer system. These measures would be implemented after approvals for mining and after mining begins. If the characterization is inadequate, there is no method to verify that no net contaminant loading is occurring to receiving streams.

The DEIS is deficient because the efficiency of the DEIS proposed groundwater capture systems cannot be verified. Any escape and discharge to receiving streams (namely South Fork Big Deer and Big Deer Creeks), to the Blackbird Mine workings, to BMSG groundwater /seeps capture systems and/or to Meadow Creek that is not known due to the complexities of the bedrock fracture controlled aquifer cannot be distinguished from the multiple existing contaminant sources.

4.4 Deficiencies in the Proposed Water Treatment System

Water treatment aspects of the FCC DEIS for the ICP have been reviewed and evaluated. The conceptual water treatment process in FCC's proposed plan of operations (Alternative II) involves chemical addition, filtration, and multiple steps of RO to treat excess water from mining operations and site drainage. The RO waste stream is to be solidified and stored in the Tailings and Waste Rock Storage Facility (TWSF), while the treated water is to be discharged to Big Deer Creek under effluent limitations of an NPDES permit. "Zero liquid discharge" is also a goal for ICP, and is substantively attained by treating and discharging water in an amount equal to or less than the net precipitation (the difference between total precipitation and evaporation) on the site.

The reviewing agencies (United States Department of Agriculture [USDA], United States Forest Service [USFS], United States Environmental Protection Agency [EPA), and the Idaho Department of Environmental Quality noted the excessive volume of solidified waste produced by Alternative II's water treatment process as problematic (DEIS Summary, Table S-2, "Water Treatment and Disposal Issue"). The water treatment system as described in Alternative IV is identified as the agencies' preferred alternative, with one of the purported beneficial changes being a reduction in the volume of solidified waste. The water treatment process presented in Alternative IV eliminates RO treatment but maintains chemical addition and filtration for removal of the contaminants. Alternative IV proposes treatability testing before startup, and as such the water treatment system could best be described as "to be determined". This alternative assumes that a variety of chemical addition schemes and supplemental unit operations for effluent polishing (nitrification/denitrification, sulfate reduction, RO or ion exchange) may be added as necessary, to meet NPDES permit effluent limits.

The DEIS relies on the Water Resources Technical Report (Hydrometrics, 2006) as the source of predicted influent and effluent water quality and an increased level of detail in conceptual water treatment process description. The data presented in the Water Resources Technical Report was evaluated by Golder in conjunction with the DEIS as part of this review.

More specifically water treatment as described in Alternative IV was evaluated for the following:

- Consistency with NEPA – adequate definition of the treatment system, its effects on the environment, and mitigation of adverse effects
- Consistency with NPDES – evaluation of predicted effluent quality and proposed effluent limits as presented in the DEIS and EPA's "Fact Sheet" for the ICP discharge to Big Deer Creek
- Capability of the water treatment system to attain "zero liquid discharge" as required in EPA's proposed permit; and
- Weaknesses in the conceptual engineering of the water treatment system described in Alternative IV.

4.4.1 The Description and Evaluation of Proposed Water Treatment Systems is Inadequate

The description of water management and treatment modifications developed for Alternative IV in Chapter 2 of the DEIS states "the water treatment process for Alternative IV would utilize the same basic process components as the pre-treatment system proposed by FCC in Alternative II, but may not require reverse osmosis as a polishing step to remove dissolved solids, nitrogen and sulfate" (DEIS page 2-44). While the Alternative IV description initially refers back to the Alternative II pretreatment system (as defined above) additional discussion (DEIS page 2-45) is provided as follows:

> "The treatment system for Alternative IV would utilize liquid/solid separation using chemical addition and either (a) clarification and media filtration, or (b) membrane filtration (for example micro/ultrafiltration membranes) for metals removal for the entire process stream; and biological nitrification/denitrification for nitrogen removal for all, or a portion of the process stream should nitrogen levels be in excess of anticipated NPDES effluent limits. If the NPDES permit contains an effluent limit for sulfate and anticipated inflow to the water treatment plant contains sulfate concentrations higher than this limit, this alternative would utilize biological sulfate reduction for all or a portion of the flow stream. If water treatabilty testing performed to support final design of the treatment plant indicates that the above described treatment train cannot produce an effluent capable of meeting NPDES limits, this alternative will allow additional water treatment processes using ion exchange or reverse osmosis for a portion or all of the flow stream. If additional polishing treatment is shown through testing to be the only viable way to remove constituents down to NPDES effluent limits, a plan for managing the liquid brine (RO waste stream) or regenerant (ion exchange waste stream) will be presented to the USFS for approval of on- or off-site disposal.

This alternative does require that the treatment process be based on best available demonstrated technology, comply with New Source Performance Standards on the types and amounts of water that can be discharged, and be tested prior to implementation to confirm treatment efficiencies. An evaluation of several standard types of water treatment processes that could be used to treat site waters is contained in the Water resources Technical Report (Hydrometrics, 2006)."

Treatment system description inadequacy. This description of the water treatment process presents a variety of potential processes, to the end result of providing a very vague definition of the treatment system. Even the chemical addition step, which is clearly defined in Alternative II as using hydrated lime, is presented in Alternative IV (by reference to Hydrometrics, 2006) as being open to use of lime, caustic soda, sulfide or carbonate. Each of these additive chemicals would provide variations in metals removal efficiency and secondary waste characterization, as well as design, operational and cost factors. The filtration step following chemical addition is described as either media filtration or membrane filtration. Treatment processes for nitrate, sulfate, and metals removal (polishing) are also

potential "add-ons". Given the wide variety of potential processes and extra steps, the DEIS does not present an "understandable" and defined treatment system. The environmental consequences of effluent discharge and secondary waste generation from an undefined system cannot be known. No logical mitigation of adverse effects could be proposed. The DEIS does not establish that NPDES permit effluent limits would be met by the proposed treatment system nor does it establish that the solid waste streams are accurately quantified or mitigated.

Nitrate and sulfate removal in Alternative IV is described as a potential add on if necessary. This is in direct contradiction to a discussion of "primary contaminants of concern" under the heading of "Process Water Characteristics" (DEIS page 2-23). In this discussion nitrate and sulfate "...are expected to occur at higher concentration in the pond water compared to natural waters" and "...may also have significant environmental effects if discharged into surface or groundwater". Nitrate and sulfate are flagged as primary contaminants of concern and would almost certainly require the additional Alternative IV treatment steps described. While additional treatment could result in an acceptable liquid effluent discharge, the biological sludge waste generated by nitrate and sulfate removal have not been considered, and could present significant effects on the total volume of solid waste resulting from water treatment.

In Section 4 of the DEIS (page 4-38) Alternative IV "assumes that effluent metals concentrations would be similar to those projected for Alternative II, and would be lower than proposed effluent limits in EPA's Draft NPDES permit in order to avoid the need for RO treatment". There is no supporting documentation for the assumption that chemical addition and filtration (Alternative IV) would equal RO for treatment efficiency. In fact, the chemical precipitation system effluent predicted and documented in Table 4-1 (DEIS page 4-15) is to the contrary. Based on the predicted "RO feed (influent)", which is identical in the process flow to the chemical precipitation/filtration effluent, eight metals would not be treated to their NPDES effluent limits. Based on data presented in Table 4-1, examples of contaminants that will not achieve effluent limitations using chemical precipitation treatment include the following:

- The removal efficiency prediction for copper is approximately 70 percent for chemical precipitation (influent concentration of 35,000 μg/L and chemical precipitation effluent of <10,000 μg/L) and requires RO polishing to reach the 99+percent removal efficiency needed for compliance with its NPDES proposed permit effluent limit.
- Cobalt removal with chemical precipitation is predicted at 91 percent (influent at 594,000 μg/L and chemical precipitation effluent at <50,000 μg/L), and also requires RO polishing to reach its NPDES proposed permit effluent limit.
- Sulfate and nitrate concentrations are predicted to be unchanged by chemical precipitation (0 percent removal) and will definitely require additional treatment steps other than RO polishing to reach their respective NPDES proposed permit effluent limits.

Solid waste description inadequacy. The objective of the Alternative IV treatment system is to reduce the volume of solid waste presented by solidification of RO brine in Alternative II, and consequently reduce the storage capacity and footprint of the TWSF. There is no discussion in Alternative IV of the predicted volume of sludge generated by chemical addition (as the only metals removal process), which is proposed for disposal in the TWSF. Some sludge could be recycled in the water treatment process, and some could be returned to the mill. However, a solid waste stream that is only suitable for disposal would still be generated. It is also important to note that in the post-closure reclamation phase, recycling water treatment sludge to the mill will not be possible. The post-closure water treatment operation will have no potential for waste minimization through recycling, and all sludge will have to be disposed onsite or offsite.

In Alternative II, chemical addition is a pre-treatment step (with RO being the main metals removal process), and a lesser volume of pre-treatment sludge could logically be assumed. In Alternative IV, chemical addition is the only metals removal step, and therefore should be expected to generate a larger solid waste stream. While the sludge volume would not be further increased by solidification, the volume and disposal are poorly defined. The DEIS fails to provide sufficient documentation of the volume and characteristics of the solid waste that will be produced as a water treatment byproduct. Discussion of the Alternative IV purported benefit of reduced volume of solid waste is not supportable.

The solid waste volume that will be generated by Alternative IV's "to be determined" treatment system is unknown, but can safely be assumed as underestimated in the DEIS. The Alternative IV option of adding RO polishing treatment for metals removal will be required as documented in the DEIS water treatment predictions (Tables 4-1 and 4-2), thus reintroducing the RO brine problem. The RO brine volume is undefined in Alternative IV, and could potentially be characterized a "RCRA hazardous waste" depending on the concentration and availability of metals in this waste stream, if it is not solidified. The objective of reducing solid waste is not demonstrated to be met by the Alternative IV water treatment system.

With the "add-on" processes that might be used to attain NPDES effluent limitations, there is no acknowledgement in the DEIS of additional solid waste volume, other than the statement that a plan for on- or off-site disposal would be prepared. The nitrate and sulfate removal processes (almost certainly required based on the DEIS identification of these compounds as "primary contaminants" and predicted influent concentrations) would both likely produce a biological sludge of unknown volume.

In the Environmental Consequences section, the DEIS states (page 4-5) that "Under Alternative IV the TWSF would have a smaller initial footprint than Alternative II (36 acres vs. 55 acres), otherwise geotechnical characteristics would be similar." The secondary streams are unknown based on the uncertainty of what the Alternative IV water treatment process train would include (with future treatability studies to develop an NPDES compliant effluent). An estimate of the size of the TWSF is unsupportable. Any mitigation of adverse effects that is suggested by the smaller TWSF footprint is unsupportable.

4.4.2 Consistency with the National Pollutant Discharge Elimination System

The DEIS does not provide a treatment system concept in Alternative II or Alternative IV that considers all contaminants included in EPA's proposed NPDES permit.

"Primary contaminants of concern". In describing process water characteristics for Alternative II (DEIS page 2-23) the DEIS states "The primary contaminants of concern (contaminants) for the ICP are nitrate, sulfate, arsenic, copper, cobalt, nickel and zinc. Primary contaminants are constituents expected to occur at higher concentrations in the water management pond water compared to natural waters and which may also have significant environmental effects if discharged into surface or groundwater." The DEIS gives no justification for definition of "primary contaminants".

The proposed permit (EPA Fact Sheet, permit number ID-002832-1, February 8, 2007) does not distinguish any of the parameters, "primary" or otherwise. Designing a treatment system to target removal of "primary contaminants" does not conform to the goal of producing an effluent discharge that is fully compliant with the NPDES permit.

Consistency with proposed permit requirements. The description of treatment standards for Alternative IV (DEIS page 2-45) states "This alternative does require that the treatment process be based on best available demonstrated technology, comply with New Source Performance Standards on

the types and amounts of water that can be discharged, and be tested prior to implementation to confirm treatment efficiencies."

In addition to best available demonstrated technology and new source performance standards, Water Quality-based Effluent Limits are also applicable (EPA Fact Sheet, February 2007). The list of water quality-based criteria is more extensive, and the limits are more stringent than the technology-based effluent limits. If the treated effluent is only compliant with technology-based criteria, the water-quality based criteria in EPA's proposed NPDES permit would not be met. Technology-based effluent limits (monthly averages) are limited to the following:

- Cadmium (50 μg/L);
- Copper (150 μg/L);
- Lead (300 μg/L);
- Mercury (1 μg/L);
- Zinc(750 μg/L);
- Total suspended solids(20 μg/L); and
- pH (between 6.0 and 9.0).

Water Quality-based Effluent Limits (average monthly) will add contaminants or provide more restrictive limits as follows (EPA Fact Sheet, February 7, 2007):

- Arsenic (50 μg/L);
- Cadmium (0.26 μg/L);
- Cobalt (70.4 μg/L);
- Copper (2.4 μg/L);
- Lead (0.45 μg/L);
- Mercury (0.01 μg/L);
- Nickel (13.22 μg/L);
- Thallium (0.47 μg/L);
- Zinc (18.45 μg/L);
- Ammonia (72,800 μg/L);
- pH (between 6.5 and 9.0)
- Dissolved oxygen (>6,000 μg/L at all times); and
- Temperature (19°C)

The water treatment systems described for Alternatives II and IV do not address the complete list of parameters that are proposed for regulation.

Neither the DEIS nor the Water Resources Technical Report demonstrate that compliance with proposed effluent limitations would be attained. The Alternative IV treatment system effluent, as described in the DEIS and the Water Resources Technical Report, is likely to violate applicable water

quality criteria for as many as nine contaminants. The Alternative IV treatment system (chemical addition, metals precipitation and liquid/solids separation) cannot be predicted to be more efficient than reverse osmosis (Alternative II) for metals removal.

Table 4-1 below, presents the water treatment predictions for a chemical precipitation/filtration treatment system and water quality criteria applicable to the ICP and Big Deer Creek (EPA Fact Sheet, February 2007). The influent and effluent predictions are presented in the DEIS in Table 4-1 as "Pre-treatment feed", and "RO Feed (Influent)". The "RO feed" is identical in the process flow to the chemical precipitation/filtration effluent. The comparison of predicted chemical precipitation/filtration effluent ("RO Feed") to the applicable water quality criteria demonstrates that the chemical precipitation/filtration treatment system would not adequately treat for arsenic, cadmium, cobalt, copper, nickel, lead, thallium, and zinc. The shaded rows in the table below highlight the contaminants that will not be adequately treated with chemical precipitation alone to meet proposed effluent limits. The predicted influent and effluent concentrations have been converted from milligrams per liter (mg/L) as reported in the source document, to micrograms per liter (μg/L) for consistency with the unit of measurement for proposed effluent limits. Water treatment influent and effluent were predicted only for Alternative II. It is not demonstrated by the predictions, nor can it be assumed that the Alternative IV water treatment system, in its "base" form (without additional treatment steps or RO or ion exchange added on) would provide an effluent in compliance with all applicable water quality criteria.[5]

[5] The DEIS acknowledges only that if the Alternative IV "base" treatment concept is implemented, the effluent limitation for sulfate would not be met.

Table 4-1. Comparison of Alternative IV's Predicted Chemical Precipitation and Filtration Effluent with Applicable Water Quality Criteria[1]

Constituent	Predicted Influent concentration (µg/L unless noted)	Predicted Chemical Precipitation Effluent concentration[2] (µg/L unless noted)	Proposed Effluent Limit	
			Max Daily in µg/L, unless noted	Avg Monthly in µg/L, unless noted
Arsenic	6,000 – 200,000	10,000 – 50,000	100	50
Cadmium	<100	<100	0.52	0.26
Cobalt	1,000 – 594,000	<50,000	141	70.4
Copper	1,100 – 55,000	<10,000	4.80	2.40
Lead	<200 – 300	<200	0.90	0.45
Mercury	—	—	0.12	0.01
Nickel	2,000 – 5,000	<5,000	29.53	14.77
Thallium	<200	<200	0.95	0.47
Zinc	2,000 – 55,000	1,000 – 10,000	27.00	14.25
Ammonia (total as N)	—	—	5.62 mg/L	2.80 mg/L
Nitrate + nitrite	10 – 54 mg/L	3 – 8 mg/L	100 mg/L	—
Sulfate	300 – 700 mg/L	100 – 700 mg/L	250 mg/L	—
Sulfide	—	—	2	—
Total suspended solids	—	—	30 mg/L	20 mg/L
pH	—	—	6.5 to 9.0 s.u. at all times	
Dissolved oxygen	—	—	>6.0 mg/L at all times	
Temperature	—	—	19°C	—
Iron	<1,000 – 1,750,000	<20,000	—	—
Aluminum	56,000 – 150,000	10,000 – 50,000	—	—
Hardness	—	—	—	—
Chloride	130 – 25,000	15,130 – 40,000	—	—
Conductivity	—	—	—	—
Total dissolved solids	—	—	—	—
Whole Effluent Toxicity	—	—	—	—
Expanded Effluent Testing	—	—	—	—

[1] Data as reported in DEIS (Table 4-1, page 4-15) for predicted influent and effluent, and EPA Fact Sheet for proposed effluent limits. The column above, headed "Predicted Chemical Precipitation Effluent Concentration is identical to the column in the reference table headed "RO Feed (influent)". Shading indicates the predicted effluent will exceed EPA's proposed effluent limit. Constituents with no data in the Predicted Influent and Effluent columns were not modeled. Constituents with no data in the Proposed Effluent Limits columns, do not have numerical limits, but must be routinely monitored.

[2] In cases where the influent values is less than the effluent minimum, the influent value would control.

Surface water quality effects. In the Environmental Consequences section of the DEIS, surface water quality effects associated with Alternative IV are "not considered to have the potential to become significant, even if worst case conditions were to occur" (DEIS p. 4-7). The predicted effluent from treatment is predicted to violate NPDES permit limits for as many as eight metals and sulfate on a routine (not worst case) basis. There is no mitigation for this non-compliant discharge in excess of water quality standards. The predicted effluent would have a significant effect on surface water quality in Big Deer Creek. The assertion of no potential for significant effects in the DEIS is unsupported.

4.4.3 Zero Liquid Discharge

The proposed NPDES permit (EPA Fact Sheet, February 2007) documents the zero liquid discharge (ZLD) goal, allowing for a flow rate of 38 gpm (54,720 gallons per day) from the TWSF and ore stockpile. In the Environmental Consequences section of the DEIS, the ZLD goal is described (DEIS page 4-19). The DEIS proposes to "establish an internal monitoring point to continuously measure the combined flow from the TWSF and the ore stockpile". When drainage flows from the TWSF and ore stockpile exceed 38 gpm, the only control mechanism is the process pond capacity to store the excess until it can be treated. When the TWSF / ore stockpile drainage reaches the pond, control of this stream is lost. It is blended with mine drainage and the mill process "bleed" stream before treatment and discharge. Capability to attain ZLD is not demonstrated. The consequences of exceeding the ZLD goal are not defined. There is no mitigation for the potentially adverse effects on the receiving waters of exceeding the ZLD goal.

4.4.4 Treatment System Process Flaws

Basis of design. The "basis of design" for the Alternative IV water treatment system (DEIS page 2-42) states "The water treatment system would be designed to meet requirements of direct discharge to surface water in Big Deer Creek, but would not include reverse osmosis as a primary treatment step in order to reduce the amount of water treatment waste that would require on-site disposal."

As noted above, the modified water treatment system (in the preferred alternative, without RO) is documented to be less effective than RO (Tables 4-1 and 4-2 in the DEIS). In fact, RO is offered as a potential "additional polishing treatment" (DEIS page 2-45). If RO is considered as a potential polishing treatment, the conclusion that chemical addition must be less efficient than RO as a primary treatment component is verified.

Per the conceptual process flow sheet (Figure 2-10) the water treatment process flow rate may range from 50 to 150 gpm. Variability in treatment plant flow is managed through an equalization pond and a 10-million gallon process pond, while ICP is in its operating phase. The ponds will be taken out of commission during the post-closure phase (Idaho Cobalt EIS Preferred Alternative Reclamation and Closure Costs). Periods of high flow to the treatment plant may not be adequately treated (or could bypass and be discharged untreated) in absence of a water management pond. Periods of low flow may result in inefficient operations of treatment processes.

While influent water quality is predicted (Table 4-1 in the DEIS), the design basis water quality characteristics are never described. Some of the contaminants have wide ranges of predicted influent concentrations (examples, iron at 1,000 to 1,750,000 μg/L , and arsenic at 6,000 to 200,000 μg/L). The water treatment plant may be under-designed if low to mid-range concentrations for contaminants were used as a basis and the contaminant concentrations run consistently at the higher end of predicted ranges. If the design basis influent characteristics use optimistically low contaminant concentrations, the effluent quality will be adversely affected, as will operations costs.

Process pond spillway. The description of revised designs needed to implement Alternative IV includes "Process ponds will include spillways to reduce risk of failure if overtopping occurs." (DEIS page 2-48).

The process pond will contain contaminated water. There is no description of conditions under which an "overflow" could occur, and no description of where the "spillway" leads. While the spillway seemingly mitigates the risk of a catastrophic pond failure, the spillway release is not mitigated.

Water Treatment Conceptual Process Flow Sheet. While this flow sheet (Figure 2-10) shows Alternative II, there is also applicability to Alternative IV. As noted above in the "Basis of design" discussion, the Alternative IV water treatment system is essentially the Alternative II pretreatment system with no additional treatment processes (no RO). The flow sheet shows a water flow rate of 151 gpm into the water treatment system and a waste stream estimated at 500 to 3,000 pounds of dry solids per day. The dry basis of solids removed is applicable to any treatment alternative because it represents the metals removed from the treated flow to attain the effluent limits. The cumulative influent concentration metals can be estimated at a maximum of 1,620,000 μg/L based on the influent flow rate at 151 gpm, and a secondary waste stream of 3,000 pounds per day. The predicted influent water quality data show a cumulative metals load in influent water that could be in excess of 8,500,000 μg/L (maximum concentrations of manganese at 6,000,000 μg/L , iron at 1,750,000 μg/L , cobalt at 594,000 μg/L and arsenic at 200,000 μg/L). If these contaminants are present at their maximum predicted concentrations the result would be a five-fold increase in dry weight of solids to be removed. Additional support for the incorrectly low estimation of secondary waste is discussed in Section 4 of the DEIS (page 4-19) in which "the EIS team more conservatively estimates that actual brine volumes could be four to ten times higher than FCC's projections".

It is also important to note that virtually all metals in the influent would be removed to the secondary waste stream in solid (sludge) form. Chemical addition is not a selective process. It cannot be used to target specific contaminants and allow others to pass through. Iron in particular is not a contaminant of concern, but could be present in the water treatment influent at a relatively high concentration and would add to the total volume of secondary waste by contributing to the sludge generation rate. The range for generation of solid waste on a dry basis could vary from 500 to 15,000 pounds per day, based on minimum and maximum predicted concentrations of metals that would be removed by chemical addition. The surface area and volumetric capacity of the TWSF might be underestimated for both Alternatives II and IV. It is likely that the assumed benefit of removing RO from the treatment train (less solid waste) would not be realized.

4.4.5 Water Treatment System Conclusions

The water treatment discussion in the DEIS inadequately develops the conceptual process. Alternative IV provides too many built-in options, and assumes that future treatability studies would be performed to ensure that an NPDES permit compliant discharge is obtained. If the treatment process can only be determined through future testing, then the environmental consequences cannot be fully addressed in the DEIS and considered in agency decisions. Mitigation of adverse effects likewise, cannot be predicted for an undefined treatment system.

The water quality prediction referenced in the DEIS does not demonstrate that the preferred Alternative IV (chemical precipitation/filtration) would attain compliance with the proposed permit effluent limits at the end-of-pipe. The DEIS discussion of likely NPDES permit limits is clouded by discussion of "primary contaminants" and there is reference to new source performance standards; however, the more stringent aquatic life standards are also applicable. The DEIS assertion that NPDES effluent limits will be attained is unsupported.

Solid waste reduction, as a supposed benefit of the preferred alternative, is not documented in the DEIS. Additional waste streams from add-on treatment steps are not considered. The estimate of solid waste production in the plan of operations was observed by the agencies to be underestimated by as much as an order of magnitude, and might also be underestimated in the preferred alternative. Potential environmental consequences of unexpected quantities of secondary waste (with unknown characterization, potentially "hazardous") are inadequately mitigated.

5.0 THE DYNAMIC SYSTEMS MODEL FAILS TO REALISTICALLY EVALUATE IMPACTS TO WATER RESOURCES

A dynamic system model (DSM) is used to evaluate and compare the five ICP alternatives included in the DEIS. The DSM was originally developed to evaluate Alternative II by Telesto (Telesto, 2005). The model was modified by Telesto and other FCC consultants to represent Alternative I, III, IV and V in the DEIS (Hydrometrics, 2006).

The DSM is a simulation model that is comprised of a series of simplified analytical models that attempt to describe the main hydrologic and geochemical processes within the mine and receiving waters downgradient of the mine. The DSM includes representations of groundwater flows and chemistry of the underground mines, as well as the flows and chemistry of the surface water system that may be affected by the mine. These representations contain quantitative relationships between important parameters and are based on site characterization data and a variety of assumptions and calculations, including analytical and numerical models.

The DSM predicts the flows and chemistry of water within the mine system and in potentially affected surface waters based on a set of assumptions about how various components of the system will perform. These assumptions include the effectiveness of the mitigation measures in a given alternative (for example, adding chemical amendments to address acid rock drainage in the mine).

Water balance components make up most of the DSM. A separate climate model was used to generate daily climatic data that are used to predict the associated flows and chemistry of water within the mine system and surface waters. The watershed hydrologic processes are simulated for different drainages in the DSM to simulate the streamflow as a function of time and water quality was assigned based on sample data and assumed improvements from ongoing Blackbird cleanup activities. The groundwater flow rate through the mine was estimated using a separate analytical model. Because this groundwater flow is expected to be contaminated, the DSM simulates the capture of a portion of the groundwater outflow using bedrock pumpback wells downgradient of the mines in Alternative II, III, IV, and V, wells within the mine void in Alternative III, and using an alluvial pumpback system in Alternatives IV and V.

The DSM introduces chemical loads to groundwater originating in the ICP facilities and attempts to simulate the transport of the groundwater impacts to the collection systems and/or surface water bodies. Metal concentrations in mine water during the post closure period are estimated based on leach tests for waste rock and tailings. The metal concentrations are estimated as a function of the pH. As discussed in Section 5.2, the predicted metal concentrations in the mine water and the impact of the mine water in receiving streams are highly sensitive to the pH conditions assumed in the model (i.e., the pH is not modeled directly but is an input assumption in the DSM). In Alternatives III through V, the DEIS assumes the alkaline amendments maintain the mine water at high pH levels, resulting in very low release rates of metals.

As with all models, the accuracy of the DSM predictions is determined by the accuracy of the conceptual models and whether the input parameters used are representative of the actual system at the mine. If features or processes that have a significant impact on the behavior of the mine and receiving streams are missing in the model, or if the input parameters are inconsistent with the actual conditions, then the DSM predictions will not be valid. The reliability of the DSM predictions is further compromised due to the inability to calibrate the model beyond the existing stream flows and metal concentrations. This is acknowledged in the DEIS supporting documents: "Unfortunately, there are few opportunities to calibrate the DSM for the ICP, which tends to increase model uncertainty (page 124, Schafer, 2006a).

The following sections point out the features, processes and parameter values where the DSM is deficient based on Golder's review of the model and the issues described in the preceding sections of this report. Because of these deficiencies, the DEIS severely underestimates the adverse impacts the ICP will have on the site streams.

5.1 Overview Of Golder's Review Of The Dynamic System Model

Golder's review of the DSM is based on information provided in the DEIS, the Water Resources Technical Report (Hydrometrics, 2006), Appendix A (Schafer, 2006a) and the DSM input files for the stochastic analyses for Alternatives II and IV. The input files obtained by Freedom of Information Act (FOIA) request were modified to run simulations that considered some of the deficiencies described in the earlier sections of this report. Even with this level of review, the complexity of the DSM model architecture and undocumented discrepancies between the Alternative II and IV model files prevented a thorough understanding of the details of some components of the model. These difficulties will certainly limit the ability of the public to thoroughly understand and review the DSM. The complexity of the DSM model is recognized in the DEIS supporting documents (p. 118, Schafer, 2006a):

> "The DSM can create an enormous amount of information during a series of 30 model iterations, each of which contains 18,300 daily time steps. There are more than 500,000 daily values created by a series of DSM runs for each output variable. Consequently, a challenge to deriving meaningful results from the DSM is finding a means of making sense of all the data."

The DSM includes approximately 60 input variables. It was not possible to find a complete list and description of the input variables included in the DSM. The majority of the inputs are uncertain due to a lack of knowledge about current and future conditions and the heterogeneous nature of geologic and hydrologic systems. The predicted behavior of the DSM will obviously change depending on the combination of the uncertain input variables assumed in a simulation. The typical method for evaluating these uncertainties in a DSM model is to perform multiple simulations with the model, randomly sampling input parameters from the range of possible values (known as a stochastic simulations). The results from each of the simulations is saved and then statistically evaluated to represent the likelihood the system will behave in a certain way, e.g., the likelihood the concentration of a contaminants will exceed water quality standards.

The modeling software used for the DSM (Stella) is not conducive to running the types of stochastic simulations described above. Therefore, the input parameters were separately sampled and then combined by the DEIS consultants (i.e., Telesto, Hydrometrics and Schafer) into different sets of model inputs to support the desired number of simulations. To reduce the number of parameters in the stochastic analysis, a sensitivity analysis was performed to identify the input parameters that have the strongest influence on the important model outputs, e.g., the predicted concentrations in receiving waters. Based on the results of the sensitivity analysis, the DEIS consultants identified the 13 parameters they judged to have the strongest influence on the model outputs.

The 13 input parameters from the sensitivity study were assigned a range of possible values that represented the uncertainty in the parameter based on available measurements and professional judgment (Appendix A, p. 117, Schafer 2006a). A list of the 13 parameters and the range of values considered are shown in Table 5-1 A value was randomly sampled from each of the parameter distributions and combined into a set of input parameters for a single simulation. A total of 30 different sets of input parameters were assembled and used to run the 30 simulations. Each simulation used a unique climatic data set that was generated by a separate climate model.

Based on the review of the DSM documentation, it appears that some of the parameters that have a strong influence of model outputs were not included in the stochastic analysis. For example, as shown in Figure 97 in Schafer (2006a), the predicted copper concentrations in Big Deer Creek are sensitive to the pH-based copper solubility equation that is selected for estimating the copper concentration in mine water. The "expected" solubility equation was apparently used for all simulations. However, as discussed in Section 4.1 in this report and as shown in Figure 86 and Table 21 in Appendix A (Schafer, 2006a), the DSM predicted copper concentration in mine water is highly sensitive to the equation used.

Table 5-2 compares the range reported in Table 24 of Schafer (2006a) to the range of the parameter values included (sampled) in the DSM stochastic analysis for Alternative IV as determined by Golder's review of the DSM simulations. There are a number of inconsistencies between the ranges specified in the report and range of values used in the DSM analyses:

- The groundwater flow adjustment percentages for Ram and Sunshine mines (Input Parameter No. 4 and 5) used in the stochastic analysis are outside the specified range (42% vs. 30%).
- The upper range of the groundwater capture efficiency (Input parameter 6) is also outside the specified range (97% vs. 90%).
- The sampled range of values for the saturated hydraulic conductivity for tailings (Input Parameter No. 7) is approximately an order-of-magnitude greater than the specified range.

We found no explanation of these inconsistencies in the DEIS or Schafer (2006a).

The pH values shown in Table 5-2 for the transient pH in the Ram backfill and slash material appears different from what is indicated in the DEIS table (Table 24, p. 117, Appendix A, Schafer, 2006a). The DEIS indicates that backfill pH has a uniform distribution with a maximum range of ±1 pH units. This refers to the distribution of pH within a single simulation, e.g., the pH for Ram Slash may vary from 7.5 to 8.5 over the 50 year simulation period. However, the pH range in the next simulation may vary from 7.0 to 8.0, again, a range of 1 pH unit. When the range of pH sampled over the 30 individual simulations is considered, the distribution ranges from 7.5 to 11.3 pH units for the Ram Backfill and 6.75 to 9.3 for the Ram Slash. However, in all the simulations for Alternative IV, the backfill and slash is assumed to be maintained at a pH no lower than 7.5 and 6.75 pH units, respectively. This assumption has a major influence on the predicted impacts from the ICP on mine water and surface waters.

Table 5.1 List of Parameters Used for Stochastic Analysis (from Table 2-9, DEIS, 2006)

No.	Input Parameter	Specified Parameter Range		
		Min	Exp.	Max
1	Precipitation % Adjustment	-10%	NA	10%
2	Baseflow as a Percentage of Percolation	29.7%	33.0%	36.3%
3	Soil Column Saturated Hydraulic Conductivity (ft/day)	0.0425	0.085	0.1275
4	Ram Groundwater Flow Adjustment %	-30%	NA	30%
5	Sunshine Groundwater Flow Adjustment %	-30%	NA	30%
6	Groundwater Capture Efficiency	50%	75%	90%
7	Tailing Infiltration (% of Rainfall)	25%	30%	35%
8	Tailing Saturated Hydraulic Conductivity (ft/day)	0.085	0.17	0.255
9	Land Application ET Rate Adjustment	-15%	NA	15%
10	Land Application Saturated Hydraulic Conductivity Percent Increase	-10%	NA	10%
11	Percent Waste Rock as PAG	15%	20%	25%
12	Reactive Portion of Slash (% Fines)	20%	40%	60%
13	Transient pH of Backfill, Slash, TWRSF	-0.5 pH unit	NA	+0.5 pH unit

Note: Parameter distributions with three values indicate a triangular distribution was used. An "NA" indicates the use of a uniform distribution. Exp. =expected value.

Table 5-2 Comparison Between Specified and Sampled Parameter Distributions in Stochastic DSM Analyses

No.	Input Parameter	Specified Parameter Range			Sampled Parameter Range		
		Min	Exp.	Max	Min	Exp.	Max.
1	Precipitation % Adjustment	-10%		10%	-9.4%		7.74%
2	Baseflow as a Percentage of Percolation	29.7%	33.0%	36.3%	30.3%	33.0%	35.8%
3	Soil Column Saturated Hydraulic Conductivity (ft/day)	0.0425	0.085	0.1275	0.05	0.09	0.12
4	Ram Groundwater Flow Adjustment %	-30%		30%	-25.4%		42.1%
5	Sunshine Groundwater Flow Adjustment %	-30%		30%	-25.4%		42.1%
6	Groundwater Capture Efficiency	50%	75%	90%	77.7%	88.3%	97.1%
7	Tailing Infiltration (% of Rainfall)	25%	30%	35%	26.2%	30.0%	33.9%
8	Tailing Saturated Hydraulic Conductivity (ft/day)	0.085	0.17	0.255	0.63	1.02	1.43
9	Land Application ET Rate Adjustment	-15%		15%			
10	Land Application Saturated Hydraulic Conductivity Percent Increase	-10%		10%	-8.4%		-9.1%
11	Percent Waste Rock as PAG	15%	20%	25%	16.1%	20.0%	24.1%
12	Reactive Portion of Slash (% Fines)	20%	40%	60%	23%	40%	57%
13a	Transient pH of Backfill (Ram)	±1 pH unit			7.5[3]	NA	11.3
13b	Transient pH of Slash (Ram)				6.75	NA	9.3

5.2 The pH Range for Alternative IV is Biased and therefore the DSM Results are Biased[4]

The DSM does not calculate mine pH levels, which are instead defined by the user, i.e., the person performing the model run (Appendix A, p. 102, Schafer, 2006a). As stated by Schafer (page 105, 2006a):

> "The assumptions used to describe mine water pH and the pH governing equations will have an overwhelming influence on predicted impacts."

[3] Represent the range of the average pH over the 50-year simulation period. The pH within a given simulation varies by one pH unit (e.g., from 8.7 to 9.7).

[4] The word "Biased" as it is used herein refers to a statistical bias (a random distortion of a statistic as a result of sampling procedures), and does not imply prejudice or intent.

This statement can be illustrated by an assumption that relatively mildly acidic (pH 5.5) conditions eventually develop within the mine and the governing equations developed for the DSM apply. The copper solubility equations from Figure 86 and Table 21 (Schafer, 2006a) at pH 5.5 yield copper concentrations for mine water of 8,900 μg/L for the "expected case" equation and 30,000 μg/L for the "upper limit" equation. In contrast, at the minimum pH assumed for water in contact with slash under Alternative IV of 6.75 pH units, the "expected case" equation yields a copper concentration in mine water of 120 μg/L, or 75 times lower concentration than predicted at pH 5.5. At pH 7.5, the minimum pH assumed for water in contact with backfill, the "expected case" equation yields a copper concentration of 9 μg/L, nearly 1000 times lower than the predicted concentration at pH 5.5. A pH of 5.5 units is well within the range of test data used to develop the equations in the DEIS and conditions that would develop if amendments were to fail in all or portions of the mine, resulting in development of acidic conditions.

The DEIS assumes the alkaline amendment in Alternative IV is completely effective in preventing ARD conditions from developing at any time during the post closure period for every possible future scenario. In every one of the stochastic simulations used to evaluate the performance of Alternative IV, the pH in the Ram backfill is assumed to be between 7.5 and 11.3 and the pH in the Ram slash is always between 6.75 and 9.3 As this pertains to the stochastic analysis, the range implies absolute certainty that the amendment will work, i.e., that there is a 0% probability or chance that this mitigation measure will fail. This unsupported modeling assumption is the reason the DSM consistently predicts minimal impacts to mine water and receiving waters (e.g., in Big Deer Creek) in every simulation, even when the groundwater capture effectiveness is relatively low. Moreover, only the "expected case" equations are used in the calculation of copper concentrations for Alternative IV, i.e., the uncertainty in the pH/copper solubility relationship (see Figure 86, Schafer, 2006a) is not accounted for in the stochastic analysis. Section 4.1 of this report describes several scenarios that would result in significantly lower pH conditions and, therefore, higher concentrations of copper in the groundwater associated with the mine including:

- Inadequate mixing of amendments, resulting in an inability to achieve the required buffering
- Bypass of impacted groundwater through the damaged rock zone (DRZ), thereby avoiding contact with the amended backfill
- Amendment consumption, resulting in depletion of the buffering capacity over time.

Section 4.1 concludes that the mine water quality predictions of the DSM are unreliable because no technical basis is provided for the supposition that alkaline conditions can be achieved and maintained in the underground mines. The range of pH conditions assumed in the Alternative IV model runs reflect overconfidence on the part of the DEIS consultants that neutral to alkaline conditions can be maintained throughout the mine and for the duration of the post-closure period.

Situations in which experts' confidence bounds (i.e., the estimate of the upper and lower values) are approximately correct are rare (Lichtenstein and Fischoff, 1977). Overconfidence (i.e., confidence bounds with too narrow a range) is a well documented bias. Researchers reviewed studies totaling nearly 15,000 judgments and found that peoples' 98% confidence bounds (i.e., the extreme values) contained the correct response only 68% of the time instead of the 4% that would be expected (Lichtenstein et., al, 1982).[5] These conditions are atypical for the complex hydrologic and

[5] Weather forecasters and professional card players are among the few groups whose judgments have been found to be well calibrated because the relevant factors are well known and the benefit of thousands of repetitions providing feedback to learn from experience. These conditions are atypical for the complex hydrologic and geochemical settings at the ICP site where the long-term behavior of the natural and engineered system components are highly uncertain.

geochemical settings at the ICP site where the long-term behavior of the natural and engineered system components are highly uncertain.

The technical report on the use of the DSM to simulate the proposed ICP (p. 118, Schaefer, 2006a) confirms that the model would predict significant impacts if the range of pH conditions in the Ram Slash and Backfill for Alternative IV was expanded:

> *"However, when uncertainty about model inputs is factored into the model, the worst case model results show that mine impacts could be significant. Higher estimated copper levels tended to occur when the mine pH or groundwater capture were at the low range of estimates or when mine inflows were at the high end of estimates."*

The above statement refers to the results for simulations of Alternative II which are essentially the same as Alternative IV if the alkaline amendment in the Ram slash is ineffective. The importance of taking into account the full range of foreseeable outcomes is stressed in a recent study on the challenges associated with predicting water quality at mine sites by Maest et. al. (2005). The authors emphasize the difficulty in estimating the effectiveness of mitigation measures:

> *"If the predictions aren't realistic, it is much harder to "retrofit" mine design than to make it right or prevent pollution in the first place."*

The effect of the unrealistic assumptions used in the DSM is reflected in Tables 5-3 and 5-4. Table 5-3 compares the DSM predicted copper concentrations in Ram mine water for Alternatives II and IV. Table 5-4 compares the predicted copper concentrations at Big Deer Creek (WQ-24). The assumption that the alkaline amendment to the slash is effective at maintaining elevated pH conditions results in a extremely low level and a very narrow range of copper concentrations in the mine water for Alternative IV (37 to 46 ppm) under all conditions. There is only a 5 µg/L difference between the best (10th percentile) and worst (90th percentile) concentrations. For the reasons given above, it is very unlikely that the copper concentrations within mine water will be maintained within this very low and narrow range of concentrations.

In contrast, the predicted copper concentrations in the mine water for Alternative II are much higher and with a broader range between the lowest and highest probable values (52 to 372 µg/L) or a difference of 320 µg/L. The DEIS evaluated the case of ARD development and projected the copper levels in the Ram mine water would be estimated at 8,000 µg/L at pH 5.5 (p. 103, Schafer, 2006a)[6]. The main difference between the DSM inputs for Alternatives II and IV is the assumption in Alternative IV that the alkaline amendment will be absolutely effective during post-closure. If the inputs to Alternative IV included the possibility that the alkaline amendments are ineffective, the range of predicted copper concentrations would be more similar to that in Alternative II and the ARD case. Furthermore, if the observed range in uncertainty for copper solubility as a function of pH were included (see Figure 86 in Schafer, 2006a), the predicted range of copper concentrations in Alternatives II and IV and the ARD development case would be much greater.

Table 5-4 summarizes the DEIS water quality predictions in Big Deer Creek for Alternatives II and IV. The results are a function of the mine water quality predictions shown in Table 5-3 combined with other input parameters in the DSM. The range in the predicted copper concentrations in Big Deer Creek at WQ-24 for Alternative IV assume attainment of water quality standards in Big Deer Creek by the BMSG (i.e., post-BT-5). The range in the predicted copper concentration is extremely narrow with the 10th and 90th percentile values differing by only 0.6 µg/L (2.1 to 2.7 µg/L). The

[6] Based on the equation for the "expected case" in Table 21 in Schafer (2006), the copper concentration should be 8,900 µg/L at pH 5.5.

upper range of concentrations predicted for Alternative IV would similar to those for Alternative II (8.7 µg/L) if mildly acidic conditions develop in the mine and the monitoring, capture, and treatment systems are not 100% effective, i.e., up to 8.7 µg/L (Table 5-4).

Table 5-3 DEIS Range of Predicted Copper in Ram Mine Water

Mine Stage	Simulation Time (Days)	Alternative II (µg/L)			Alternative IV (µg/L)		
		10th	50th	90th	10th	50th	90th
Ram Operations (Pre-BT-5)	1521	58	84	360	39	44	56
Ram Operations	1887	59	88	322	39	45	57
Sunshine Operations	4809	42	81	346	37	37	38
Closure (Year 5)	6636	52	89	372	41	43	46
Closure (Year 23)	13210	50	65	196	41	44	48

Reference: Table A-3 and Table A-67, Schafer, 2006a.

Table 5-4 DEIS Range of Predicted Copper in Big Deer Creek (WQ-24)

Mine Stage	Simulation Time (Days)	Ambient (µg/L)	Alternative II (µg/L)			Alternative IV (µg/L)		
			10th	50th	90th	10th	50th	90th
Ram Operations (Pre-BT-5)	1521	11.7	10.8	11.2	11.3	10.9	11.2	11.3
Ram Operations	1887	3.1	2.4	2.5	2.6	2.4	2.5	2.7
Sunshine Operations	4809	3.1	2.3	2.5	2.6	2.3	2.5	2.6
Closure (Year 5)	6636	3.1	3.6	4.4	8.7	2.1	2.4	2.5
Closure (Year 23)	13210	3.1	3.3	3.7	5.7	2.3	2.5	2.6

Reference: Table A-32 and Table A-96, Schafer, 2006a.

In effect, the DEIS uses the narrow (overconfident) range of possible pH conditions in the Ram Slash (i.e., a pH from 7 to 9) to conclude surface water quality effects of Alternative IV do not have the potential to become significant (page 4-7, DEIS):

> *"Thus, in contrast to Alternative II, the impacts to Big Deer Creek predicted for Alternatives III, IV and V are not considered to have the potential to become significant, even if worst case conditions were to occur."*

The narrow pH range assumed in the DSM stochastic analysis is unsupported and reflects an overconfidence in the proposed mitigation measures. The alkaline amendment cannot be guaranteed to be 100% effective for the reasons presented in Section 4.1. If realistic "worst case" conditions are included in the pH range, the upper range of potential impacts to Big Deer Creek from Alternative IV and the other alternatives will be much higher. As a result, the DSM does not provide a realistic evaluation of the alternatives.

5.3 The Number of Stochastic Simulations is Inadequate to Identify the Best and Worse Case Conditions

The purpose of a stochastic analysis is to propagate the uncertainty in the input parameters in a simulation model in order to understand the full range of uncertainty in the output from the model. The predicted output parameters from a stochastic analysis will cover a range of values with some values being more likely than others. The result are arranged in order from highest to lowest to identify the "best case" and "worst case", i.e., the 10th and 90th percentile values in the DEIS. In the case of the DEIS, a relatively small number of realizations (individual computer model simulations) is used to represent the range of possible outcomes. Probabilistic analyses typically consist of hundreds to thousands of realizations. The typical test to determine whether a sufficient number of realizations have been run is to compare the 10th and 90th percentile values from two sets of runs (e.g., 100 realizations versus 200 realizations). If the values are similar, the number of realizations is sufficient to define the specified percentiles. The closer the percentile is to the extreme value of the distribution, the more realizations required.

The difference between the minimum (min) and maximum (max) values from a stochastic analysis and the 10th and 90th percentile values provides another indication of whether additional simulations are justifiable. For example, if the 90th percentile and max values are similar, additional simulations are unlikely to result in a large change in the 90th percentile value. Alternatively, if there is a large difference between the values, the precision of the 90th percentile value is suspect and additional simulations are warranted.

Table 5-5 compares the 10th and 90th percentile values of copper concentration in Ram mine Water with the min and max values for Alternative II. While the difference in the min and 10th percentile values is relatively small, the max values are as much as twice the 90th percentile values because of distribution of results is highly skewed (asymmetrical) towards the higher concentrations. If additional simulations were run to better define the upper range of the distribution, the 90th percentile value is likely to be significantly larger than reported in the DEIS. A similar situation exists for the 10th/90th percentiles and min/max values for Big Deer Creek (Table 5-6). The max copper concentration values during the post-closure period are approximately 50% higher than the "worst case" (90th percentile) value. Therefore, additional realizations are required to better define the "worst case" impacts to Big Deer Creek and other surface water bodies for Alternative II.

The model outputs summarized in Tables 5.5 and 5.6 do not take into account the overconfidence in the assumptions for pH conditions described in Section 5.2, above. The use of realistic ranges of pH conditions for both Alternatives II and IV would yield much higher maximum and 90th percentile copper concentrations for mine water and at Big Deer Creek station WQ-24.

Table 5-5 Comparison of the 10th - 90th and Percentile Minimum – Maximum Values of Predicted Copper in Ram Mine Water

Mine Stage	Simulation Time (Days)	Alternative II (µg/L)			
		Min	10th	90th	Max
Ram Operations (Pre-BT-5)	1521	56	58	360	695
Ram Operations	1887	57	59	322	674
Sunshine Operations	4809	39	42	346	758
Closure (Year 5)	6636	50	52	372	700
Closure (Year 23)	13210	50	50	196	349

Table 5-6 Comparison of the 10th - 90th and Percentile Minimum – Maximum Values of Predicted Copper in Big Deer Creek (WQ-24)

Mine Stage	Simulation Time (Days)	Alternative II (µg/L)			
		Min	10th	90th	Max
Ram Operations (Pre-BT-5)	1521	10.8	10.8	11.3	11.4
Ram Operations	1887	2.3	2.4	2.6	2.7
Sunshine Operations	4809	2.2	2.3	2.6	2.7
Closure (Year 5)	6636	3.5	3.6	8.7	14.9
Closure (Year 23)	13210	3.3	3.3	5.7	8.8

5.4 The DSM Does Not Address the Issues Raised in Previous Sections of These Comments

The previous sections of this report show that it is not valid to assume water quality standards in Big Deer Creek will be achieved in the future and that the ICP is likely to result in additional impacts to site streams. Section 1.3 of this report shows that, in spite of the major achievements of the BMSG remedial actions at improving water quality and restoring aquatic life in site streams, there is no valid basis for the assumptions in the DEIS that BMSG actions will result in attainment of water quality standards in South Fork Big Deer, Big Deer Creek, and Panther Creek. For example the DSM assumes the copper concentrations will eventually reach 3.1 µg/L and 2.0 µg/L in Big Deer Creek and South Fork Big Deer Creek respectively (Table 4-8, Table 4-9, DEIS). The DEIS does not provide a technical basis to support these assumptions. The assumed concentrations are significantly lower than the lowest hardness-based water quality standard of 3.5 µg/L.

Sections 3 and 4.2 describe why, in the fractured flow environment of the Blackbird Mine Site and the ICP, it will not be possible to fully monitor releases from the ICP mines and distinguish those releases from other sources, including from the Blackbird Mine site. The DSM has no models or

input parameters to account for the failure of the monitoring system to detect all releases. Those loads will ultimately discharge to receiving streams and add to metal concentrations at Big Deer Creek and elsewhere. Based on the monitoring approach described in the DEIS, these loads may be attributed to the Blackbird Mine.

Section 4.1 of this report challenges the assumption in the DEIS that the addition of alkaline amendments to the mine backfill and waste rock (slash) will result in consistent temporal and spatial control of pH within the within these materials. Section 5.2 above emphasizes that the pH assumed in the DSM has an overwhelming effect on the predicted water quality within the mines and receiving streams. It is the opinion of Golder Associates that the narrow range of pH assumed in Alternative IV is biased and represents an overconfidence in the long-term performance of the propose mitigation method.

As discussed in detail in Section 4.3, the basis for assuming the effectiveness of the capture system is not provided in the DEIS. The capture efficiency for the agencies preferred alternative is assumed to be as high as 97%. When this assumption is combined with the assumption that the ARD amendments will be 100% effective, the DSM predicts an extremely narrow range of copper concentrations that results in no impacts to Big Deer Creek. These results are inconsistent with the complexity and inherent uncertainties in the site and proposed mine system.

As described in Section 4.4, the DEIS does not demonstrate that the water treatment processes assumed for the preferred alternative would obtain compliance with the NPDES limits proposed by EPA. As indicated in Table 12 of Schafer (2006a), the DSM assumes a 99% removal efficiency for copper and other metals for Alternative IV, regardless of the influent concentration of the metals. However, review of the DSM computer files for Alternative IV shows that the copper concentration in the effluent from the water treatment system is constrained to be no greater than 4 µg/L. When copper concentrations in the influent are less than 4 µg/L, the effluent concentrations are assumed to be equal to the influent.

The DSM assumes very low influent concentrations to the water treatment system based on the assumption of successful buffering of the mine water resulting in effluent concentrations that are much lower than even the NPDES limits.

5.5 Summary and Conclusions Concerning DSM Issues

The projected impacts from the ICP on Big Deer Creek and other streams are based on a DSM that includes a number of unsupported assumptions, most notably that alkaline amendment in Alternative IV are completely effective in preventing ARD conditions in the mine during the post closure period for every possible future scenario. If inadequate mixing of amendments, the bypass of impacted groundwater through the damaged rock zone, or amendment consumption occur, low pH conditions and increased mass loading will result. The pH range assumed in the DSM is biased and reflects overconfidence in the proposed mitigation measures. If realistic "worst case" conditions are included in the pH range for Alternative IV, the potential impacts to Big Deer Creek will exceed water quality criteria.

Moreover, the small number of simulations performed for the stochastic analysis results in an underestimation of the reasonable worst case. The use of the 90th percentile value from the stochastic analysis to represent the "worst case" conditions is misleading given the relatively small number of realizations performed. A larger number of realization is needed to better define the worst case estimate.

The results from the DSM are also very dependent on the assumption that BMSG remedial actions will result in attainment of water quality standards in the future in South Fork Big Deer, Big Deer Creek, and Panther Creek. There is no valid technical basis for this critical assumption in the DEIS. Furthermore, the DSM does not account for a failure of the monitoring system in fractured bedrock to detect all releases from the ICP. The predicted water treatment effluent concentrations are inconsistent in the DEIS and DSM. The concentrations of metals in the effluent predicted by the DSM for Alternative IV are lower than those stated in the DEIS.

6.0 FINANCIAL ASSURANCE CALCULATIONS UNDERESTIMATE THE LIKELY COST OF RECLAMATION

6.1 General Reclamation Cost Review

The costs and backup information provided in the FCC DEIS and the EPA comments and reclamation bond calculations (March 7, 2007) were reviewed and evaluated for completeness, as well as for general compliance with the USFS Training Guide for Reclamation Bond Estimation (USFS, 2004). The financial assurance analysis provided for review comprised four pages of text with attached spreadsheet calculations. The write-up contained inadequate documentation to confirm the validity of the financial assurance estimate, and in the case of Post Closure O&M, the detailed cost sheet was missing from the provided documentation.

Specific comments to various costing components are included below:

- We noted that very little material was being imported to the site and question whether the significant quantities of growth media will be obtainable from the nearby borrow sources.
- The long term post closure O&M duration is assumed to be 5 years. It is likely that additional monitoring and maintenance will be required after the 5 year timeframe.
- The contingency of 20% of direct cost is low for this very preliminary stage of design. The October 2006 version of the financial assurance included a 30% contingency. Based on generally accepted practice for this level of project definition a contingency of at least 30% should be used (US Army Corps of Engineers, 1997; EPA, 2000).
- The contractor profit is included at 10% of Direct Cost. Based on the USFS Guide, a contractor profit on the order of 30% should be considered (USFS 2004, Page 43).
- Water monitoring for interim O&M – It was unclear how the $138,000 for water monitoring was developed.
- There was an apparent discrepancy in the number of drums of hazardous material that were expected to be removed from the site. The assumption appeared to be that there would be 100 cubic yards of miscellaneous contaminated building debris, yet only 40 drums were costed to be removed from the site (40 drums is roughly equivalent to 10 cubic yards).
- Fuel costs are estimated at $3.00 per gallon. Based on 2007 prices in the Salmon area, this assumed cost is low.
- In the volumes and areas spreadsheet, growth media is listed for each of the borrow sites, yet on the detailed cost sheet for borrow sites, no cost for growth material is included.
- No material costs have been included for erosion and sediment control, such as straw bales, fencing, or other potential materials.
- Costs have been included for groundwater capture. It is not possible to evaluate whether these costs are reasonable, as the final groundwater capture system required has yet to be developed.
- Although the Post Closure O&M detail sheet was missing from the most recent cost estimate, it was included in the October 2006 version. If the costs are similar, the 3 years of environmental monitoring will be inadequate both due to the short duration of monitoring, as well as the likelihood that quarterly monitoring will not be adequate to monitor and characterize potential releases to groundwater.

In addition to the comments above, the primary deficiency in the cost estimate is centered around the type of water treatment required and the costs associated. Details on the water treatment cost assessment are provided in the section below.

6.2 Water Treatment Cost Review

The Idaho Cobalt DEIS Preferred Alternatives Reclamation and Closure Costs (Closure Costs) document was reviewed and similar to the technical information on water treatment was found to be incomplete or inconsistent as discussed in the following paragraphs.

General Water Treatment Description. As described in Section 2.3 of the Closure Costs document the water treatment costs are based on the agency preferred alternative (Alternative IV) and assume a conventional precipitation and solids removal system. The costs are calculated on an annual basis and post-closure assumes that water treatment continues for 100 years following mine closure. The annual water treatment cost estimate is based on nominal flow rate of 75 gpm. Based on the proposed permit, 75 gpm is the mine dewatering rate. There is an additional requirement to treat an average of 38 gpm of drainage flow from the TWSF and ore stockpile. Unless the ore stockpile is removed and the TWSF is capped prior to cessation of mining activities, the treatment plant will be required to operate at an average of 113 gpm (EPA Fact Sheet, February 7, 2007) with a design maximum flow of 151 gpm (DEIS). The water treatment system conceptual design, capital cost estimate, and O&M cost estimates are based on projections of both water quality and treatment process performance. Representative water is not available for characterization or treatability testing and will not be available until the system is commissioned and operational. Therefore the design and cost projections need to be conservative to account for these uncertainties.

Deficiency in O&M Costs for Compliance with Proposed Effluent Limits. The Water Treatment cost table includes line items indicative of a process utilizing lime precipitation, solids dewatering and offsite sludge disposal as described in the DEIS for preferred Alternative IV. Table 4-1 (page 4-15) of the DEIS shows that the projected effluent from the chemical precipitation system does not meet the proposed effluent limits. This table was reproduced in Section 4.4 as Table 4-1 (Table titled *"Comparison of Alternative IV's Predicted Chemical Precipitation and Filtration Effluent with Applicable Water Quality Criteria")* and clearly shows that the effluent from the preferred Alternative IV will not meet the proposed effluent limits for arsenic, cadmium, cobalt, copper, lead, nickel, thallium, zinc, and sulfate. In order to be fully compliant with the effluent limits additional water treatment equipment a reverse osmosis system would be needed. This additional process equipment would affect the costs in a number of ways as discussed specifically in the sections below.

O& M Costs Based on Treatment Flow Rate. The O&M cost table in the reclamation bond shows a design flow basis of 75 gpm while the water balance provided in the proposed NPDES permit (EPA Fact Sheet, February 2007) shows treatment of 113 gpm on average and a 151 gpm maximum (DEIS). The water treatment O&M costs presented in the reclamation bond could be 50 to 100% low based on underestimation of flow rate alone and could increase costs to the range of $520,000 to $692,000. The addition of an RO system to treat up to 150 gpm of water for metals and sulfate removal and a brine management system could increase the annual O&M costs to a total in excess of $1,000,000 per year.

Power. The O&M cost table presents power for pumping and plant electrical for a system with simple electrical requirements that include mostly pumps and mixers. The annual electrical cost for the lime precipitation system at 75 gpm treatment flow is presented at approximately $70,000 per year. Flow rate corrections to 113 gpm or 150 gpm increase the power costs to $105,000 to $140,000. Additional of an RO system and an evaporator for brine management could increase the

annual power costs to the range of $300,000 to $400,00 and includes up to 200 hp on the RO system and an additional 400 hp on the evaporator system.

Secondary Waste Disposal Costs. The costs provided for secondary waste disposal are based on the low flow estimate of 75 gpm and increase directly from $87,864 per year to the range of $132,382 per year to $175,728 per year at maximum flows. Inclusion of an RO system, which is required for compliance with effluent limits, will increase the secondary waste disposal costs significantly. Generally use of an evaporative system (such as a mechanical vapor recompression evaporator) is more cost effective than solidification for brine management on a life cycle cost basis. If an evaporative system were used to manage the brine from the RO system the capital costs for a 20 gpm brine system would be approximately $4,000,000. The annual O&M, including offsite disposal of the evaporator solids could increase annual O&M costs by approximately $330,000 Secondary waste management can be one of the most significant water treatment cost contributors and is affected by hauling distance to the disposal site, waste disposition (hazardous or conventional solid waste) and waste form (solid or liquid). The disposal costs are based on hauling the waste no more than 90 miles and disposal as a non-hazardous waste. The sludge will not be available for a TCLP test to confirm that it is nonhazardous until after the mine is reopened. If the waste fails the TCLP test and requires disposal as a hazardous waste then the disposal costs would be significantly affected.

Reagent Costs. The cost for hydrated lime as presented in the reclamation bond is based on a dose rate of 12 milligrams per liter (mg/L) (2 tons of hydrated lime per year for a nominal treatment plant flow rate of 75 gpm). This dose rate appears to be underestimated by as much as two orders of magnitude. The lime treatment process removes dissolved metals by precipitating metal hydroxides. A dose of 12 mg/l of hydrated lime into a 75 gpm flow rate is stoichiometrically inadequate to precipitate 51 – 8,448 mg/l of dissolved metals (from Table 4-1 in the DEIS using the high and low ranges for the "Pre-Treatment Feed" column and the "RO Feed"). If the lime dosage increases then the flocculant and hydrochloric acid costs must also be increased. The lime cost is likely to be in the range of $50,000 to $75,000 at 75 gpm nominal, and could be in excess of $100,000 at the proposed permit nominal flow rate of 113 gpm. The reclamation bond estimate (for 2 tons of hydrated lime annually) is $300, potentially underestimated by a factor in the range of 167 to 333.

As noted above, an RO is required in order to meet the effluent limits and both cleaning chemicals and antiscalent chemical are required and could increase the O&M cost an additional $10,000 to $25,000. In FCC's Plan of Operations (DEIS Alternative II) RO brine waste was to be solidified and disposed onsite in the TWSF. Solidification reagents for one year of post-closure operation are needed but are not priced in the current estimate. If RO brine is not solidified and disposed onsite, it will have to be hauled and disposed offsite. As noted above waste disposal costs are also absent from the current estimate.

Labor. Based on the monthly labor hours in the water treatment estimate, a laborer or operator will be staffing the plant approximately 8 hours per day 7 days per week. Depending upon how the remainder of the site is staffed this does not allow for the use of the "buddy system" that is standard operating procedure for most mines. In addition, labor cost should also be allocated for overtime due to callouts during off-shifts and supervision. Many states require licensed operations staff and generally with a membrane system the licensing requirements are the highest level of operator. The $35/hr labor rate is low for a "C" or "B" licensed operator and extremely low for a skilled and experienced "A" licensed operator. If the treatment process is to include chemical precipitation, RO, and evaporation which would be required to meet effluent limits then a full-time "A" licensed operator and a part-time "B" or "C" licensed operator could reasonably be required for successful operations. In addition the water treatment equipment required for effluent compliance, the RO system and brine management evaporator, increases the monthly labor cost Monthly labor could

reasonably be estimated at 400 hours per month, at an average rate of $45 per hour for a monthly total of $18,000. Overtime for callouts and other non-routine items should be included and is estimated 25% of total labor or $4,500 for a total annual labor cost of $22,500 as opposed to the $3,500 presented in the water treatment estimate. In addition, some supervision, engineering support, and home office support is required.

Maintenance. There is no cost for maintenance of equipment. Routine and non-routine maintenance should be estimated above and beyond operations labor. Filtration and RO units may require specialized maintenance which can be provided only by trained technicians. If maintenance is estimated at 5% of equipment cost for the lime precipitation and RO system it could potentially be approximately $55,000 or more for routine maintenance and membrane replacement.

Engineering/Project Management Support. There is no line item cost for project management or engineering support. Technical support for recovery from process upsets should be estimated and included. Project management functions such as invoicing, regulatory reporting, client and community interface are also absent from the current estimate.

Equipment Replacement. Since the system life cycle costs are calculated based on a 100 year design life the equipment must be replaced as typical equipment life is 20 to 30 years. Assuming that the equipment requires complete replacement twice during the life of the project then the equipment replacement cost in today's dollars may be approximately $4,400,000 for each equipment replacement. This is an installed equipment cost for the lime precipitation, reverse osmosis, and evaporator system and does not include the building, foundations, etc.

Contingency. An Overhead and Contingency value of 10% was included for Post Closure Water Treatment. Based on the uncertainties in the water quality, water flow rate, and design parameters in the absence of water quality and treatability study data, a contingency of at least 30% should be used. It is unclear how overhead is built into this estimate.

Summary of Water Treatment Cost Review. The financial assurances are inadequate because the projected annual operating and maintenance cost of $345,936 is significantly underestimated as a result of proposed water treatment equipment that is not adequate to achieve effluent standards. The operating costs are likely to be in the range of $750,000 to $1,250,000, an increase of more than a 100 percent to as much as 360 percent. In addition, capital expenditures for equipment replacement of close to $5,000,000 are required a minimum of twice during the anticipated 100-year operating life.

7.0 SUMMARY AND CONCLUSIONS

The USFS prepared a DEIS that describes a plan for constructing and operating the ICP. After reviewing this document and its supporting information Golder found that the DEIS is deficient for a variety of reasons:

1. The DEIS, EPA's draft NPDES permit and the State of Idaho draft certification all require that the ICP produce zero net contaminant loading to Big Deer Creek and other site streams. Any loading from the ICP to site streams would also interfere with the ability of the BMSG to comply with the 1995 consent decree and 2003 UAO.

2. Without mitigation, water quality impacts are significant and the expected water quality in Big Deer Creek is expected to substantially exceed water quality standards. FCC and the DEIS team acknowledge that without mitigation, the proposed ICP would result in water quality impacts to surface and groundwater that exceed water quality standards.

3. In evaluating the water quality impacts of the ICP, the DEIS makes unsupported assumptions regarding geochemistry, hydrogeology, and water treatment

    a. The DEIS assumes that the pH of the underground workings can be completely and permanently buffered to maintain neutral to alkaline conditions and thus maintain metal concentrations at low levels and within very narrow ranges. It is unlikely to be technically feasible to maintain perpetual buffering conditions for the entire mine workings, including the DRZ.

    b. Because the bedrock is fractured, it is virtually impossible for a monitoring well system to detect and characterize all contaminate loadings, even though this would be necessary under the agency's Alternative IV. Metal concentrations in waters released from the ICP to the fractured bedrock will vary in space and time, and some of the releases will avoid detection by the monitoring network

    c. The capture system for Alternative IV is not adequately described in the DEIS. More importantly, the effective the operation of the capture system is dependant on the monitoring system, which will not be 100% effective. The escape and discharge of contaminants from the ICP mines cannot be distinguished from other sources in surface water monitoring and capture systems. Therefore, the efficiency of the ICP capture systems to remove all contaminant loads cannot be verified.

    d. The DEIS assumes that conventional chemical precipitation/filtration will be used for water treatment, yet the ability of such a system to meet NPDES limits is not demonstrated.

4. The mitigating measures proposed in Alternative IV are assumed to be 100% effective, but there is no information provided to support the assertion that they will be 100% effective. To the contrary, there is abundant mining industry experience suggesting that the mitigating measures will not be wholly effective during mining or following mining, during closure. Those empty assumptions drive the DEIS's analyses purporting to demonstrate that, under Alternative IV, the mine and its waste-management systems would perform adequately to protect the environment.

5. A realistic evaluation of ICP impacts would predict significant loading impacts to Big Deer Creek. Without mitigating measures that are 100 percent effective, there will be a contaminant loading impact to Big Deer Creek and Panther Creek.

6. Using reasonable assumptions regarding the future pH of mine water and the effectiveness of mitigation systems, modeling shows that the loadings of contaminants in Big Deer Creek would exceed water quality standards establish by the State of Idaho and the EPA. Because the underlying assumptions for Alternative IV are not supported by the DEIS or its accompanying documents and are inherently improbable, one must conclude that the ICP would result in an impermissible net increase in contaminant loading to receiving streams, including Big Deer Creek and Panther Creek.

7. The DEIS does not evaluate the impact of these loadings on fish or their underlying food chain in these receiving streams. Not only would mass loadings of copper and other contaminants be problematic, but because of the proximity of the remedial action at the Blackbird Mine facilities downgradient of ICP, such discharges would interfere with the BMSG's ability to meet consent decree and AOC requirements to meet water quality objectives in the Panther Creek drainage.

8. Because of the deficiencies described above, the DEIS does not properly assess the impacts on the environment from the proposed ICP.

9. The financial assurances are inadequate because the projected annual operating and maintenance cost of $345,936 is significantly underestimated as a result of inadequate water treatment plant capacity (flow rate) and proposed water treatment equipment that is not adequate to achieve effluent standards. The operating costs are likely to be in the range of $750,000 to $1,250,000, an increase of more than a 100 percent to as much as 360 percent. In addition, capital expenditures for equipment replacement of close to $5,000,000 are required a minimum of twice during the anticipated 100-year operating life.

10. The problems described above with respect to Alternative IV also apply to Alternatives II, III and V.

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ATTACHMENT A

POLICY FOR METAL LEACHING AND ACID ROCK DRAINAGE AT MINESITES IN BRITISH COLUMBIA – JULY 1998

Policy for Metal Leaching and Acid Rock Drainage at Minesites in British Columbia - July 1998

Issued By:

Ministry of Energy and Mines and Ministry of Environment, Lands and Parks

4.5 Blending of PAG and NPAG Wastes

Blending refers to the co-deposition of potentially acid generating (PAG) wastes with materials with excess neutralization potential (NP), or non-potentially acid generating (NPAG) wastes. The objective in blending is to create a composite in which the acid produced by PAG wastes is neutralized by excess NP and drainage alkalinity from NPAG materials, with a consequent reduction in metal solubility.

The degree of mixing and the spatial relationship between PAG and NPAG materials plays a major role in determining both the performance and the effectiveness of the blend. Performance is generally maximized when complete, grain-by-grain mixing of PAG and NPAG produces a composite that is entirely NPAG. Where there is some degree of physical segregation between the blended materials, acidic pH conditions are expected to develop to some degree in the PAG material.

Blending has some potential strengths as a mitigation tool, including limited maintenance requirements, compatibility with a wide variety of terrestrial end land uses and in some cases fewer long-term geotechnical concerns (i.e. compared to a water retaining dam) and lower costs. However, blending also has a number of potential disadvantages which currently restrict its use. The type of constraints will, to some degree, depend on the degree of mixing and the spatial relationship between PAG and NPAG materials.

Major constraints include:

Costs - The major constraint for a completely mixed blend of PAG and NPAG wastes are the potentially prohibitive materials handling or amendment costs.

Performance Limitations - Elevated neutral pH concentrations of some metals are possible even if ARD from the segregated PAG material is neutralized. For a well mixed composite, there is the possibility of elevated neutral pH metal leaching from metal-rich sulphides even under neutral pH weathering conditions.

Technical Uncertainty - For a segregated blend, the composite waste performance will depend on the interactions of complex geochemical and hydrological processes, factors which are difficult to study and for which the current understanding is limited. This makes the prediction of water movement and geochemical performance difficult.

Demanding Information Requirements - Blending requires comprehensive material characterization and, in the case of a segregated blend, waste design and construction plans, both of which must be supported by detailed prediction information.

Extensive Material and Construction Requirements - PAG and NPAG materials must have suitable characteristics. NPAG wastes must occur in sufficient proportions and their composition and timing of excavation must be compatible with that of PAG waste. The requirement for detailed operational material characterization may delay excavation, materials handling and

deposition. Also, blending often has demanding materials rehandling and deposition requirements.

The acceptability of a blending proposal will depend on the mitigation objectives, site-specific conditions, evidence provided and the proposed design. Blending will only be accepted as an environmental protection tool if supported by detailed design criteria, strong evidence of feasibility and effectiveness, and in the case of a segregated blend, adequate back-up or contingency measures. With a large surplus of effective NP, small drainage inputs and/or low, neutral-pH metal loadings, a blended waste may produce acceptable drainage for discharge. Where site conditions are less favourable, the role of blending will likely be restricted to that of an accessory tool to other more feasible or reliably effective mitigation procedures.

4.5.1 Information and Design Requirements

A proposal to blend wastes must include detailed materials handling and placement plans, supported by comprehensive material- and site-specific testing. A knowledge of the geochemistry, hydrology and consequent long-term contaminant discharge rates are required to set design criteria and determine the potential need and timing of contingency mitigation measures. Since the performance of blended wastes depends on complex site-specific processes, it is not possible to set generic blending design constraints.

Effective Neutralization - Effective neutralization requires NPAG materials with suitable weathering characteristics to be available in sufficient proportions and properly placed relative to PAG materials. Design objectives to improve NP effectiveness include measures to reduce the rate of acid generation, maximize ARD contact with NP and reduce the blinding of neutralizing minerals by iron and aluminum precipitation.

Drainage Reduction - Reductions in the volume and rate of flow of drainage, especially through PAG materials, will maximize NP effectiveness and reduce metal loadings. Placement of the blended waste, especially its PAG components, in a topographic position that limits drainage inputs will reduce drainage discharge. The physical properties and configuration of PAG and NPAG materials within the blended waste can also be used to minimize the leaching of PAG strata.

Material Characterization and Monitoring - The proponent will be required to undertake pre-operational and post-deposition material characterization, and monitor the quality and quantity of drainage and the progress of weathering within the waste. It is essential that the mine plan allows sufficient time to carry out the necessary material characterization prior to material placement or mixing.

Compatibility with the Mine Plan - The proponent must demonstrate that the proposed PAG/NPAG material segregation and blending is compatible with the mine geology and excavation plan. The blending plan must show the relative proportions of PAG and NPAG rock types excavated during different phases of mine development, demonstrate that the plan is compatible with the mining sequence and indicate that there

are sufficient resources for any required materials rehandling. A favourable waste balance, compatible PAG and NPAG material excavation, and the timely availability of disposal sites all minimize the need for rehandling.

Interim and Contingency Prevention/Mitigation Measures - Where significant uncertainty exists, detailed contingency plans will be required and blended wastes must be placed in a location and manner that permits drainage collection. A contingency plan must include provision of the necessary resources and a monitoring program to ensure timely and effective

implementation of the secondary mitigation measures. Sufficient resources must be available to conduct any outstanding materials handling and mitigation requirements for stockpiled PAG waste in the event that a shut down precludes part of the plan. Interim prevention/mitigation measures may be required to delay ML/ARD onset in materials exposed in temporary stockpiles prior to final disposal in a blended dump or impoundment.

BAIRD • HANSON • WILLIAMS LLP

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January 27, 2005

Ray Henderson
Minerals Program Manager
Salmon-Challis National Forest
P.O. Box 729
Salmon, Idaho 83467

Cyndy Mackey, Esq.
Assistant Regional Counsel
U.S. Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, Washington 98101

Re: Formation Capital Corporation, U.S.
Exploration Mining Plan of Operation
United States Forest Service
Lemhi County, Idaho

Dear Mr. Henderson and Ms. Mackey:

Formation Capital Corporation, U.S. ("FCC"), a Nevada corporation registered to do business in Idaho, is developing the cobalt and copper mineral deposits of the Idaho Cobalt Project ("ICP") property ("Property"), near the Blackbird Mine in Lemhi County, Idaho. Baird Hanson Williams, LLP ("BHW") represents FCC on matters concerning the ICP.

On August 16 , 2004, FCC proposed a mining plan of operations ("Exploration MPO") for an exploration decline on FCC's unpatented mining claims within the National Forest System administered by the United States Forest Service ("USFS"). The law firm of Covington & Burling, representing the Blackbird Mine Site Group ("BMSG"), an unregistered partnership, provided comment on the MPO by letter dated January 7, 2005 ("2005 Demand Letter"). The 2005 Demand Letter resurrected and reiterated comments made about the ICP, generally, in BMSG's July 26, 2001 letter ("2001 Demand Letter") that was sent to the federal and state officers and agency CERCLA Trustees who,

collectively, manage the Blackbird remediation and the Idaho Cobalt Project approval process ("Federal/State Managers").

The attached Memorandum responds to the issues raised in the 2005 Demand Letter and the 2001 Demand Letter (collectively, the "Demand Letters"). Generally, the Demand Letters allege that the USFS cannot approve the Exploration MPO without releasing the BMSG from the environmental liability associated with the Blackbird Mine. We vehemently disagree. The attached Memorandum states FCC's position point-by-point.

Now that both sides have staked out their respective "legal" positions, FCC suggests that at the earliest possible opportunity the Federal/State Managers, BMSG, and FCC meet to resolve these issues. FCC will make itself available wherever and whenever most convenient to you.

Sincerely,

Joseph H. Baird

Joseph H. Baird

cc: Rachel Jacobson, USDOJ
Nick Krema, IAG
Douglas Conde, IAG
Elton Modroo, Idaho DEQ
Nick Iadanza
Theodore Garrett, C&B
Bruce Smith, Moore Smith
Merlyn W. Clark, HTEH
William Scales, FCC
Brian R. Hanson, BHW

LAW OFFICES
BAIRD HANSON WILLIAMS LLP
A LIMITED LIABILITY PARTNERSHIP

MEMORANDUM

Formation Capital Corporation, U.S.

Exploration MPO

Response to Blackbird Mine Site Group Letters

January 27, 2005

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8.3 Based upon our preliminary review of public records immediately available to FCC, we believe the BMSG's individual members are liable, and have been liable since the inception of the BMSG, as person under the Clean Water Act pursuant to the United States Supreme Court's holding in *Best Foods* - 25

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BHW 2005
Memorandum

LAW OFFICES

BAIRD HANSON WILLIAMS LLP

A LIMITED LIABILITY PARTNERSHIP

MEMORANDUM

TO: Ray Henderson
Minerals Program Manager
Salmon-Challis National Forest

FROM: Baird Hanson Williams LLP J H Baird

DATE: January 27, 2005

CLIENT: Formation Capital Corporation, U.S.

RE: Exploration MPO - FCC Response to Blackbird Mine Site Group Letters

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INTRODUCTION:

Formation Capital Corporation, U.S. ("FCC"), a Nevada corporation registered to do business in Idaho, is developing the cobalt and copper mineral deposits of the Idaho Cobalt Project ("ICP") property ("Property"), near the Blackbird Mine in Lemhi County, Idaho. Baird Hanson Williams, LLP ("BHW") represents FCC on matters concerning the ICP. On August 16, 2004, FCC proposed a mining plan of operations ("Exploration MPO") for an exploration decline on FCC's unpatented mining claims within the National Forest System administered by the United States Forest Service ("USFS"). The law firm of Covington & Burling, representing the Blackbird Mine Site Group ("BMSG"), an unregistered partnership, provided comment on the Exploration MPO by letters dated January 7, 2005 ("2005 Demand Letter"). The 2005 Demand Letter resurrected and reiterated comments made about the ICP in BMSG's July 26, 2001 letter ("2001 Demand Letter") that was sent to the federal and state officers, and agency CERCLA Trustees, managing the Blackbird remediation and the Idaho Cobalt Project approval process ("Federal/State Managers").

This Memorandum responds to the issues raised in the 2005 Letters and the 2001 Demand Letter (collectively, the "Demand Letters") in the context of the Exploration MPO approval process.

EXECUTIVE SUMMARY

Collectively, the assertions made in the Demand Letters categorically state that any USFS actions to approve the Exploration MPO are "unlawful" and that EPA and Trustees "*must* relieve BMSG of its water quality obligations." The Demand Letters state that EPA must suspend application of fundamental federal environmental laws (notably, the Clean Water Act ["CWA"]) and that the "BMSG cannot lawfully be required to meet water quality standards . . .". Additionally, the Demand Letters frame a stark choice for the USFS to either "allow Formation's mining plan to proceed . . . and relieve the BMSG of its water quality obligations" or disapprove the Exploration MPO. Further, the Demand Letters state with unambiguous certainty that the result of USFS failure to enforce a "no negative environmental impacts" standard "would relieve the BMSG of its obligations under the [Blackbird Agreements]." Finally, the Demand Letters claim that approval of the Exploration MPO is "unfair."

More specifically, the Demand Letters state, among other things, that:

> It is **unfair and unlawful** for the BMSG to be placed in jeopardy because of contradictory actions of different branches government . . . **The BMSG cannot lawfully be required** by the USEPA and the Trustees[1] **to meet water quality standards while at the same time the USFS sanctions and approves actions by a third party** that will jeopardize the BMSG's ability to meet water quality standards. . . . **If the USFS is determined to allow Formation's mining plan to proceed, then EPA and the Trustees must relieve the BMSG of its water quality obligations.**

2005 Demand Letter, p. 2. The 2001 Demand Letter and the 2005 Demand Letter cover much of the same ground. The 2001 Demand Letter states that the Idaho Cobalt Project will have significant effect upon the Blackbird remediation. Perhaps, most importantly, the 2001 Letter also states that the actions of FCC Idaho Cobalt Project "must be performed in a manner that has *no negative environmental impacts* on surface water quality, groundwater, groundwater quality, or aquatic biota," and further indicates that if the Federal/State Managers do not force this standard upon the Idaho Cobalt Project that such inaction "would relieve the BMSG of its obligations under [existing agreements with the Federal/State Managers (collectively, the "Blackbird Agreements")]."

The Demand Letters are breathtaking in the scope of relief sought and surprising in the unqualified certainty by which the relief is demanded; however, the Demand Letters are most remarkable in their complete absence of single supporting citation to law, regulation, policy, the 1995 Consent Decree or any other legal instrument. Indeed, the Demand Letters are wholly devoid of any legal analysis. The Demand Letters contain only naked assertions of "unlawful" and "illegal" behavior on the part of the USFS and assertions of non-existent standards upon FCC and non-existent obligations upon the United States. Analysis of the plain language of applicable statutes, regulations and/or

[1] The "Trustees" are the federal/state CERCLA Trustees involved with the 1995 Blackbird Mine Consent Decree.

instruments (most specifically the 1995 Consent Decree) fails to disclose any support for almost any of their legal/regulatory contentions.[2] In fact, although we have sincerely tried, we cannot discern a credible legal basis for almost any of the major claims made by the Demand Letters, as is discussed below.

Nevertheless, as the Federal/State Managers review these responsive comments, it is critical that they keep in mind that FCC presents the law and equities merely to set the legal/regulatory record straight, *not* because implementation of the Exploration MPO will have significant impact on the BMSG. Although FCC takes strong exception to the characterization of the legal/factual situation in the Demand Letters, FCC is still targeting the "no measurable impacts" goal, as a matter of FCC's corporate policy and environmental stewardship, *not* because it is law, since it is *not* legally applicable. FCC was designing the Idaho Cobalt Project to achieve "no measurable impacts" long before BMSG sent the 2001 Demand Letter, and shall continue to strive towards that goal.

As the attached Telesto Technical Memorandum describes, the best available science predicts that implementation of the Exploration MPO will not cause any measurable increase in copper concentrations at any of BMSG's three surface water compliance stations, including specifically: (1) Panther Creek downstream of the mouth of Blackbird Creek; (2) Panther Creek downstream of the mouth of Big Deer Creek; or (3) Big Deer Creek downstream of the mouth of South Fork of Big Deer Creek. Collectively, these are BMSG's compliance points ("Compliance Points") in the Biological Restoration and Compensation Plan ("BRCP") of the Consent Decree. BRCP, p. 20. FCC's "no measurable impacts" goal refers to achieving no measurable impact at the Compliance Points. Thus, as a practical matter, the Exploration MPO will satisfy BMSG's desired "no negative environmental impacts" goal at the Compliance Points, even though it is legally irrelevant.

Contrary to the implications of statements contained in the Demand Letters, the USFS does not have the discretionary authority to categorically prohibit exploration or mining activities on the Property. USFS regulatory authority over surface water is limited to reasonably evaluating the Exploration MPO for compliance with the Federal Water Pollution Control Act, taking into account the economic impacts of any environmental controls placed upon the operation. The 2001 Demand Letter's requirement that the USFS ensure that there is "no negative environmental impacts" from the ICP does not exist in statute, regulation or policy. In any case, FCC implementation of the Exploration MPO is predicted to have no measurable impact on BMSG's Compliance Points, which should satisfy even BMSG's extreme fears. To the extent that the USFS seeks to impose BMSG's extralegal desires on FCC by the imposition of unnecessary and inappropriate goals or illegal standards that effectively preclude development of the Project, then a legitimate "takings" claim will arise in an amount of about $261,000,000.

[2] This analysis is based primarily upon the application of general environmental law to the facts, as understood by FCC, and analysis of the Consent Decree; we do not claim to examined the entire regulatory or judicial dockets since publication of the 2005 Demand Letter on January 7, 2005; however, we believe this to be substantially more than a good faith effort in the time available.

The USFS will not be held liable for approval of the Exploration MPO pursuant to CERCLA law because: (1) mere exercise of regulatory authority does not give rise to CERCLA "operator" liability; and (2) the USFS is not a CERCLA "owner" of lands that are subject to unpatented claims.

Neither CERCLA, nor the Consent Decree, mandates that the EPA *must* "relieve the BMSG of its water quality obligations [standards]" under current circumstances. In fact, neither CERCLA, nor the Consent Decree, currently provides EPA with even the discretion to grant BMSG's demand, and we certainly could discern no credible theory by which such a result could be forced upon EPA by the BMSG. Thus BMSG's contention that it "cannot lawfully be required . . . to meet water quality standards" is unsupported and clearly erroneous.

The Consent Decree provides only highly constrained mechanisms for BMSG to be relieved of its obligations to meet water quality standards; none of these mechanisms are prospective, none of these mechanisms are self-implementing (i.e., automatically burdening the U.S.), each mechanism is subject to specific factual showings, and each mechanism imposes the burden of proof on BMSG. The plain language of the Consent Decree provides that BMSG is subject to and must comply with the Clean Water Act concurrently with, and in addition to, performing remedial actions ordered under CERCLA pursuant to the Consent Decree. Additionally, the Consent Decree indicates that BMSG agreed to obtain all necessary permits, instead of relying upon the CERCLA 121(e) "permit waiver."

Approval of the MPO does not excuse BMSG from performance of the Consent Decree. The plain language of the Consent Decree simply does not excuse BMSG from the "Commitments by Settling Defendants" in Article V (which contains BMSG's primary obligations) under any circumstances, except that a delay in performance may be obtained by a valid appeal to the Trustees for application of Force Majeure and after BMSG sustains the burden of proof. "Additional Actions" described in Paragraph 26 of the Consent Decree may be excused if an exceedance is "unrelated to the Blackbird Mine"; however, this excuse only applies after Settling Defendants can sustain the burden of proof and does *not* excuse performance of the Article V Commitments. The BMSG entered into the Consent Decree knowing full well, at the time, that FCC was exploring for minerals to develop a mine; thus, the BMSG should not appeal to equity or fairness in an attempt to avoid the harsh language of the Consent Decree or to push BMSG's environmental liability onto FCC.

Although we do not believe BMSG obligations under the Consent Decree can be avoided, except in the certain described circumstances above, for the sake of analysis, assuming BMSG *could* avoid operation of the Consent Decree, the BMSG members continue to be liable for remedial action at the Blackbird Mine under several legal authorities. Based upon our preliminary review of public documents immediately available to FCC and upon the United States Supreme Court's holding in *Best Foods*, the members of the BMSG appear to be jointly and severally liable for the Blackbird Mine's environmental

liabilities as: (1) a common law and/or statutory partnership under Idaho law; (2) as current "operators" under CERCLA; and, (3) as a "person" under the Clean Water Act.

Despite the best scientific evidence to the contrary, *if* the Exploration MPO were to impact the Compliance Points, then a panoply of legal/regulatory mechanisms and remedies are available by which such impacts are managed including USFS enforcement authority over Exploration MPO activities, CWA enforcement, and CERCLA; privately, BMSG could bring actions under the CWA citizens suit provision and CERCLA.

In short, the BMSG Demand Letters seek extraordinary prospective termination of a Mining Plan of Operation for which the best available scientific evidence indicates that there will be no measurable impact upon the BMSG Compliance Points. Moreover, the Exploration MPO is the next step toward development of a project that seeks to produce cobalt (a mineral critical to strategic and pollution reduction technologies) from the only primary cobalt mining district in the United States and which will provide much needed, high quality jobs and taxes for Lemhi County for many years to come. Ultimately, BMSG seeks to preclude ICP operation by alleging that it is illegal for the Federal/State Managers to implement their statutory mandates to review, regulate and approve the ICP in accordance with applicable law and regulations; however, BMSG does not cite to any statutes, regulations or agreements to support their contentions. BMSG's strongest policy argument appears to be that the Exploration MPO *might* impact BMSG; however, the best available science says that will not happen. Under the circumstances, the net legal effect of the Demand Letters to the Exploration MPO approval process is of no greater weight than any other "not in my backyard" letter that says "mining is bad," but mining can't be *too* bad because a BMSG member sought to permit a mine here less than 25 years ago, and all of the BMSG members are either major mining companies or are affiliated with major mining companies.

Ironically, BMSG, a collection of several multi-billion dollar companies, appeals to "fairness," at the expense of FCC. This effort is grossly misplaced, since the BMSG is really laboring under the weight of CERCLA and the burden of their and their predecessor's poor environmental stewardship, not any potential impacts of FCC. Indeed, a large amount of FCC's resources are being consumed to address issues arising from the fact that the BMSG has not returned the streams to their original condition, and yet, to date, FCC has politely allowed the BMSG remedial action to proceed without any interference on the part of FCC, despite the serious costs to FCC. Indeed, as a practical matter, BMSG seeks to continue to consume all loading to the local streams and preclude FCC from seeking even a theoretical small contingent (i.e., the Exploration MPO is not expected to have any effect on the BMSG Compliance Points) future portion of BMSG's very much larger and very real current loading. In doing so, BMSG is seeking to allocate BMSG's CERCLA liability to FCC, even though FCC is a wholly innocent, noninvolved adjacent party, seeking to provide good local jobs and operate at the very vanguard of environmentally responsible mining. If BMSG were successful in this endeavor, this would certainly turn EPA "Brownfields" policies upside down.

BMSG boldly seeks to live in a risk-free world, indicating that FCC must "insure impact-free performance" and arguing that it is unfair for BMSG even to be put in "jeopardy" of *potential* impacts, even though the best available science says no impacts will occur. Ideally, we would all like to be free of the risk of airplanes falling out of the sky on our houses, but the answer is not to terminate use of air travel; the answer is to manage the risk. When the relative risks and costs of the extreme alternatives (momentarily ignoring that the Exploration MPO only addresses an exploration adit) are simplistically compared, the executive answer becomes clear. Simple termination by the USFS of the Exploration MPO, would effectively terminate the ICP, which would have a 100% probability of a present value impact of about $260,000,000. On the other hand, if the MPO were to move forward, FCC believes there will be no measurable impact on BMSG, which yields a "zero" dollar impact on BMSG. On the other hand, BMSG believes they will suffer significant costs; if, for the sake of argument, and without any basis for suggesting how such impacts could occur, we merely assign a potential cost impact to BMSG of $10,000,000; then the relative impacts of the extreme alternatives is a current, real impact of $260,000,000 to FCC, compared to a speculative future impact of $10,000,000 to BMSG. Ignoring law, and considering only "fairness" and executive decision-making, the result is clear; the ICP should move forward and any material risk should be managed. Fortunately, in this case "fairness" and the law are on the same side, as is discussed below.

1.0 Contrary to the implications contained in the Demand Letter, the USFS does not have the discretionary authority to categorically prohibit exploration or mining activities on the Property; FCC's rights to develop the Property are governed by the Mining Law of 1872, not the USFS.

The Demand Letters state:

> . . . *by approving the project, the government would have interfered with* the BMSG's ability to comply with the 1995 Consent Decree and the 1994 and 1995 Administrative Orders, which would relieve the BMSG of its obligations under those agreements. 2001 Demand Letter
>
> The BMSG cannot lawfully be required by the USEPA and the Trustees to meet water quality standards while at the same time the USFS *sanctions* and approves actions by a third party that will jeopardize the BMSG's activity to meet water quality standards." 2005 Demand Letter.

(Emphasis added.) However, implicit in these statements is that the USFS has a control over hard rock mineral exploration and mining that it simply does not possess.

> The mining industry enjoys a free right of access across public lands for exploration and development of mineral resources. Under the Mining Law of 1872, [citation omitted] the public domain is free and open to exploration and occupation. This right of access was recognized for USFS lands in the Forest Service Organic Act of 1897, [citation omitted] which states that nothing in the

> Act shall "prohibit any person from entering upon such national forests for...properly locating and developing the mineral resources thereof." Even though FLPMA [the Federal Land Management and Policy Act of 1976] amended the statutory law pertaining to ROWs across public lands, Section 302(b) specifically states that "no provision of this section or any other section of this Act shall in any way amend the Mining Law of 1872 or impair the rights of any locators of claims made under that Act, including, but not limited to, rights of ingress and egress." [Citation omitted] These rights have consistently been recognized by judicial and administrative opinions. [Citation omitted]

Mark D. Bingham, "Access Issues and Public Lands Rights of Way," Special Institute, Rocky Mtn. Min. L. Foundation, 1997, p 7-1. The USFS does not need to affirmatively open public land to hard rock mineral exploration and development before such activities proceed. Thus, the USFS does not have the authority to "sanction" the mineral exploration and development uses of the Property, as suggested by BMSG.

The USFS *does* have certain specified authority over the environmental impacts on surface resources pursuant to 36 CFR 228 (July 1, 2004) (the "USFS Regulations"), as discussed in Section 2.0. The preamble to the USFS Regulations captures limitations on USFS authority quite clearly.

> The Forest Service recognizes that prospectors have a statutory right, not mere privilege, under the 1872 mining law and the Act of June 4, 1897, to go upon and use the open public domain lands of the National Forest System for the purposes of mineral exploration, development and production. Exercise of that right may not be unreasonably restricted. Specific provision has been made in the operating plan approval section of the regulations charging Forest Service administrators with the responsibility to consider the economics of the operations, along with other factors, in determining the reasonableness of the requirements for surface resource protection.

39 FR 31317 (August 27, 1974). Given that FCC's authority to develop the ICP arises from "statutory right, not mere privilege," prosecution of the ICP is not a land use decision the USFS has made and is now implementing. The Mining Law of 1872 Mining Law is self-initiating. The USFS Regulations specifically provide:

> It is not the purpose of these regulations to provide for the management of mineral resources; the responsibility for managing such resources is in the Secretary of the Interior [who is governed by the Mining Law of 1872].

36 CFR 228.1 (July 1, 2004). Of course, this is not to suggest that the USFS is devoid of regulatory authority (as discussed immediately below); however, the USFS cannot just categorically prohibit FCC plans, as suggested by BMSG. Thus, BMSG's allegation that the USFS sanctioned mining development in the area of the Blackbird Mine as part of a specific land use decision is clearly erroneous.

2.0 USFS regulatory authority over surface water is limited to reasonably evaluating the Exploration MPO for compliance with the Federal Water Pollution Control Act, taking into account the economic impacts of any environmental controls placed upon the operation; the 2001 Demand Letter's supposedly mandated "no negative environmental impacts" standard does not exist in statute or regulation.

The 2001 Demand Letter states that that the Idaho Cobalt Project "*must be* performed in a manner that has *no negative environmental impacts* on surface water quality, groundwater, groundwater quality, or aquatic biota." (Emphasis added.) Significantly, the Demand Letters do not cite to any legal authority to support the "no negative environmental impacts" standard. In fact, no such standard exists in statute or regulation. Of course, BMSG has not suggested that either its Blackbird Mine or its remedial operations satisfy the "no impacts" standard, because it is very difficult to satisfy such a standard. Nevertheless, the 2001 Demand Letter specifically requires the USFS "to insure impact-free performance." If the BMSG begins to aggressively fight for the EPA to apply the BMSG "impact-free" standard to the Blackbird Mine remediation, then the Agencies should take into account the "fairness" of applying the BMSG standard to the ICP; however, until then, the Agencies should seek to comply with law.[3] As discussed below in Section 9.2 of this Memorandum, FCC and BMSG have a *collective* obligation to the TMDL, when promulgated, and in the interim, the Idaho DEQ's "PM98-2: Policy for No-net Increase (TMDL)," is relevant, but allows for adjustment based upon "net" effect and has other elements of flexibility; however, in any case, the Exploration Adit is predicted to have no measurable impacts to the Compliance Points. Unfortunately, BMSG's "no impacts" concept has been floated about and seems to have confused the agency officers, as evidenced by the December 23, 2004 letter from the Idaho Department of Environmental Quality ("DEQ") to Ray Henderson. The applicable legal standard is described below.

The USFS Regulations provide the agency with the authority to ensure that "[a]ll operations shall be conducted, where feasible, to minimize adverse environmental impacts on National Forest System surface resources," 36 CFR 228.8 (July 1, 2004); this standard is further constrained by the fact that any such environmental limitations be economically reasonable. More specifically, Section 228.5(a) provides that the USFS "shall . . . analyze the proposal, considering the economics of the operation along with the other factors in determining the reasonableness of the requirements for surface resource protection." Section 228.8 (b) provides that where surface "water quality" is of concern the USFS is authorized to ensure that the "[o]perator shall comply with

[3] Since there is no supporting law, the BMSG must just view the "no impacts" standard as good policy. In which case, it should be applied to all mining operations. We must wonder aloud how the corporate parents and affiliates of the BMSG would feel if they understood that the BMSG believes their worldwide mining operations *must* be conducted to satisfy a "no impacts" standard.

applicable Federal and State water quality standards, including regulations issued pursuant to the Federal Water Pollution Control Act . . . ". CWA compliance and implementation issues are discussed below in Section 9.2.

The USFS Regulation preamble clarifies the role of economic reasonableness that must be a part of any environmental requirement that the USFS seeks to impose.

> A major concern by the mining industry, and noted by the Public Lands Subcommittee on Interior and Insular Affairs, is the possibility of unreasonable regulations, with resulting cost increases that could make otherwise viable mineral operations prohibitively expensive. . . . Specific provision has been made in the operating plan approval section of the regulation charging Forest Service administrators to consider the economics of operations, along with the other factors, in determining the reasonableness of the requirements for surface resource protection.

39 FR 31317 (August 28, 1974). Thus, it is critical for the Federal/State Managers to be clear that the Demand Letters "no negative environmental impacts" standard is wholly erroneous and misleading. To summarize the legally applicable standard, the USFS may seek environmental controls on a mining plan of operations to minimize adverse environmental impacts, where such controls are feasible and economically reasonable; however, in the case of surface water impacts, the specifically applicable standard is that of compliance with the Clean Water Act.

Calculated copper concentration predictions for the relevant receiving surface waters demonstrate that there will be no measurable impacts. As a practical matter, all things have an effect on everything in the universe, so it is not credible to speak in terms of "no impact"; therefore, "zero" must be defined as that which is measurable. Thus, the best available scientific information demonstrates that the "operator . . . shall comply with applicable water quality standards," as required by the USFS Regulations. The attached Telesto Memorandum discusses this in detail. However, if, contrary to the best available scientific information (but as expected by BMSG), there were to be measurable impacts attributable to the ICP, then this potential conflict would be resolved pursuant to the relevant mechanism under the Clean Water Act, i.e., a "TMDL," as discussed below in Section 9.2. Of course, none of the above discussion has taken into to account the economic reasonableness component of the applicable standard.

3.0 FCC's Exploration MPO is subject to USFS Regulations, NEPA and the CWA, not CERCLA.

As discussed above in Section 1.0, the FCC's Exploration MPO is subject to the USFS Regulations. In turn, this subjects the Exploration MPO to NEPA compliance. In addition, FCC is subject to the CWA. However, FCC is not subject to CERCLA, nor any aspect of the Consent Decree created pursuant to CERCLA. CERCLA §107(a) provides liability for "any person" who is a past or present owner or operator of a facility from which hazardous substances are being or were released to the environment from a

facility.[4] Although almost any activity can theoretically release a "hazardous substance" to the environment, as a practical matter, FCC is not a person described by any of these categories with regard to the Blackbird remedial action, nor is FCC a signatory to the Consent Decree. *The specific remedial terms and conditions of the 1995 Consent Decree apply to the BMSG signatories, not the drainage, and the Consent Decree does not provide regulatory limits applicable to third parties.* CERCLA creates legal liability, but must look to other statutes for substantive environmental standards. Nevertheless, as discussed below in Section 4.0, since the Exploration MPO activities will have no measurable effect on the Compliance Points, BMSG's compliance with the surface water quality aspects of the Consent Decree will not be affected by the Exploration MPO. However, as discussed below, both the BMSG and FCC need to ensure that their activities are in compliance with the CWA.

4.0 FCC implementation of the Exploration MPO is predicted to have no measurable impact on BMSG's Compliance Points

FCC will conduct extensive water quality monitoring to provide early identification of any water quality impacts. Of course, this is more for FCC's protection than BMSG's. FCC needs to document compliance with the CWA and FCC segregation from BMSG's impacts on the environment. Nevertheless, this monitoring will provide a significant additional measure of protection for both the USFS and BMSG.

The Consent Decree BRCP "Task 1: Water Quality Monitoring" provides that "six sampling stations will be established for water quality monitoring and will include:

[i] Panther Creek upstream of Blackbird Creek;
[ii] Panther Creek downstream of the mouth of Blackbird Creek;
[iii] Panther Creek upstream of Big Deer Creek;
[iv] Panther Creek downstream of the mouth of Big Deer Creek;
[v] Big Deer Creek upstream of South Fork of Big Deer Creek;
[vi] Big Deer Creek downstream of the mouth of South Fork of Big Deer Creek."

BRCP, p. 19. BMSG's "three points of compliance are:

(1) Panther Creek downstream of the mouth of Blackbird Creek;
(2) Panther Creek downstream of the mouth of Big Deer Creek;
(3) Big Deer Creek downstream of the mouth of South Fork of Big Deer Creek.

BRCP, p.20. Collectively, these are BMSG's compliance points ("Compliance Points") in the Biological Restoration and Compensation Plan, p. 20. FCC's "no measurable impacts" goal refers to achieving no measurable impact at the Compliance Points. As discussed in the attached Telesto Technical Memorandum, the best available scientific information indicates that the Exploration MPO will satisfy the no measurable impacts goal. In addition, FCC will be monitoring upstream of the Compliance points for purpose of demonstrating compliance with the CWA, which will provide an additional measure of

[4] The "arranged for" and "transporter" liability categories are not really germane to the issues at hand.

security and advance warning. Thus, as a practical matter, the MPO will satisfy BMSG's desired "no negative environmental impacts" goal, even though it legally irrelevant.

5.0 To the extent that the USFS seeks to impose BMSG's desires on FCC by the imposition of unnecessary and inappropriate goals that effectively preclude development of the Project, then a legitimate "takings" claim will arise in an amount of about $260,000,000.

If a USFS determination denies FCC "all economically beneficial use of the property" (by law, mining claims can only be mined) this would be a *per se* or categorical taking. In *Lucas v. South Carolina Coastal Council*, 505 U.S. 1003, 1015 (1992), "the Supreme Court held that the government can only avoid liability if it is able to show that the limitations on use fall within background principles of the State's law of property and nuisance already placed upon land ownership." James M. Hudson, "Federal Regulatory Takings and Inverse Condemnation: A Primer of Do's and Don'ts for Mineral Project Proponents and Legal Practitioners," 48 Rocky Mt. Min. L. Instit. 4-1, 4-4, 2002. We are not aware of any part of the Idaho Cobalt Project Plan that would be deemed a "nuisance" under Idaho law.

In fact, a "regulatory taking of property can involve either a permanent taking *or a temporary taking*." Id. at 4-6 (emphasis added). In *Bass Enters. Prod. Co. v. United States*, 133 F.3d 893 (Fed Cir. 1998) plaintiffs were awarded over $8.9 million in compensation when "the Bureau of Land Management (BLM), which is in charge of the [oil and gas] lease, denied the permits '*at this time*'" because "BLM's decision was based upon EPA's present inability to assess whether acquisition of the lease would be required." Id. at 894. In short, mere delay of a project may be sufficient to give rise a takings claim.

Accordingly, if the USFS were to bow to the BMSG's admonitions and preclude project development, then as a practical matter, the USFS will have purchased the Idaho Cobalt Project through inverse condemnation. Since relevant "comparable sales" are difficult to find in the mineral resource context, "the court will typically consider the discounted present value of the risk-adjusted cash flow from the project."[5] An independent economic evaluation done by Mine Development Associates of Reno, NV, utilizing $18/lb cobalt returned a Net Present Value of over $260,000,000. Using the long term average cobalt price of 15$/lb, for every year that the ICP is delayed FCC loses some $32,000,000 in lost revenue and the US citizens lose $11,000,000 in taxes which would have been directly generated. Even assuming a worst-case scenario, BMSG cannot claim that even the *potential* impact of the Idaho Cobalt Project on BMSG could have an impact of this magnitude on itself or the United States.

Thus, not only has BMSG stated that the Idaho Cobalt Project "must" meet a "no negative environmental impacts" standard (a standard that BMSG's project does not

[5] *Hudson* at 4-25 and 4-26, citing "*Eastern Minerals Int'l, Inc. v. United States*, 39 Fed. Cl 621 (1997), *rev'd on other grounds sub nom.* Wyatt v. United States, 271 F. 3d 1090 (Fed. Cir. 2001); Whitney Benefits, Inc. v. United States, 18 Cl. Ct. 394 (1989), *aff'd*, 926 F.2d 1169 (1991)," Id. at n. 76..

achieve, nor seek to achieve), but BMSG also seeks to achieve a risk-free world for BMSG, despite the fact the *actual* costs to Formation (and via a takings action, therefore upon the United States) would seem to be at least two orders of magnitude greater than the *potential* worst case scenario costs to BMSG.

Given the gross disparity of the costs that BMSG seeks to impose on FCC relative to the costs that *might* be imposed on BMSG because of Exploration MPO approval, if "fairness" were the only criterion, then the USFS must approve the project. In fact, even assuming that the BMSG could somehow avoid their CERCLA and CWA obligations (they can't, as discussed below in Sections 7.0, 8.0 and 9.0), the financial risk to the USFS is significantly lower if it were to approve the Exploration MPO, than to face the relative certainty of a takings claim from FCC, if the ICP was terminated by the USFS. As a practical matter, FCC *is* the Idaho Cobalt Project and vice versa. FCC has no choice but to pursue the Project and any resulting litigation to the bitter end. It is a matter of survival.

6.0 The USFS should not be held liable under CERCLA for approval of the Exploration MPO.

The 2005 Demand Letter states "[i]f the USFS . . . allows Formation to proceed, the . . . USFS should be responsible for the consequences." In fact, the USFS will not be held liable under CERCLA for approval of the Exploration MPO because: (1) the USFS cannot categorically prohibit adit construction, but is limited to reasonable regulation (as discussed in Section 2.0 above) and therefore does not have sufficient nexus to the activity to give rise to CERCLA liability; (2) the best available scientific information indicates there will be no measurable impacts at the Compliance Points (as discussed in the attached Telesto Memorandum): (3) mere exercise of regulatory authority does not give rise to CERCLA "operator liability" (see Section 6.1, immediately below) ; and, (4) the USFS is not deemed to be an "owner," within the meaning of CERCLA, for unpatented mining claims (see Section 6.2 below).

6.1 Mere exercise of regulatory authority does not give rise to "operator" liability pursuant to CERCLA.

The United States Supreme Court's decision in *United States v. Best Foods*, 524 U.S. 51 (1998) looks to the plain language dictionary definition of "operate" and concludes that:

> ". . . under CERCLA, an operator is simply someone who directs the workings of, manages, or conducts the affairs of the facility.

Id. at 67. Given the constraints on USFS authority described above in Section 2.0, the USFS cannot reasonably be deemed to be an "operator" with the meaning of CERCLA. Even in situations where federal or state regulatory agencies have significantly greater authority, the courts have consistently held that exercise of mere regulatory authority will not give rise to liability.

> EPA's regulatory activities do not render it an owner/operator under CERCLA.

U.S. v. Western Processing Co., Inc., 761 F. Supp. 725, 731 (W.D. Wash. 1991). Nor is this an isolated holding.

> In summary, thus far, as noted by the court in *United States v New Castle County*, no court has found a state liable as any category of PRP [i.e., potentially responsible party] based solely on minimal activities performed as a regulator.

Allan J. Topol and Rebecca Snow, Covington & Burling, Superfund Law and Procedure, Thompson/West, Vol. 1, 2004, Section 3:71, p. 476. Thus, the case law supports the plain language analysis performed above. The USFS will not be deemed to be an "operator" just because it exercises its statutorily mandated regulatory authority.

6.2 The USFS is not an "owner," within the meaning of CERCLA, for lands subject to unpatented mining claims.

The courts have squarely addressed the question of whether the USFS will be held liable for lands subject to locations of unpatented mining claims.

> Because unpatented mining claimants possess vested property rights (including the right to sell, mortgage, or inherit), are subject to taxation, and cannot be divested of their rights if they demonstrate substantial compliance with maintenance requirements specified in the mining law, I find that the United States is not an "owner" in the fullest sense of the term. Furthermore, the United States receives no financial benefit from its lands subject to unpatented mining claims and lacks the power to retain title to its land if the claimant seeks title. It has no ability to set the boundaries of the conveyance or establish the terms of the sale based upon the land's value. *See* Locke, 471 U.S. at 86, 105 S. Ct. at 1788 (upon compliance with requirements of the mining laws, the applicant's rights to a mineral patent mature, and the United States has no authority to withhold patents under such circumstances); *Freese v. United States*, 226 Ct. Cl. 252, 639 F.2d 754, 758, *cert. denied*, 454 U.S. 827, 102 S. Ct. 119, 70 L. Ed. 2d 103 (1981) (holding vested right arises when claimant complies fully with procedures set forth in federal mining laws for obtaining patents). Finally, the United States is not allowed to exclude individuals from the land and may only regulate mining activities in the national forests in order to protect surface resources. Therefore, I find it inappropriate to deem the United States an "owner" for purposes of CERCLA liability.

U.S. v. Friedland, 152 F. Supp. 2d, 1234, 1246 (D. Colo.). Thus, the USFS should not be deemed to be liable for remedial activities as an "owner" under CERCLA.

7.0 Neither CERCLA, nor the Consent Decree, provides a mechanism by which the EPA *must* "relieve the BMSG of its water quality [standards] obligations"; in fact, with only limited exception, neither CERCLA, nor the

Consent Decree, provides EPA with the authority to voluntarily accede to BMSG's demand to eviscerate the CWA, let alone be *required* to do because of an USFS action.

The 2005 Demand Letter states that "[t]he BMSG cannot lawfully be required by the USEPA and the Trustees to meet water quality standards while at the same time the USFS sanctions and approves actions by a third party that will jeopardize the BMSG's ability to meet water quality standards." Despite this emphatic statement, the 2005 Demand Letter does not provide the USFS with any citations or analysis, or even a broad hint, about how this legal interpretation might be true. Accordingly, we must provide the USFS with our own evaluation of how BMSG might be lawfully excused from compliance with water quality standards, and after analysis, make appropriate determinations. After review, as discussed below, we were unable to identify any means by which the BMSG may avoid compliance with applicable water quality standards, except by changing the water quality standards themselves.

7.1 CERCLA's mechanism for waiving water quality standards as an ARAR has neither been applied for, nor granted, thus BMSG's contention that it "cannot lawfully be required . . . to meet water quality standards" is unsupported and clearly erroneous.

The discussion in previous sections of this letter demonstrates that the USFS has little, if any, discretion to categorically prohibit the Exploration MPO, and thus, cannot be ascribed with choice or control over FCC's decision to prosecute the project. Nevertheless, for the sake of analysis, this section evaluates how it might be alleged that pursuant to *CERCLA* "BMSG cannot lawfully be required . . . to meet water quality standards." In fact, we were unable to identify any provision by which CERCLA provides EPA with the authority to waive "water quality standards" established pursuant to the Clean Water Act without BMSG application to, and a grant of approval by, EPA for waiver of ARARs; and, we are unaware that either such triggering event has occurred.

CERCLA *does* include a provision sometimes referred to as a "permit waiver" (but see also discussion in Section 7.2.2 below), which is often misunderstood by persons not familiar with CERCLA to mean that CERCLA "trumps" other substantive environmental laws. It does not. In fact, EPA clearly differentiates between this often cited "permit waiver" and substantive compliance with other environmental laws stating:

> CERCLA actions should not be delayed by time-consuming and duplicative administrative requirements such as permitting, although *remedies should achieve the substantive standards of applicable or relevant and appropriate laws* [i.e., "ARARs"] . . .

55 FR 8756-7 (March 8, 1990). Thus, despite the fact that the BMSG is performing a CERCLA action, water quality standards are applicable to the Blackbird Mine, *absent an ARARs waiver*.

Generally, CERCLA does not create environmental standards, but relies upon the standard created by other environmental laws and regulations to determine, "How clean is clean." Generally, in order to determine, "How clean is clean?" at a CERCLA site, EPA will review environmental standards under other legal authorities and select those that are "applicable or relevant and appropriate" ("ARARs") for the remedial action at hand. In shorthand reference, this is the ARARs process. One of the most significant aspects of the Superfund Amendments and Reauthorization Act of 1986 was that it amended CERCLA to provide that ARARs shall not be waived, except in very limited circumstances. 42 USC § 9621(4).

> The six statutory waivers [for ARARs] are: [1] Interim Measures; [2] Greater Risk to Human Health and the Environment; [3] Technical Impracticability; [4] Equivalent Standard of Performance; [5] Inconsistent Application of State Requirements; [and, 6] Fund Balancing.

CERCLA/Superfund Orientation Manual, EPA/542/R-92/005, October 1992, p. 8. Review of the above-quoted list indicates that the potential waivers for Interim Measures, Greater Risk, Equivalent Standard, Inconsistent Application, and Fund Balancing appear wholly irrelevant to the current situation. Further, we are unaware of any information that suggests "Technical Impracticability" or "Inconsistent Application of State Requirements" has any merit. Moreover, we are unaware, to date, of BMSG even making any application for, nor EPA granting, any such waiver. Thus, since BMSG has not even properly sought EPA's permissive authority to grant a waiver of water quality standards, we are unaware of any way in which EPA "must" agree to relieve BMSG of water quality standards pursuant to CERCLA, as BMSG suggests. Moreover, even if EPA were to grant BMSG an ARAR waiver for surface water quality standards, this does not relieve the Blackbird Mine from achieving water quality standards under the Clean Water Act, but merely provides relief from CERCLA liability for such violations. An ARARs waiver would not preclude enforcement or specific enforcement under the Clean Water Act or IEPHA. Avoiding application of water quality standards under the Clean Water Act would involve changing the water quality standards themselves, and a public participation process under the CWA, not a merely implied contractual right pursuant to a Consent Decree. Thus, we are unaware of any way in which EPA could be forced to obviate the application of water quality standards to the BMSG as a result of USFS actions, because we are unaware of any means by which EPA could accomplish the same goal voluntarily and not be subject to citizen participation and citizen suit for failure to implement the Clean Water Act.

7.2 USFS Approval of the Exploration MPO does not excuse BMSG from performance of the Consent Decree obligations.

7.2.1 The Consent Decree specifically states that EPA's ability to select remedial standards (including "water quality standards") shall be unimpaired by the Consent Decree; thus, absent specific language that overrides this general intent, the Consent Decree cannot be read

to require EPA to waive application of water quality standards to the BMSG.

Among other things, the Consent Decree provides that "[n]othing in this Consent Decree is intended to predetermine or limit EPA's authority to select any Response Actions, including clean-up standards pursuant to Section 121 of CERCLA, 42 U.S.C. § 9621, related to the Site." Thus, according to the normal rules of contract interpretation, the plain language of the Consent Decree provides that EPA *cannot be required* to relieve the BMSG of its water quality under any circumstances unless the Consent Decree contains very specific implementing language that clearly overrides this language of general intent. Section V(B)(5)(c) provides for achievement of certain specified water quality standards, and provides the EPA and Trustees some flexibility to enforce such standards, so long as a minimum standard of "sustaining salmonids through all life stages" is maintained, but there is no language indicating when or if the EPA (or Trustees) "must" waive water quality standard. In fact, the only language by which a contractual limitation of water quality standards is even discussed or potentially implied by the Consent Decree concerns: (1) the "Force Majeure" language discussed below in Section 7.3.3; (2) the "Additional Actions" language discussed below in Section 7.3.4; and (3) the "Reopener Provisions," also discussed in Section 7.3.4. However, as discussed immediately below, none of these provisions could obviate the application of water quality standards to the BMSG pursuant to the CWA.

7.2.2 The plain language of the Consent Decree provides that BMSG is subject to and must comply with the Clean Water Act concurrently with, and in addition to, performing remedial actions ordered under CERCLA pursuant to the Consent Decree.

Section V(C), Paragraph (6) of the Consent Decree states that "[a]ll activites undertaken by Settling Defendants pursuant to this Consent Decree and any associated Work Plans shall be performed in accordance with the requirements of applicable federal and state laws"; thus, there seems to be little question that the Clean Water Act, including pertinent "water quality standards" are applicable. Moreover, in the case of the CWA, performance "in accordance with the requirements of applicable federal and state laws" would require obtaining and maintaining a valid NPDES permit for all discharges, subject to the CWA. The BMSG does not appear to have performed this requirement.

The BMSG might argue that NPDES permit requirements are not "applicable" because CERCLA Section 121(e)(1) provides that:

> No Federal, State, or local permit shall be required for the portion of any . . . remedial action conducted entirely onsite . . .

As discussed above in Section 7.1, this provision does not waive substantive compliance with the Clean Water Act under any circumstances; however, the plain language of the Consent Decree indicates that BMSG and the Federal/State Managers agreed that Section 121(e) would not be applicable, and the District Court provided a public and binding

character to the arrangement.[6] Section V(D), Paragraph 7(a) ("Permits") states the following.

> Where any permit or approval is needed, **Settling Defendants**, with cooperation of the Trustees, **shall submit and complete applications and take all other actions necessary to obtain all such permits or approvals.**

If Section 121(e) could excuse BMSG from securing permits, then this language would be rendered mere surplus language and wholly irrelevant, contrary to the fundamental tenet of judicial interpretation of agreements that seeks to give meaning to all contract provisions, to the extent possible. To argue that because of Section 121(e) no "permit or approval is *needed*" (emphasis added) is disingenuous. All parties to the Consent Decree were aware of the existence of Section 121(e) when the Consent Decree was signed; the reference to "where . . . *needed*" is clearly a reference to the needed factual nexus (i.e., one does not "need" a Clean Air Permit for a discharge to a water of the U.S.). Moreover, there is additional contractual machinery in the Consent Decree that supports this interpretation, discussed immediately below.

Section V(D), Paragraph 7(b) states "Settling Defendants may seek relief under provisions of Section XX (Force Majeure) of this Consent Decree for any delay in the performance of the Work resulting from a failure to obtain, or a delay in obtaining, any permit or approval required for the Work." If the Consent Decree intended 121(e) to obviate the need for permits, then a plain language interpretation of the Consent Decree would render V(D), Paragraph 7(b) to be mere surplus language, and wholly irrelevant, just like Section V(D)(6); however, this starts down a tortured pathway of eviscerating significant portions of the Consent Decree in order to find an interpretation favorable to BMSG. Moreover, this is not the end of it.

Section XXII, Paragraph 70 of the Consent Decree provides that "[t]he penalties stipulated established in this Consent Decree shall be in lieu of the statutory penalties established under CERCLA, CWA [the Clean Water Act], ESA [Endangered Species Act], and the Idaho Environmental Protection and Health Act [EPHA]." This provision can only be interpreted to mean that the full regulatory weight of these provisions apply to the Blackbird Mine, *except* that statutory cash penalties shall be assessed pursuant to the lesser amounts in the Consent Decree. The only interpretation that can be made of this paragraph is that the BMSG must keep the Site in full compliance with the CWA (and other acts), and the Consent Decree *only* limits the amounts of cash penalties. This is important because cash penalties are only one mechanism for enforcing the CWA, it does not change the nature of the statutory and regulatory obligations, which may be enforced by injunctive relief, not merely cash penalties. *Thus, the BMSG may be subject to injunctive enforcement of the CWA outside of the Consent Decree; moreover, third*

[6] There are also serious questions about how any pre-existing discharges, particularly those already subject to NPDES permitting, could be deemed a "portion . . . of any remedial action" subject to 121(e), and about the extent to which potential CWA violations are "on site"; however, we will ignore these issues in favor of the primary discussion in the accompanying text.

parties may bring actions pursuant to the CWA citizens suit provision to enforce application of the CWA, regardless of EPA's temperament.

Collectively, the provisions discussed above evidences a comprehensive regulatory scheme and understanding about the Blackbird Mine remediation agreed to by Parties, and states that the BMSG would obtain "all . . . [necessary] permits." This was given further public character when it was approved by the Federal District Court. Thus, regardless and independent of the status of the existence of BMSG's obligations under the Consent Decree, the BMSG must maintain current compliance with the Clean Water Act, something that is enforceable pursuant to the CWA citizen suit provisions.

Section 505 of the CWA allows any person "having an interest which is or may be adversely affected" to commence a civil action against any person for violation of any effluent standard, limitation or order, or against EPA for failure to perform a nondiscretionary duty. Section 505(a), 33 U.S.C. § 1365(a). Moreover, the CWA explicitly allows the prevailing party or substantially prevailing party in citizen suits to recover litigation costs, including attorney and expert witness fees. Section 505(d), 33 U.S.C. § 1365(d). All of this becomes particularly important below in Section 9.2, regarding development and enforcement of the TMDL, since one of the very first steps in developing a TMDL is ensuring current compliance of existing NPDES sources with the CWA.

7.2.3 The plain language of the Consent Decree does not excuse BMSG from the Article V "Commitments by Settling Defendants" pursuant to the facts described by the Demand Letters.

Article V(B), Paragraph 5 (a) – (g) comprises the "Commitments by Settling Defendants" of the Consent Decree. The Commitments by Settling Defendants ("Commitments") create the following substantive remedial obligations:

> 5(a) Settling Defendants shall . . . implement . . . the BRCP [i.e., the Biological Restoration and Compensation Plan] . . . ". [BRCP Section I provides for implementation of: (1) Hatchery Operations Plan; (2) Smolt Survival Plan; and (3) "Planning and Monitoring." ["Planning and Monitoring," more specifically, includes the: (1) "Performance Monitoring Plan" ("PMP"); and (2) "Environmental Compliance."]
>
> 5(b) Settling Defendants shall perform Response Actions related to the Site, and conduct operation and maintenance of the final remedial action in accordance with the ROD to be issued by EPA, in consultation with the Trustees.
>
> 5 (c) Settling Defendants shall achieve and ensure that the Ambient Water Quality Criteria for dissolved copper established by EPA . . . [per the CWA], and set forth in the BRCP are maintained as set forth in the BRCP for three consecutive years prior to January 1, 2005, or for a shorter period as determined

> by Trustees, and maintained for the duration of the entire BRCP monitoring program, as set forth in Appendix B. . . .
>
> 5(c) . . . If . . . EPA selects a standard for water quality at the Site different from the standard set forth . . .[for dissolved copper, immediately above], [such different standard] . . . will achieve a level of water quality in Panther Creek and Big Deer Creek sufficient to sustain salmonids through all life stages . . . .
>
> 5(d) Settling Defendants shall implement the plan for sediment removal and bank stabilization as specified in Appendix C.

The Commitments are not contingent tasks, but are presently enforceable commitments of the BMSG. These obligation exists, even if the type of impacts posited by BMSG were to occur, subject only to the "Force Majeure" provisions.

Consent Decree Paragraphs 54 – 56 provide the following.

> If any event occurs that may delay the performance of any obligation under this Consent Decree . . .the Settling Defendants shall notify Trustees' project coordinator within four days of when Settling Defendants first knew or should have known that the event might cause delay. . . . *If the Trustees agree that delay or anticipated delay is attributable to a force majeure event, the time of performance for the obligations under this Consent Decree that are affected by the force majeure event will be extended for such time as is necessary to complete those obligations.* . . . [If there is a dispute, then Article XXI Dispute Resolution shall be used;] Settling Defendants shall have the burden of demonstrating by a preponderance of the evidence that the delay or anticipated delay has been or will be caused by a force majeure event . . .

Thus, *if*: (1) FCC were to cause material problems that "delays or prevents performance of any obligation," Consent Decree, p. 25; (2) FCC did not correct the situation; (3) the Trustees agreed that a force majeure had occurred or the BMSG could demonstrate by a preponderance of the evidence a force majeure had occurred; *then* the "time for performance for the obligations . . . that are affected . . . will be extended for such time as necessary . . .," but such obligations are delayed, not excused. Certainly, force majeure does not prospectively "relieve the BMSG of its obligations under . . . the Blackbird Agreements," simply ". . . *by approving the project,*" 2001 Demand Letter, nor does force majeure suggest that "[t]he BMSG cannot lawfully be required by the USEPA and the Trustees to meet water quality standards while . . . actions by a third party . . . *jeopardize* the BMSG's activity to meet water quality standards," 2005 Demand Letter. (Emphasis added.) If BMSG believes these statements to be true, then the BMSG must make a claim of force majeure immediately upon the approval of the Exploration MPO. However, we do not believe that the Trustees would concur or that the BMSG could cause any tribunal, administrative or judicial, to agree.

It should be noted that that Article XXIII of the Consent Decree includes the "Reopener Provisions" that, pursuant to Paragraph 72, provides "all obligations imposed on [the BMSG] under this Consent Decree shall automatically terminate upon the United States' or the State's . . . exercise of the reopener provision set form in Paragraph 71. However, Paragraph 71 provides: (1) such relief only by an affirmative, voluntary action of EPA and/or the State; and (2) the United States and the State with the right to "initiate proceedings in this action or a new action, seeking recovery of additional Response Costs and/or Natural Resource Damages . . .". Paragraph 71. This is certainly not the type of prospectively triggered general relief described by the Demand Letters. On the other hand, as a practical matter, this reopener provides the U.S. with a means to avoid any limitations the Consent Decree may place on BMSG's obligations in order to ensure that "water quality levels in Panther Creek and Big Deer Creek shall be capable of sustaining salmonids through all life stages . . ." Consent Decree, Paragraph 71(b). In short, if the standard described in the previous sentence is not being met, and the Consent Decree is deemed an obstruction to achieving such standard, the agencies may void the Consent Decree; however, the BMSG has no equivalent right.

7.2.4 The Consent Decree provides relief to the BMSG from the Additional Actions provision of Paragraph 26 "where . . . [an] exceedance is . . . from releases . . . unrelated to the Blackbird Mine"; however, such relief does *not* apply to the Commitments discussed in Section 7.3.3 of this Letter and such relief is granted only *after* "Settling Defendants can demonstrate . . . [the release] is unrelated to the Blackbird Mine."

The "Additional Actions," described in Paragraph 26, offers relief of a type somewhat similar to that described by the Demand Letters; however, this relief only applies to the obligations that comprise the "Additional Actions," not the Commitments described above, nor would it apply merely because the Exploration Adit MPO was approved. Paragraph 26 provides "at any time after January 1, 2002 that water quality standards exceeds the levels set forth in Subparagraph 5(c) . . . Settling Defendants must take actions . . . to prevent exceedances, unless: (1) the exceedences do not cause injury to biological resources; (2) other agreements with EPA will address the problem; or (3) Settling Defendants can demonstrate technical infeasibility of addressing the exceedance. Most importantly, the additional actions of Paragraph 26 "shall not apply where Settling Defendants can demonstrate to the Trustees that any such exceedance is . . . from releases of hazardous substances in tributaries to Panther Creek unrelated to the Blackbird Mine."

Thus, with regard to Additional Actions, BMSG is entitled to certain specific relief pursuant to the Consent Decree; however, this provision does not effect BMSG's obligations to perform the Article V Commitments. Moreover, such relief is granted only *after* "Settling Defendants can demonstrate . . . that any such exceedance is . . . from releases . . . unrelated to the Blackbird Mine." This places the burden of proof on the BMSG, not the USFS, EPA or FCC. Thus, even the Consent Decree language that is most favorable to BMSG does not even remotely suggest that ". . . by approving the project . . . [the government] . . . would relieve the BMSG of its obligations under those

agreements. 2001 Demand Letter, p. 1. The BMSG is certainly not entitled to be released from the Additional Actions *prospectively*, merely because the USFS approves the Exploration MPO.

7.2.5 The BMSG entered into the Consent Decree knowing full well, at the time, that FCC was exploring for minerals to develop a mine; thus, the BMSG should not appeal to equity or fairness in an attempt to avoid the harsh language of the Consent Decree or to push BMSG's environmental liability onto FCC.

Although rarely applied in the corporate setting, there are equitable contractual concepts that will excuse performance in case of mistake or other grossly inequitable situation that makes performance of the contract impossible or extremely unfair; however, the facts surrounding the BMSG's situation do not even remotely support such an argument.

In the spring of 1995, when the Consent Decree was executed, FCC was already exploring the Property. Thus, the BMSG members knew or should have known that the FCC Property was prime exploration ground in a traditional mining area (after all, the BMSG was remediating a mine) that was open to exploration and development pursuant to the laws of the U.S. and the State of Idaho. To the extent that the BMSG had extraordinarily sensitive needs that exceeded normal environmental standards with regard to the management of the FCC Property, then the BMSG should have acquired the land. At the time the Consent Decree was signed, FCC had sunk relatively little money into the development of the Property, thus BMSG could have easily and relatively cheaply reacquired FCC's Property.

Instead of reacquiring the Property, the BMSG gambled. As veteran mining companies, they knew that only a tiny percent of exploration projects turn into mines and that the odds were heavily against a new mine ever being developed. They bet wrong. Now that FCC has poured ten years, and the blood, sweat toil and tears of the managers, employees and shareholders to develop an Idaho Cobalt Project that is so close to success and that its net present value is approximately $260,000,000, BMSG seeks to monkey-wrench an interim MPO Exploration of the Project. These are not attractive facts upon which the BMSG should seek to cry "unfair." These are certainly not facts upon which BMSG can seek to claim "surprise" or "mistake" in agreeing to the contract language found in the Consent Decree; thus, the BMSG must find it relief with the tight strictures of the Consent Decree's concept of Force Majeure.

7.2.6 Summary of the limitations of BMSG liability under the Consent Decree related to potential FCC actions.

USFS Approval of the Exploration MPO does not excuse BMSG from performance of the Consent Decree obligations. Nevertheless, the plain language of the Consent Decree provides for certain specific potential limitations of BMSG liability in the event that FCC should create water quality problems; however, BMSG's primary obligations under the Consent Decree, i.e., the Commitments described in Paragraph 5, are only subject to

abatement pursuant to the Force Majeure Provision, which: (1) merely delays, but does not terminate, performance; and (2) must be approved by the Trustees or, in the alternative, BMSG must carry the burden of proof in a court. The Additional Actions will be excused if "Settling Defendants can demonstrate . . . that any such exceedance is . . . from releases of hazardous substances in tributaries to Panther Creek unrelated to the Blackbird Mine." Still, neither of these limitations on BMSG responsibility are prospective in nature to the extent that mere approval of the Exploration MPO terminate BMSG obligations under the Consent Decree. Moreover, equitable concepts cannot allow the BMSG to escape the Consent Decree provisions simply due to FCC's activities, because when the BMSG executed the agreement, they were aware that FCC was seeking to develop a mine.

8.0 Although we do not believe BMSG obligations under the Consent Decree can be avoided, except to the limited extent described above in Section 7.3; for the sake of analysis, assuming BMSG *could* avoid operation of the Consent Decree, the BMSG members continue to be liable for remedial action at the Blackbird Mine under several legal authorities.

8.1 Based upon our preliminary review of public documents immediately available to FCC, the members of the BMSG appear to be jointly and severally liable for the Blackbird Mine's environmental liabilities as a common law and/or statutory partnership under Idaho law.

Based upon a preliminary analysis of immediately available public documents, including notably the Demand Letters, it appears that the BMSG is managing and controlling activities at the Blackbird Mine and has done so for some time. The BMSG is not an entity incorporated or registered as a legal "person" with the State of Idaho Secretary of State's Office, nor is it a registered foreign business entity, per an electronic investigation conducted on January 19, 2005. Thus, it would appear that the "BMSG" is merely a "doing business as" name for the persons controlling its actions to hold out to the agencies and other outside parties as the person in charge of the remedial actions. Based upon such absence of registration with the Idaho Secretary of State's Office, BMSG constitutes a partnership, as an unincorporated joint venture.

"Idaho Code § 53-213[7] mandates the filing of the certificate of limited partnership with the secretary of state" in order for a limited partnership to be recognized. *Durrant v. Christensen*, 120 Idaho 886, 821 P.2d 319 (December 17, 1991).

> In order to form a limited partnership, a certificate of limited partnership must be executed and filed in the office of the secretary of state.

I.C. § 53-208(a). Similarly, a foreign limited liability partnership must also be registered to be qualified to transact business in Idaho. I.C. § 53-3-1102(a). As noted above, we did not find any such registrations for the BMSG. Thus, the BMSG is not a corporation or limited partnership entitled to enjoy the protection of limited liability in Idaho.

[7] The same requirement is recodified as I.C. § 53-208(a) and I.C. § 53-3-1001(c).

To the extent that several persons conduct a collective enterprise without creating a corporation or limited partnership, Idaho law holds the collective group to be a partnership. I.C. § 53-306 1., prior to July 1, 2001, and I.C. §53-3-202(a) after July 1, 2001. Under the Revised Uniform Partnership Act as adopted by Idaho July 1, 2001, general partners in a partnership are jointly and severally responsible for the liabilities of the unregistered group. I.C. § 53-315 and § 53-3-306(a), before and after July 1, 2001, respectively.

Thus, the legal persons that comprise the BMSG have been, and will continue to be, jointly and severally liable for operations conducted under its auspices pursuant to the Idaho law of partnership. This includes, without limitation, CERCLA liability and Clean Water Act compliance for the Blackbird Mine Site, as well as liability under the law of nuisance. FCC does not have access to BMSG records to determine the identity of the Blackbird Mine CERCLA operators; however, the USEPA has authority pursuant to CERCLA Section 104(e) to conduct this exact type of inquiry for just this type of purpose. The information could also be made available through discovery in a CWA citizen's suit proceeding, as described in Section 8.3 below.

8.2 Based upon our preliminary review of limited public records available to FCC, we believe the BMSG's individual members are liable, and have been liable since the inception of the BMSG, as current "operators" under CERCLA, pursuant to the United States Supreme Court's holding in *Best Foods*.

The United States Supreme Court's decision in *United States v. Best Foods*, 524 U.S. 51 (1998) substantially eliminated much of the previous expansive reading of CERCLA liability where it: (1) went beyond traditional norms of appropriate corporate subsidiary governance for direct liability; or (2) went beyond the traditional common law framework for derivative corporate liability. However, despite the importance of the *Best Foods* decision in limiting CERCLA liability, it is by no means a "free pass" from CERCLA liability for complexly layered corporate entities. In fact, based upon our preliminary review of the public records available to FCC, BHW believes that the individual members of the BMSG are jointly and severally liable as current operators of the Blackbird Mine under both CERCLA and the Clean Water Act.

In *Best Foods*, the Court states that:

> CERCLA's 'operator' provision is concerned primarily with direct liability for one's own actions.

Id. at 66. Since the BMSG does not exist, the members of the Group seem to have been directly conducting operations at the Site. In *Best Foods*, the Court looks to the plain language dictionary definition of "operate" and concludes that:

> . . . under CERCLA, an operator is simply someone who directs the workings of, manages, or conducts the affairs of the facility. To sharpen the definition for purposes of CERCLA's concern with environmental contamination, an operator must manage, direct, or conduct operations specifically related to pollution, that is, operations having to do with the leakage, disposal of hazardous waste, or decisions about compliance with environmental regulations.

Id. at 67. Even assuming that the BMSG had shell corporations sign the Administrative Orders on Consent, all outward manifestations of control over environmental management, including the Demand Letters attacking FCC Exploration MPO have been conducted in the name of and on stationary of the BMSG, an unregistered business entity. *Best Foods* provides specific guidance concerning application of the direct liability standard in the parent-subsidiary setting, particularly regarding segregation of direct from indirect liability.

> If . . . direct liability for the parent's operation of the facility is to be kept distinct from derivative liability for the subsidiary's own operation, the focus of the enquiry must necessarily be different under the two tests. The question is not whether the parent operates the subsidiary, but rather whether it operates the **facility**, and that operation is evidenced by participation in the activities of the facility, **not the subsidiary**. Control of the subsidiary, if extensive enough, gives rise to **indirect liability under piercing doctrine**, not direct liability under the statutory language. Any liabilities [the parent] may have as an **operator**, then stem directly from its control over the **plant**. [Quotation marks and citations omitted].

Id. at 69 (emphasis added). Of course, regarding BMSG, there is no subsidiary or other business entity in existence. Thus, there is no need to debate the extent of what might have been appropriate operation of the "corporation" versus operation of the "facility"; the BMSG entities and the managing natural persons, in fact, operate the facility, because there is no other business entity.

Moreover, the Supreme Court's opinion specifically indicates that direct liability would exist where:

> (1) the subsidiary merely owned the facility, but the parent in all other respects "operated" the facility [In fact, Blackbird CERCLA decisions appear to have been made by BMSG, not the record "owner" of the facility];
>
> (2) the subsidiary and the parent entities operated the facility as a joint venture [BMSG does not exist, thus the BMSG members necessarily operated the Blackbird facility and remediation for purposes of environmental management];
>
> (3) a dual officer or director might depart so far from the norms of parental influence exercised through dual office holding as to serve the parent, even when

ostensibly acting on behalf of the subsidiary in operating the facility," Id. at 72 [Again, the BMSG does not exist, so there are no "norms" to examine]; or,

(4) an agent of the parent with no hat to wear but the parent's hat might manage or direct activities at the facility.

Id. at 72. The last criterion above illustrates the dilemma in a somewhat picturesque manner; the BMSG members simply have had "no hat to wear" regarding Blackbird Mine environmental conditions and remedial operations, except that of the BMSG member companies. CERCLA provides a limited exclusion from liability for "response action contractors," but the BMSG members certainly do not qualify. 42 U.S.C. § 9619, see particularly (d) "Exception."

To briefly recap, since the BMSG is not a registered business entity providing limited liability to the legal persons that comprise the BMSG. Thus, the persons who comprise the BMSG are directly liable under CERCLA as an "operator" of the Blackbird Mine site and remedial operations, per *Best Foods*. As discussed above in Section 8.1, CERCLA § 104(e) or discovery per a CWA action would provide the necessary information to determine which entities and/or individuals are the real parties at interest liable for Blackbird Mine discharges.

8.3 Based upon our preliminary review of public records immediately available to FCC, we believe the BMSG's individual members are liable, and have been liable since the inception of the BMSG, as person under the Clean Water Act pursuant to the United States Supreme Court's holding in *Best Foods*.

The *Best Foods* decision was under CERCLA, but if one examine the plain language, structure and history of the CWA definition of "person," which forms the basis for CWA liability under Section 402 (point source discharges), there is no reason to believe that the CERCLA "owner/operator" analysis of Best Foods would not apply to the Clean Water Act concept of "person" as well. Thus, even in the highly unlikely event BMSG were able to avoid CERCLA liability for its past and ongoing activities, BMSG still likely would be liable under the CWA for surface discharges of pollutants from point sources or of dredged or fill materials into waters of the United States.

Clean Water Act Section 301 provides that "the discharge of any pollutant by any person shall be unlawful." 33 U.S.C. § 1311(a). One exception to Section 301 is the National Pollutant Discharge Elimination System ("NPDES"), which allows point source discharges of pollutants to waters of the United States so long as those discharges are made in compliance with the terms and conditions of a permit. Unless individual members of BMSG obtained an NPDES permit, individual or general, to cover all discharges from their operations, the discharge may violate Section 301 and be illegal. The courts and EPA interpret the Clean Water Act's definition of "point source" broadly. See Committee To Save Mokelumne River v. East Bay Municipal Utility District, 13 F.3d 305 (9th Cir. 1993) (abandoned copper/zinc mine facility drainage is subject to

CWA); Umatilla Water Quality Protective Association v. Smith Frozen Foods, Inc., 962 F. Supp. 1312, 1318 (D. Or. 1997) (waste water pipeline and brine pond may be subject to CWA -- "The Ninth Circuit, like EPA, has consistently given a broad definition to 'navigable waters' for purposes of the CWA"); Beartooth Alliance v. Crown Butte Mines, 904 F. Supp. 1168, 1173 (D. Mont. 1995) (mine adit and pits are point source discharges subject to the CWA). As precisely addressed by the Beartooth Alliance case, no reasonable question exists regarding whether the adit is a "point source," nor is there any question about the Blackbird tailings area.

The CWA also defines "person" broadly as "an individual, corporation, partnership, association, State, municipality, commission, or political subdivision of a State, or any interstate body." 33 U.S.C. § 1362(5). The individual members of BMSG are "persons" under the CWA. The CWA does not define "owner or operator" for purposes of the NPDES program, but EPA defines the terms as follows:

> Owner or operator means the owner or operator of any "facility or activity" subject to regulation under the NPDES program.

40 C.F.R. § 122.2 (2004). Obviously, this definition leads one right back to the broad definitions of regulated discharges discussed above. In the closely related context of Section 311 liability for spills and leases, CWA defines "owner or operator" for purposes of onshore facilities as "any person owning or operating such onshore facility ..." Id. at § 1321(a)(6). Again, under these definitions individual members of BMSG are potentially liable. As discussed above in Section 8.1, CERCLA § 104(e) or discovery per a CWA action would provide the necessary information to determine which entities and/or individuals are the real parties at interest liable for Blackbird Mine discharges.

8.4 FCC does not have sufficient information available to adequately assess whether corporate "veil piercing" theories provide additional guarantees of BMSG performance; however, even a casual examination of the record suggests an opportunity.

In the event there was an effort made by the BMSG and/or its members to avoid corporate parent liability using corporate limited liability arguments, then it would become necessary to examine whether it were possible to "pierce the corporate veils" of subsidiary corporations. This is an intensely factual analysis that simply cannot be conducted at this time. Nevertheless, even a casual examination of the record shows that this could be an area worthy of examination. For example, although "Alumet Corporation" executed the Consent Decree, but the Alcan Corporation 10K for the year ended December 2003, i.e, the most current annual report available, summarizes liability at the Blackbird Mine without distinguishing between Alumet and Pechiney, Alumet's parent corporation.

9.0 Despite the best scientific evidence to the contrary, *if* the Exploration MPO were to impact the Compliance Points, then a panoply of legal/regulatory

mechanisms and remedies by which any such impacts could be readily managed.

9.1 In the event the Exploration MPO was to impact the Compliance Points, then USFS enforcement authority over Exploration MPO activities, EPA CWA enforcement, and BMSG, privately, could bring actions under the CWA citizens suit provision and CERCLA.

Despite the best scientific evidence to the contrary, if the Exploration MPO were to impact the Compliance Points, multiple remedies, public and private are available to address the issues at the earliest possible moment. The USFS has direct regulatory control and mine inspections concerning enforcement of the Exploration MPO, and can require changes to a mining plan of operation that does not satisfy its design parameters. EPA and the State of Idaho have powerful authorities to require compliance under the Clean Water Act and the Idaho Environmental Protection and Health Act, respectively. Additionally, the USFS, EPA, and IDEQ all have extraordinary powers available under CERCLA. Finally, the BMSG can implement private remedies to ensure compliance and remediation through the CWA and CERCLA, itself.

9.2 The CWA 2009 TMDL must equitably allocate loading among several persons along the same stream segment; there is no credible legal, nor equitable, theory for allocating all loading to the BMSG, when the BMSG is a facility currently out of compliance with the CWA.

In the event the Exploration MPO was to contribute loading to the Compliance Points, the CWA provides a mechanism specifically to address such impacts. Pursuant to the CWA, the State of Idaho is already required to prepare "Total Maximum Daily Load" ambient water quality programs ("TMDL") for Panther Creek, Big Deer Creek, and Bucktail Creek (collectively, the "District Creeks"). A TMDL sets a standard and develops an implementation plan to achieve that standard on a pollutant-by-pollutant basis. The TMDL takes into account point and nonpoint sources potentially affecting the waterbody, which means that affected private parties must come to a reasonable accommodation regarding each other's contribution of loading, if any, to the affected waterbody. The TMDL will be developed by the State of Idaho and reviewed under the Clean Water Act by the Environmental Protection Agency. The TMDL for the Blackbird District Creeks is deferred by the State of Idaho until 2009, cannot be developed in such manner as to ignore the Idaho Cobalt Project as a potential nonpoint source, nor can the TMDL legally require the ICP to have "no negative environmental impacts" or "no material effect" while allowing the BMSG to discharge pollutants that consume all of the TMDL allocation.

BMSG's required participation in a TMDL is simply not a legal cause for BMSG to avoid the Blackbird Agreements, contrary to the suggestion in the BMSG Letter. We are not going to review this issue in detail at this time; however, we observe that the Blackbird Consent Decree specifically states that "[a]ll activities undertaken by Settling Defendants pursuant to this Consent Decree . . . shall be performed in accordance with

the requirements of applicable federal and state laws and regulations." Section V(C)(6), p. 9. Minimally, this would include participation in, and compliance with, the District Creeks TMDL, when it is developed.

10.0 The 2005 Demand Letter states that "[i]t is *unfair* . . . for the BMSG to be placed in jeopardy because of the contradictory actions of different branches of government . . ." HOWEVER this is a grossly misplaced appeal to fairness for a variety of reasons, including but not limited to, BMSG is liable under CERCLA for poor environmental stewardship, yet BMSG is unfairly trying to shift this liability to FCC, even though FCC has done nothing wrong and is not liable under CERCLA.

If the USFS review of FCC's Exploration MPO is going to consider BMSG's pleas for "fairness," then FCC submits the following issues of "fairness" also to be considered.

1) *BMSG is liable under CERCLA for poor environmental stewardship, yet BMSG is unfairly trying to shift this liability to FCC, even though FCC has done nothing wrong and is not liable under CERCLA.*

2) *BMSG unfairly seeks to prohibit, prospectively, implementation of the Exploration MPO, even though the best scientific information available indicates the Exploration MPO will have no effect on BMSG.* As a practical matter, BMSG is seeking to have the USFS issue an injunction against construction of the adit, simply because the adit *might* have an impact on BMSG, even though the best scientific information indicates that the adit will have no effect upon BMSG. Ignoring all of the legal reasons why BMSG is wrong, as discussed above, it is worth noting that generally a court will only restrain actions prospectively using an injunction only if one can show that there is a "substantial likelihood" of suffering "irreparable harm." Obviously, BMSG has not even come close to making such a showing. Thus, as a matter pure "fairness," since no court would issue an injunction against FCC on these facts, the USFS should not "enjoin" FCC by refusing to approve the Exploration MPO.

3) *BMSG unfairly seeks to impose the "no negative environmental impacts standard" on the ICP without seeking to impose such standard on the Blackbird Mine.* BMSG's "no negative environmental impacts" standard has no basis in law or regulation. Thus, it is at most BMSG's suggested policy. If "fairness" is a criterion, then it is just as logical for BMSG to be held to the "no negative environmental impacts" standard as for FCC, so that BMSG can return the streams to a natural background condition. This would facilitate FCC's work.

4) *BMSG's 2001 Demand Letter states that by ". . .approving the project, the government would have interfered with the BMSG's ability to comply with the 1995 Consent Decree . . . ," yet BMSG has unfairly advocated legal and environmental standards that do not exist without citation to statute, regulation or policy, thereby confusing agency personnel, and interfering with the legitimate*

and environmentally responsible development of the Exploration MPO and, ultimately the ICP.

5) *BMSG unfairly seeks to prohibit mining in a mining district, an area in which the only significant land uses have been mining and logging.*

6) *BMSG unfairly seeks to deprive Lemhi County of one of its single greatest potential sources of good paying, year- round, long-term jobs and tax revenue.*

7) *BMSG unfairly seeks to economically sterilize a huge swath of Lemhi County from any economically productive land use.* BMSG seeks relief from satisfying relevant water quality standards for Blackbird, Bucktail and Big Deer Creeks in order to continue its long-standing pollution of the area, and yet simultaneously seeks to sterilize vast expanses of Lemhi County from economic activity by opposing any economic development that *might* impact BMSG. Of course, this precludes new local jobs, growth of tax base, and seeks to stifle the prosperity of the County. This is directly contrary to EPA national policy regarding Brownfields development. It is also contrary to Lemhi County economic goals and needs.

8) *BMSG seeks to deprive the United States of its sole source of primary cobalt production.* Cobalt is a strategic and critical metal used in many diverse industrial, military and high technology applications. The United States remains the world's largest consumer of cobalt [year 2000 data]. With the exception of negligible amounts of byproduct cobalt produced as intermediate products from some mining operations, the United States did not mine or refine cobalt in 2000. Mineral Survey Annual - 2000, USGPO, 2001.

9) BMSG unfairly waited until FCC had invested millions of dollars in the Property before raising objections in 2001, when in fact, only BMSG could know that it believed it had extraordinarily sensitive land use needs that far exceed current applicable environmental standards.

11.0 Suggested Pathway Forward

Now that both sides have staked out their respective "legal" positions, FCC suggests that at the earliest possible opportunity the Federal/State Managers, BMSG, and FCC meet to resolve these issues. FCC will make itself available wherever and whenever most convenient to all persons involved.

BHW 2007
Letter

BAIRD • HANSON • WILLIAMS LLP

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May 24, 2007

Ray Henderson
Minerals Specialist
Salmon-Challis National Forest
1206 South Challis Street
Salmon, ID 83467

Robert Rau
United States Environmental Protection Agency (EPA), Region 10
1200 Sixth Avenue, OWW-130
Seattle, Washington 98101

Re: Idaho Cobalt Project - Comments on the Draft Environmental Impact Statement
Applicable Legal and Technical Standards and Draft NPDES Permit -
CERCLA and NEPA Equivalency and Blackbird Mine Standards

Dear Messrs. Wood and Rau:

Baird Hanson Williams LLP ("BHW") represents Formation Capital Corporation, U.S. ("Formation"); as you know, Formation is the proponent of the Idaho Cobalt Project in the above-captioned matter.

Issues that will arise in the commenting about the Idaho Cobalt Project include: (1) legally applicable standards; and (2) the sufficiency of the technical analyses. With regard to these issues, the United States Forest Service and the United States Environmental Protection Agency should look to the Blackbird Mine remedial actions to determine the appropriate maximum applicable standards and the sufficiency of technical analyses that would be required.

Pursuant to the Comprehensive Environmental Response Compensation and Liability Act of 1980, as amended ("CERCLA"), the Blackbird Mine remedial action was required to comply with:

> (i) any standard, requirement, criteria, or limitations under any Federal environmental law, including, but not limited to, the Toxic Substances Control Act, the Safe Drinking

> Water Act, the Clean Air Act, Clean Water Act, the Marine Protection, Research and Sanctuaries Act, or the Solid Waste Act; or
>
> (ii) any promulgated standard, requirement, criteria, or limitation under a State environmental . . . law that is more stringent than any Federal standard, requirement, criteria, or limitation . . .
>
> [that] is legally applicable to the hazardous substance or pollutant or contaminant concerned or is relevant and appropriate under the circumstances or the release or threatened release of such hazardous substance or pollutant or contaminant . . . [s]uch remedial action shall require a level or standard of control which at least attains Maximum Contaminant Level Goals established under the Safe Drinking Water Act . . .

42 U.S.C. 9621(d)(2)(A). In short, at a minimum, the EPA is required to regulate the Blackbird Mine pursuant to any "legally applicable" standard. Of course, the Idaho Cobalt Project is subject to any legally applicable standard, too. The Blackbird Mine and the ICP are both cobalt metal mines effecting similar or identical drainages and lands. One major difference is that Formation will not use the outdated mining and milling practices used in the 1940's, 1950's and 1960's that created the Blackbird Mine problems (specifically, uncontrolled discharge of waste rock, mill tailings and untreated mine water into streams and drainages); nevertheless, the scope and nature of the environmental requirements applied and technical analyses required to evaluate the environmental issues associated with future impacts on groundwater and surface water would be similar. Thus, the standards applicable to both mines should be identical, unless EPA is able to provide an articulable reason for any difference. On the other hand, under EPA's CERCLA "relevant and appropriate" authority EPA can be more stringent with the Blackbird Mine than with the Idaho Cobalt Project, but not the other way around, and any USFS requirements that are "relevant and appropriate" are also pertinent to the Blackbird Mine.

To the extent that either the USFS or EPA determines that the "legally applicable" standards for the Idaho Cobalt Project should be more stringent that an equivalent one at the Blackbird Mine, then that more stringent standard would applicable to the Blackbird Mine. CERCLA provides for citizen suits at 42 U.S.C. 9659. If the Noranda Mining, Inc. were to seek to application of more stringent standards to the Idaho Cobalt Project as part of an appeal of an approval, then it would become necessary to determine whether such standard has been properly applied to the Blackbird Mine.

Sincerely,

Joseph H. Baird

Joseph H. Baird

UNITED STATES DEPARTMENT OF AGRICULTURE
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CONSERVATION & ENVIRONMENT DIVISION

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Telephone: 202-720-6716
Facsimile: 202-720-6039
E-mail: sharmian.white@usda.gov

FAX COVER SHEET

DATE: May 3, 2005

FROM: **Sharmian L. White**

TO: Joseph Baird

OFFICE: Baird Hanson Williams LLP

FAX #: 208-367-0828

NUMBER OF PAGES SENT (INCLUDING COVER SHEET): 4

MESSAGE: _____

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United States Department of Agriculture
Office of the General Counsel
Washington, D.C. 20250-1400

May 3, 2005

VIA FACSIMILE AND U.S. MAIL

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Merlyn W. Clark
Hawley Troxell Ennis & Hawley
877 Main Street, Suite 100
Boise, Idaho 83701
Fax: 208-342-3829

Re: **Formation Capital and the Blackbird CERCLA Site**

Messrs. Garrett, Smith, and Clark:

The USDA-Forest Service ("Forest Service") is in receipt of your January 7, 2005 letter regarding Formation Capital's ("Formation's") proposed plan of operations for an exploration decline to conduct bulk sampling related to Formation's Idaho Cobalt Project proposal, as well as the BMSG's technical comments on the proposal, also dated January 7, 2005. A response to the technical comments was sent by Ray Henderson of the Forest Service to Dave Jackson via a letter dated April 14, 2005 and four enclosures, including:

a March 29, 2005 Formation letter addressing Monitoring and Road issues;
a January 14, 2005 Formation letter addressing Idaho DEQ comments;
a January 28, 2005 Hydrometrics Review of the Telesto comments on the proposal; and
a January 10, 2005 Formation letter with initial responses to the BMSG's comments.

The Forest Service is committed to working with Formation Capital to ensure that any approved operations would conform with all applicable environmental laws and standards. Additionally, the Forest Service recognizes the Blackbird Mine Site Group's obligations at the Blackbird Site under the 1995 Consent Decree and EPA administrative orders, and is committed to the remediation and restoration goals at the site. Indeed, the Forest Service has committed significant resources toward remediation and restoration of the Site.

At this time, Formation's proposal remains under review. However, the Forest Service will note that the options available to the Federal government in this situation are not as limited as your letter suggests (e.g., either reject Formation's plan or relieve the BMSG of its obligations at the Blackbird Site). The Forest Service recognizes Formation's rights under the Mining Laws, and intends to evaluate and act upon Formation's proposal in accordance with the applicable legal standards. Moreover, as you know, no provisions of either the 1995 CD or of EPA's administrative orders would allow for automatic release of the BMSG entities from their obligations at the Site.

Formation's proposal is receiving appropriate scrutiny in light of the significant interests involved. The Forest Service may impose appropriate requirements on a plan of operations prior to approval of such plan in order to protect National Forest System surface resources, and may reject an unreasonable plan of operations. There are also various options available to the Forest Service under the applicable regulations for modifying an approved plan or enjoining mining operations once they have commenced if there are unforeseen environmental consequences or the operations are unnecessarily or unreasonably causing irreparable injury, loss or damage to surface resources. You may be sure that the Forest Service will take all appropriate measures to ensure that legitimate BMSG concerns regarding the proposal and any operations performed under any approved plan are addressed.

The Forest Service has submitted Formation's proposal for review by TetraTech RMC, one of the Forest Service's consultants for the Blackbird Mine Site. TetraTech RMC, like the BMSG, suggested water quality monitoring as a means of verifying that there are no unacceptable impacts to ground water and surface water from the operation. Based on the suggestions received, the Forest Service has required Formation to propose a water quality monitoring program. Further, the Forest Service is extending to the BMSG the opportunity to review and provide comments on the proposed monitoring program. A copy of the proposed monitoring program was sent to Dave Jackson in the correspondence referenced above.

The Forest Service notes the BMSG's concerns regarding the access road identified by the plan of operations. The correspondence to Dave Jackson, referenced above, addresses the road issues, and includes a new figure showing no closures to existing facilities used by the BMSG in its efforts at the Blackbird Site. The Forest Service will not allow Formation to impair the BMSG's access to Bucktail Creek or any other portion of the Site.

We note your comments regarding financial assurance related to the proposed operations. If the plan is approved, the Forest Service will require a bond in accordance with the applicable regulations, agency direction, and agency guidance. While bonding is discretionary, the Forest Service Manual requires bonds to cover the costs of reclamation. Under the Forest Service's bonding guidance, bond estimates should cover all Forest Service costs (direct and indirect) that would be incurred in taking over operations due to operator default, based on the cost of contracting the reclamation work according to the Federal Acquisition Regulations. Training Guide for Reclamation Bond Estimation and Administration For Mineral Plans of Operation authorized and administered under 36 CFR 228A (USDA-Forest Service, April, 2004). Estimates are not required to cover, nor would it be appropriate for the Forest Service's bond estimate to cover, the cost of worst-case scenarios that are not predicted to occur. Id. at 5, 44. That said, the Forest Service is committed to bonding any approved operations at a sufficient level, consistent with all appropriate factors to be considered at the site, and is carefully reviewing comments on the bond estimate submitted by Formation as a part of its proposal. If Formation's proposal is approved, the Forest Service will include its bond requirements with the decision. Copies of the decision will be sent to all entities that received notice of the proposal through the Forest Service's scoping process, including the BMSG.

The Forest Service looks forward to working with the BMSG to ensure that any issues and concerns associated with Formation's proposals and the Blackbird Mine Site are identified and addressed.

Sincerely,

Sharmian L. White

Sharmian L. White

cc: Ray Henderson, USDA-Forest Service
Russ Bjorklund, USDA-Forest Service
Rachel Jacobson, USDOJ
Cyndy Mackey, US EPA
Nick Krema, IAG
Sharon Shutler, NOAA
Joseph H. Baird, Baird Hanson Williams, LLP

Appendix B

Appendix B

Public Notice

BBMSF
16.5
09/01/07

ENVIRONMENTAL Fact Sheet

EPA **Blackbird Mine Superfund Site, Lemhi County, Idaho**

U.S. Environmental Protection Agency, Region 10 — September 2007

Cobalt Cleanup Plan Revised for Blackbird Mine

The U.S. Environmental Protection Agency (EPA) has issued an Explanation of Significant Difference (ESD), revising the clean up plan for the Blackbird Mine Superfund site in Lemhi County, Idaho. EPA evaluated the results of cobalt toxicity testing in surface water and determined that a less stringent cleanup level for cobalt would still be protective of fish at the site. This change in the cobalt cleanup level means that the proposed collection and treatment of water from the West Fork Tailings Impoundment will not be required.

Status of Early and Remedial Cleanups

Cleanup actions conducted since 1995 have collected contaminated runoff water in the mine area and treated it for copper and cobalt. These cleanup actions have also stabilized waste-rock piles at the mine. Soils contaminated with arsenic along the banks of Panther Creek have been removed. Construction of the Bucktail Creek diversion pipeline is scheduled to occur in 2010. Post-construction monitoring of these cleanup activities is ongoing.

Five-Year Review Coming Up

Next year, EPA will start a comprehensive Five-Year Review of the Blackbird Mine cleanup. The review is a checkup to evaluate the progress and effectiveness of cleanup activities. EPA conducts reviews at least every five years to ensure that cleanup actions are protective of people and the environment. Please let us know if you have information about the site that we should consider in our review. The final Five-Year Review report will explain the results and include recommendations to resolve issues found during the review. The final report will be available at the locations listed below and EPA will also send an update summarizing the review findings.

Background

Blackbird Mine is an inactive mine located about 25 miles west of the town of Salmon in east central Idaho (Lemhi County). Cobalt, silver and copper ore were extracted from underground and open pit mining operations. Contaminated soil, sediments and tailings were released from the Blackbird Mine site during high water flows from thunderstorms and snowmelt. The main environmental concerns at the mine are cobalt, copper and arsenic released into Blackbird Creek, the South Fork of the Big Deer Creek, Big Deer Creek, and Panther Creek.

The Potentially Responsible Parties, referred to as the Blackbird Mine Site Group, conducted the site investigation and cleanup under EPA oversight and in consultation with the State of Idaho, U.S. Forest Service, and the National Oceanic Atmospheric Administration. The Blackbird Mine Site Group consists of Noranda Mining Inc., M.A. Hanna Co. and Intalco Corporation (formerly Alumet Corporation). EPA issued its Record of Decision for the cleanup plan in 2003.

For more information:

For more information about the cleanup, please contact:
Fran Allans, Project Manager, 208-378-5775,
allans.fran@epa.gov or
Suzanne Skadowski, Community Involvement Coordinator, 206-553-6689,
skadowski.suzanne@epa.gov

To view the ESD and cleanup plan, visit:

EPA's Blackbird Mine webpage
http://www.epa.gov/r10earth/
(Go to *Index* then click on *B* to find *Blackbird Mine Superfund Site*)

Salmon Public Library
204 Main Street, Salmon, Idaho

U.S. EPA Idaho Operations Office
1435 North Orchard Street, Boise, Idaho
Please call for hours: (208) 378-5746

U.S. EPA Region 10 Records Center
1200 6th Avenue, Seattle, Washington
Please call for an appointment (206) 553-4494

USEPA SF
1270391

U. S. Environmental Protection Agency
1200 Sixth Avenue, ETPA-081
Seattle, Washington 98101-1128

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U.S. EPA
Permit No. G-35
Seattle, WA

Blackbird Mine Superfund Site,
Lemhi County, Idaho
September 2007

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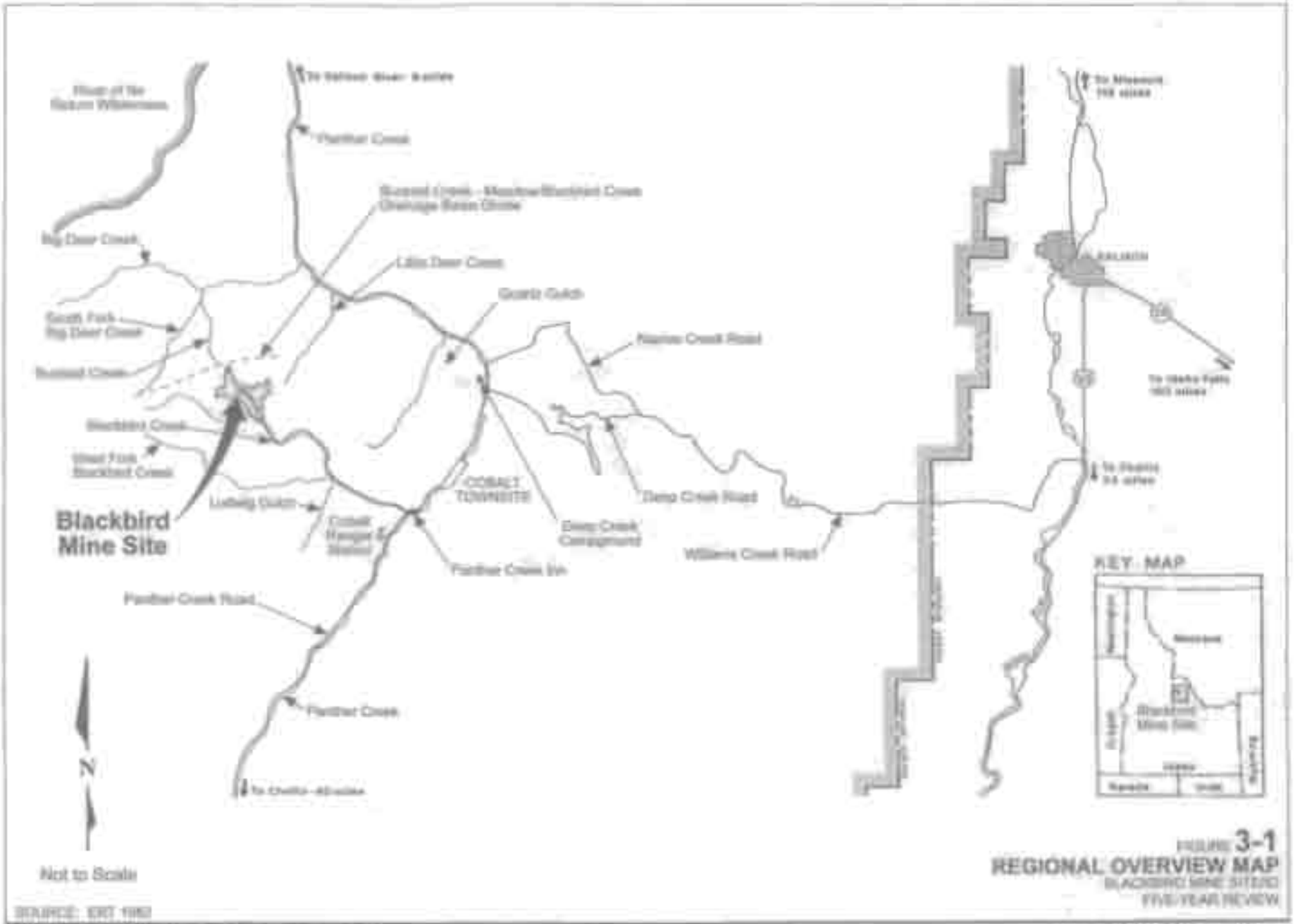
Figures



SOURCE: ERT 1992

FIGURE 3-1
REGIONAL OVERVIEW MAP
BLACKBIRD MINE SITE
FIVE-YEAR REVIEW

After Golder Associates

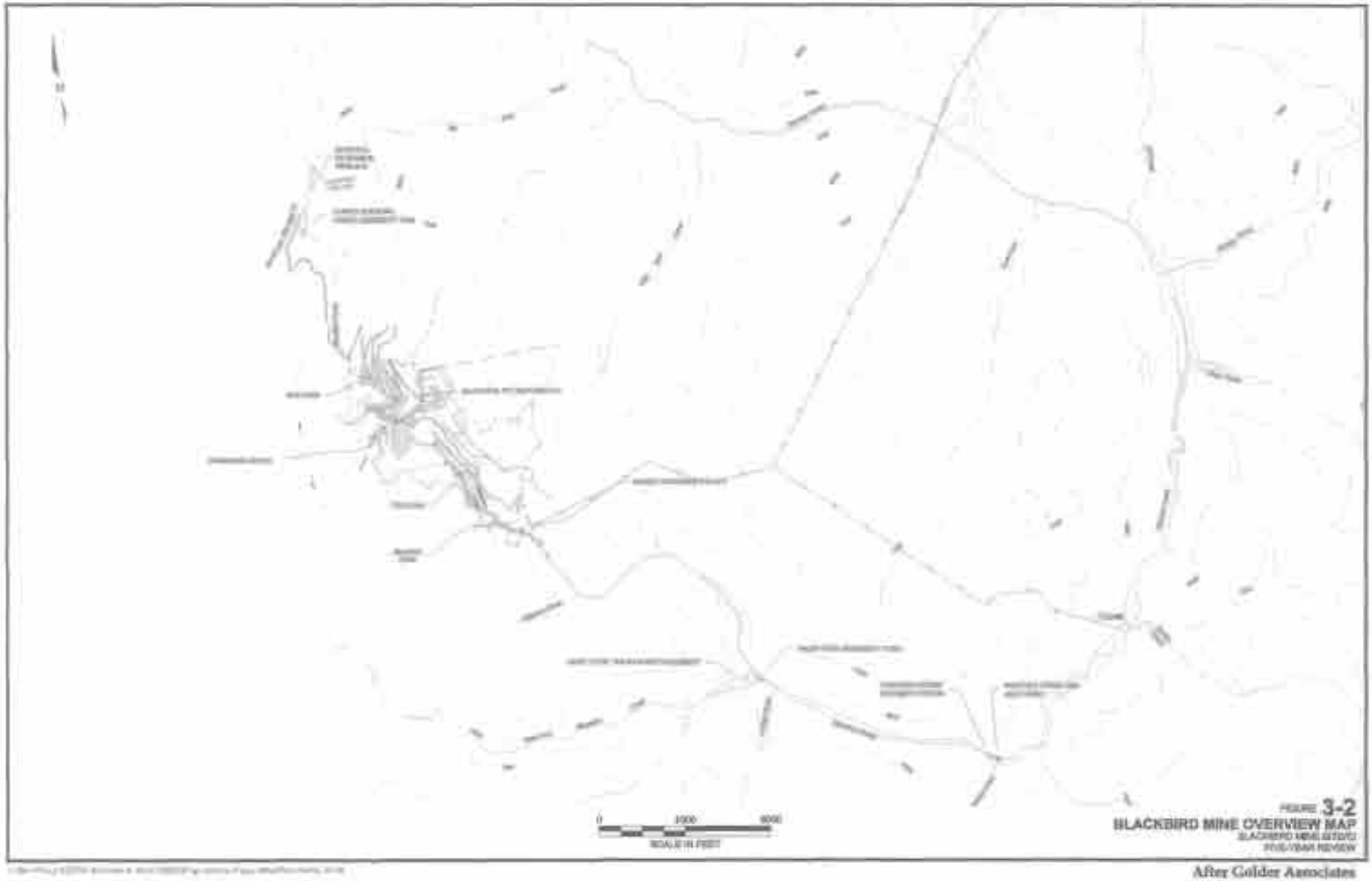


FIGURE 3-2
BLACKBIRD MINE OVERVIEW MAP
BLACKBIRD MINE, IDTO/ID
FYI5-YR5 REVIEW

After Golder Associates

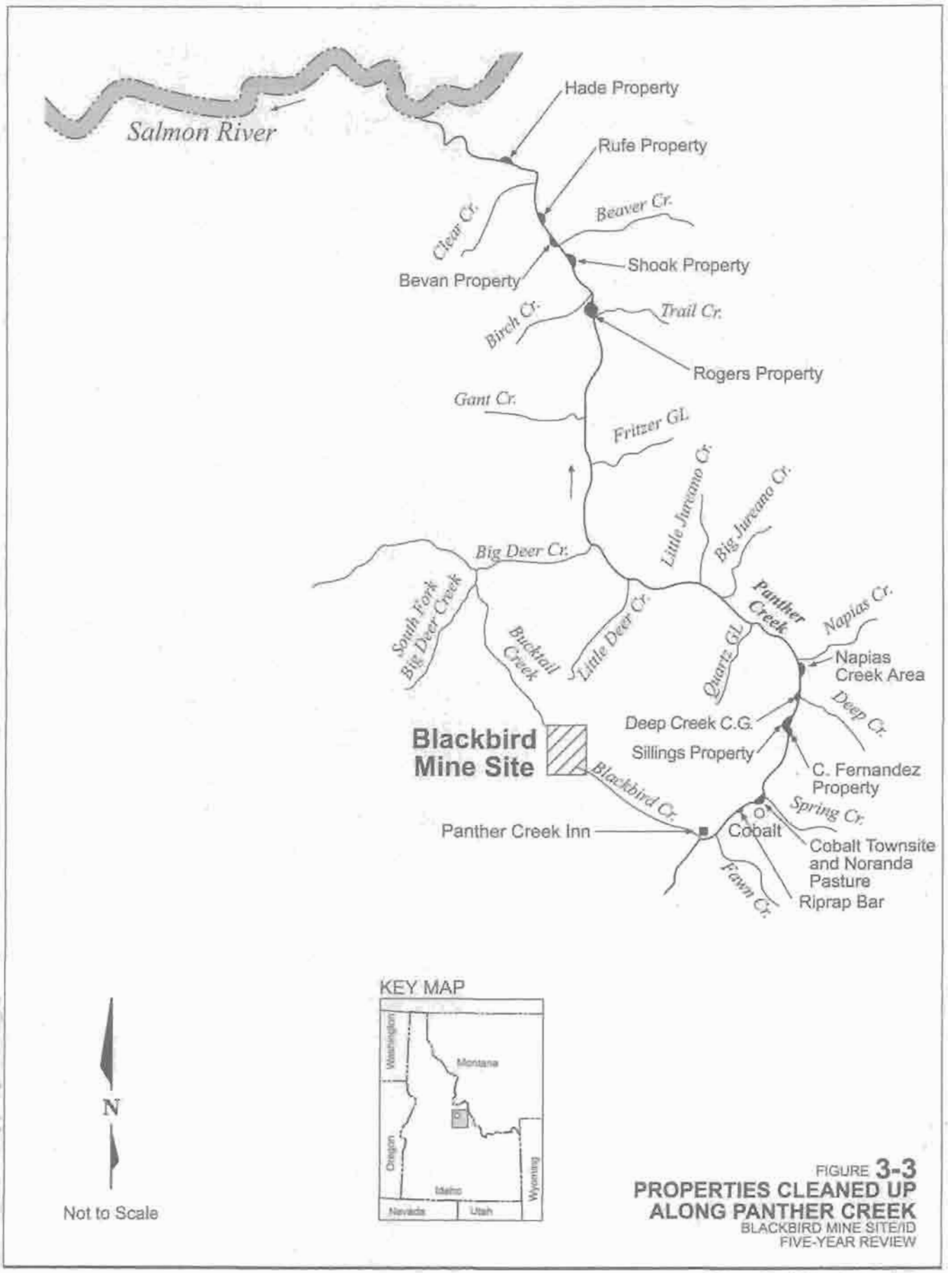
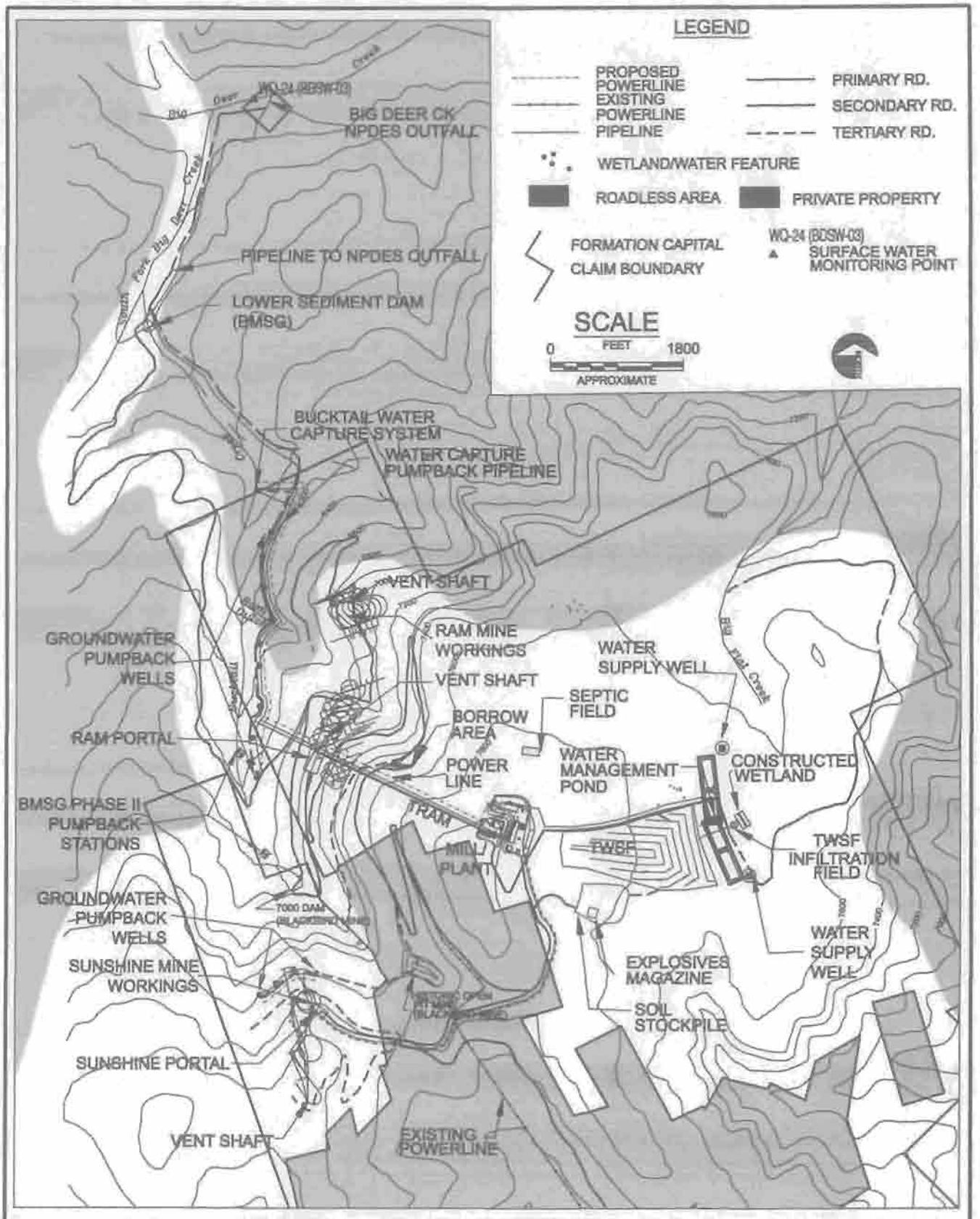


FIGURE 3-3
PROPERTIES CLEANED UP ALONG PANTHER CREEK
BLACKBIRD MINE SITE/ID
FIVE-YEAR REVIEW

After Golder Associates



IDAHO COBALT PROJECT FORMATION CAPITAL CORPORATION, U.S. LEMHI COUNTY, IDAHO	Jan, 2008	PREFERRED ALTERNATIVE FOR IDAHO COBALT PROJECT BLACKBIRD MINE SITE/ID FIVE-YEAR REVIEW

FIGURE 3-4

After Hydrometrics

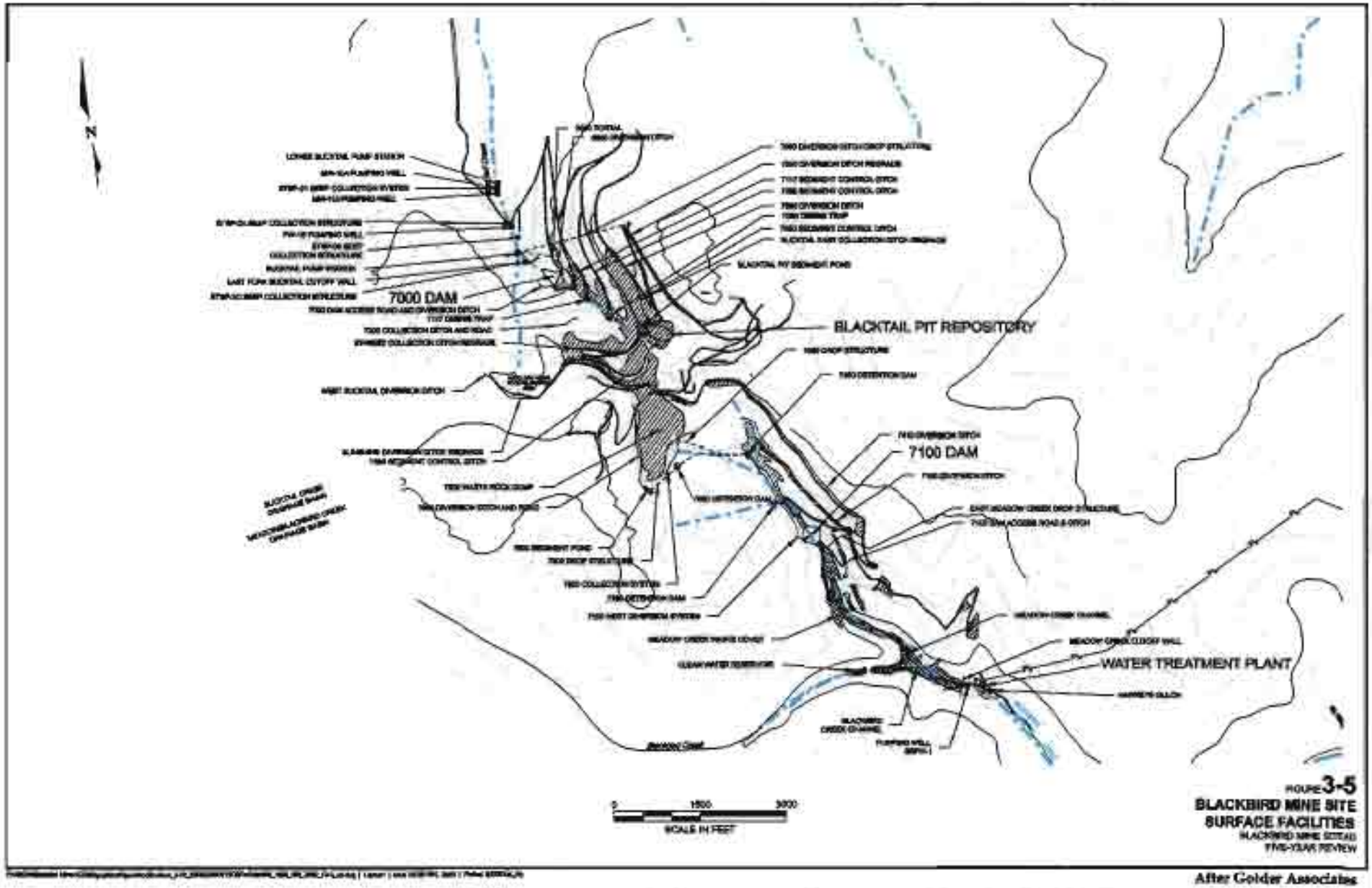


FIGURE 3-5
BLACKBIRD MINE SITE SURFACE FACILITIES
BLACKBIRD MINE SITE(S)
FIVE-YEAR REVIEW

After Golder Associates

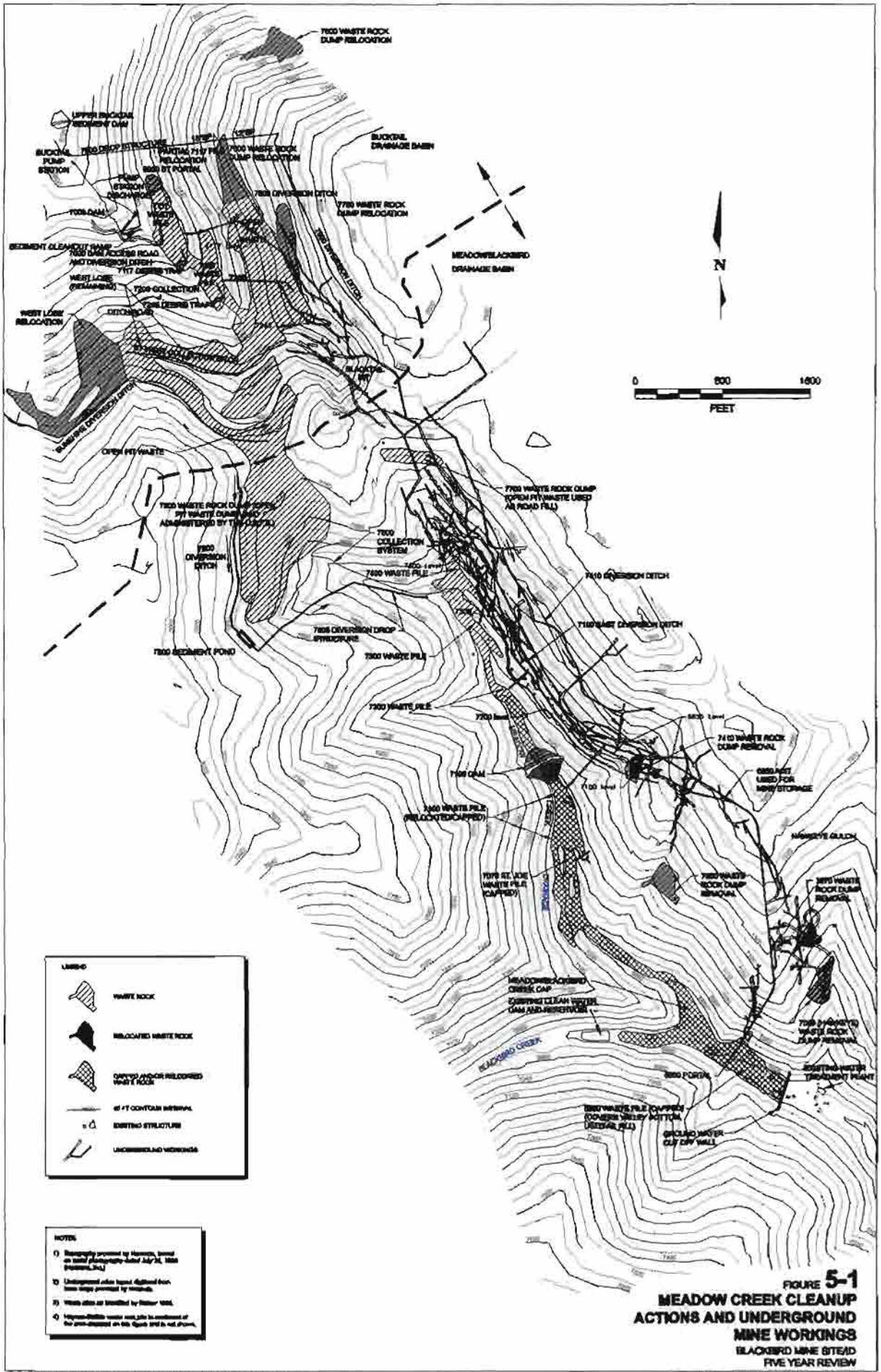
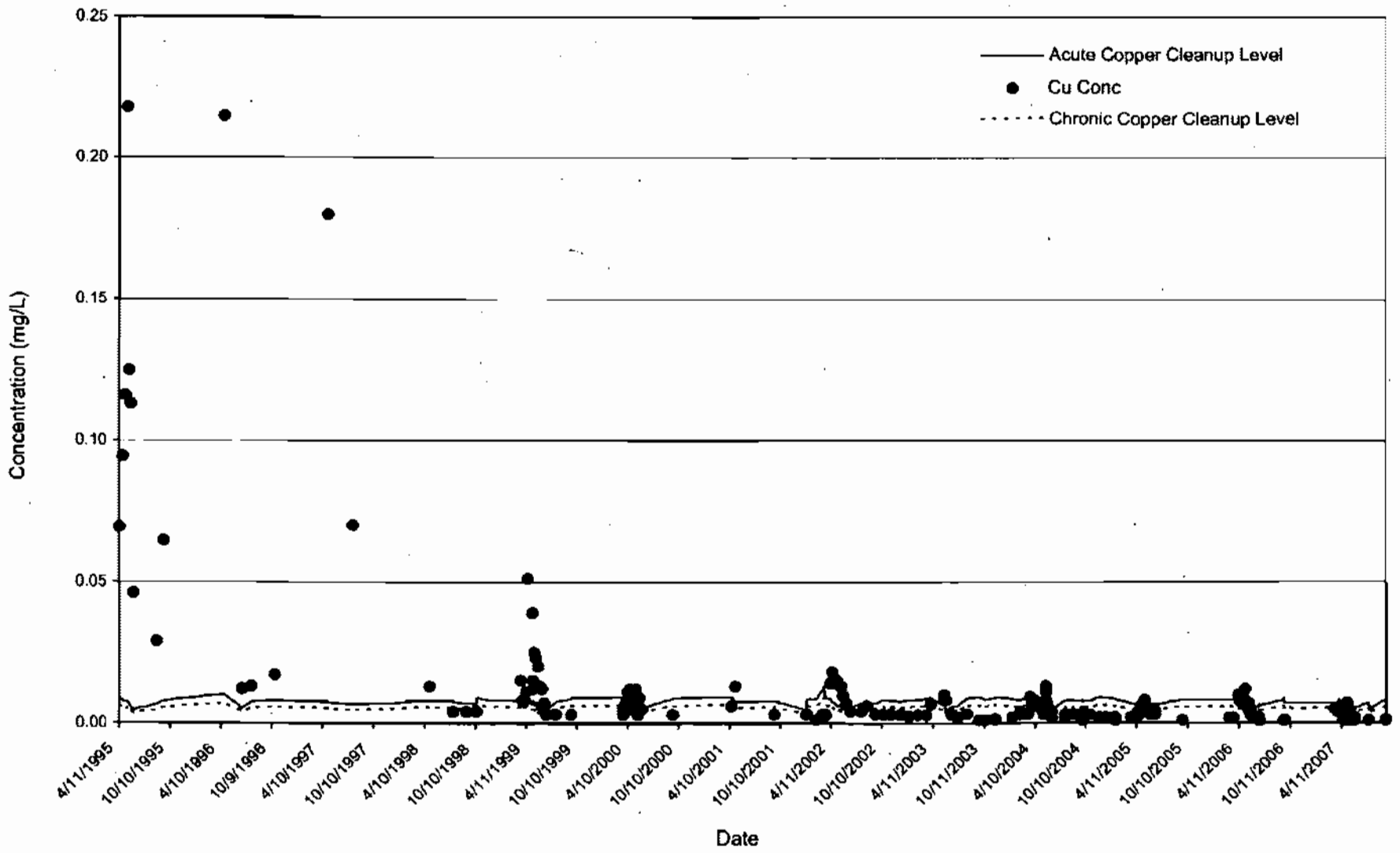


FIGURE 5-1
MEADOW CREEK CLEANUP ACTIONS AND UNDERGROUND MINE WORKINGS
BLACKBIRD MINE SITE/D
FIVE YEAR REVIEW

After Golder Associates

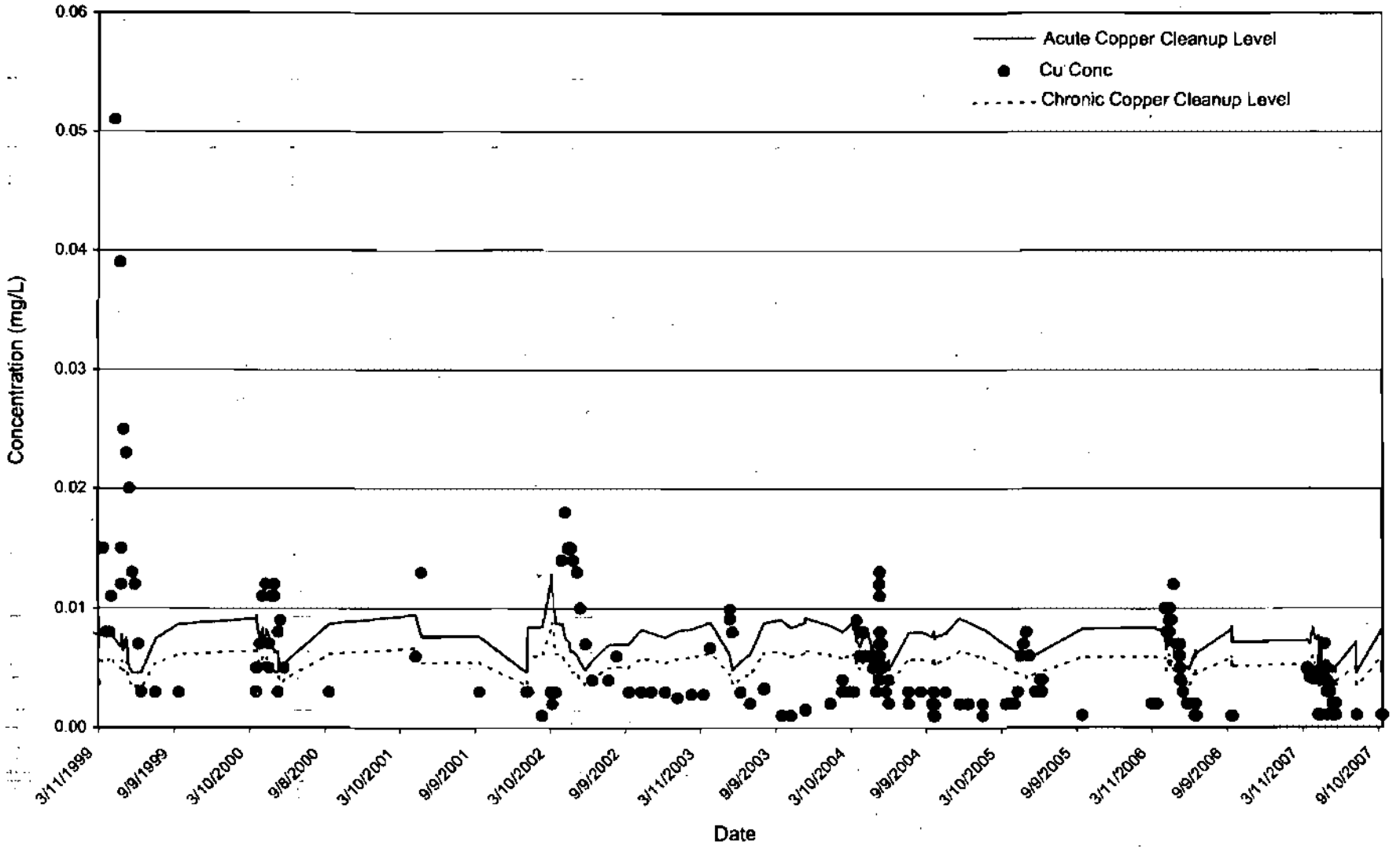


IWQS- Idaho Water Quality Standards
CCC - Criteria Continuous Concentration (chronic criteria)
CMC - Criteria Maximum Concentration (acute criteria)

FIGURE 6-1

1995 to 2007 DISSOLVED COPPER CONCENTRATIONS IN PANTHER CREEK DOWNSTREAM FROM BLACKBIRD CREEK

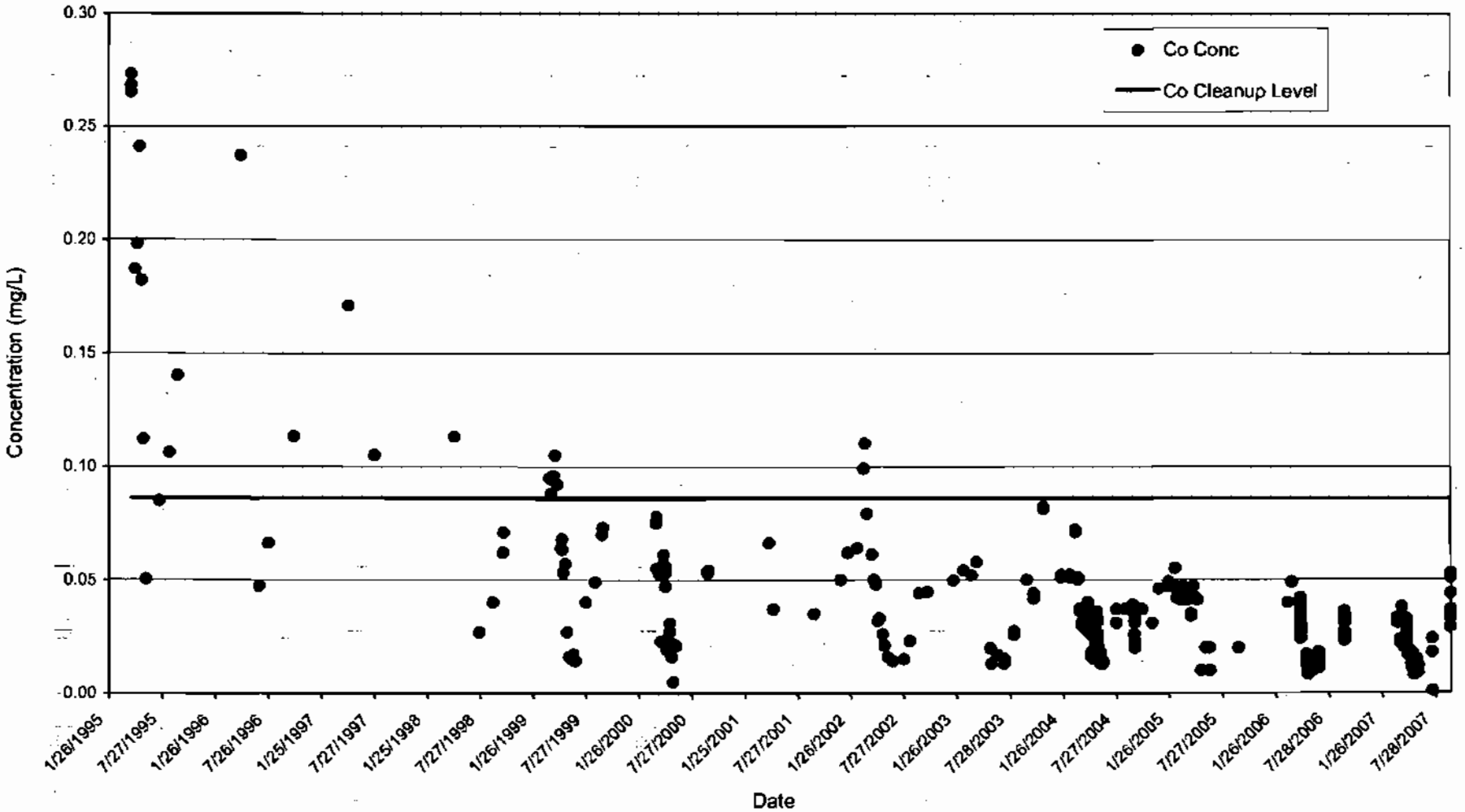
After Golder Associates



IWQS - Idaho Water Quality Standards
CCC - Criteria Continuous Concentration (chronic criteria)
CMC - Criteria Maximum Concentration (acute criteria)

FIGURE 6-2

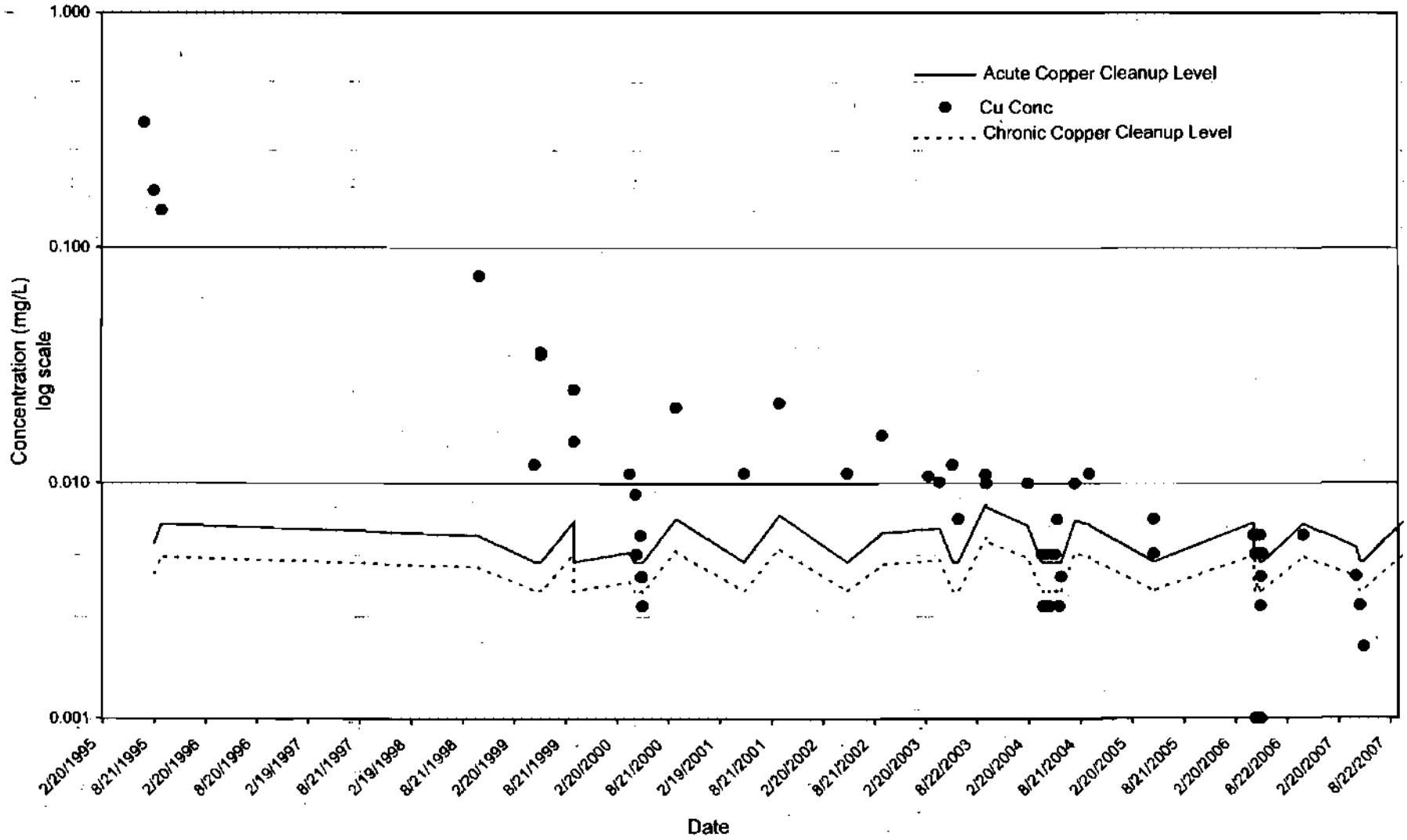
1999 to 2007 DISSOLVED COPPER CONCENTRATIONS IN PANTHER CREEK DOWNSTREAM FROM BLACKBIRD CREEK



Cobalt WQCL - Cobalt Water Quality Cleanup Level; A site-specific cobalt toxicity test program was conducted to determine the appropriate cobalt cleanup value for Blackbird Mine. After the conclusion of the toxicity testing, EPA selected a cobalt cleanup value of 86 ppb. The BMSG disagrees and believes that the cleanup value based on the toxicity testing results should be 101 ppb cobalt. Because recent stream values have been below 86 ppb, EPA has advised the BMSG that it is not requesting response actions to address cobalt at this time.

FIGURE 6-3

1995 to 2007 DISSOLVED COBALT CONCENTRATIONS IN PANTHER CREEK DOWNSTREAM FROM BLACKBIRD CREEK

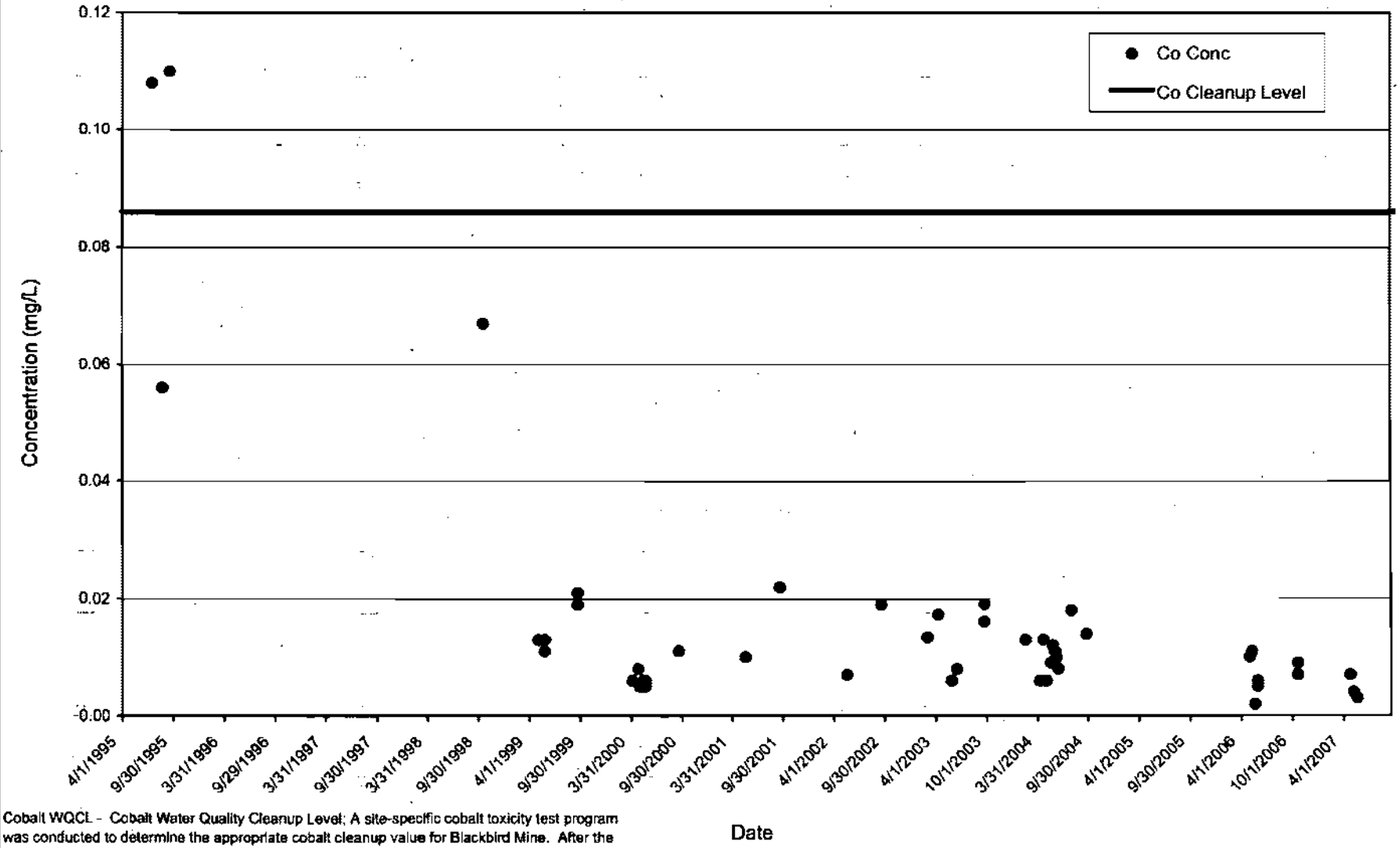


IWQS - Idaho Water Quality Standards
CCC - Criteria Continuous Concentration (chronic criteria)
CMC - Criteria Maximum Concentration (acute criteria)

FIGURE 6-4

1995 to 2007 DISSOLVED COPPER CONCENTRATIONS IN BIG DEER CREEK DOWNSTREAM FROM SOUTH FORK BIG DEER CREEK

After Golder Associates



Cobalt WQCL - Cobalt Water Quality Cleanup Level; A site-specific cobalt toxicity test program was conducted to determine the appropriate cobalt cleanup value for Blackbird Mine. After the conclusion of the toxicity testing, EPA selected a cobalt cleanup value of 86 ppb. The BMSG disagrees and believes that the cleanup value based on the toxicity testing results should be 101 ppb cobalt. Because recent stream values have been below 86 ppb, EPA has advised the BMSG that it is not requesting response actions to address cobalt at this time.

FIGURE 6-5

1995 to 2007 DISSOLVED COBALT CONCENTRATIONS IN BIG DEER CREEK DOWNSTREAM FROM SOUTH FORK BIG DEER CREEK