CHAPTER 3. AFFECTED ENVIRONMENT

Introduction

This chapter describes the existing environmental resources in the Idaho Cobalt Project (ICP) study area. Components of the environment that could be affected by the proposed Project have been reviewed and analyzed. NEPA regulations at 40 CFR 1502.15 have been used to guide the baseline investigations, as well as comments received from the general public, local, state, and federal agencies, Tribes, and other organizations during the Project's public scoping process and Scoping Content Analysis conducted in 2001 (see Public Involvement Section in Chapter 1). NEPA regulations require that the EIS "succinctly describe the environment of the area" and further requires that the "data…shall be commensurate with the importance of the impact."

Since completion of the 2001 public scoping process, a review of issues key to the preparation of this EIS has been ongoing between the FS, EPA, EIS team, Idaho State agencies, other federal agencies, and Tribes. This review and comment process has been accomplished in large part through the Idaho Joint Review Process.

As a portion of FCC's initial January 2001 submittal to the FS of a Plan of Operations (POO), FCC provided several baseline environmental studies to support the POO. The FS and EIS multidisciplinary team with expertise in earth, biological, and social sciences reviewed the baseline studies submitted by FCC. This team examined existing information, determined additional information needs, and developed data collection strategies. Following the initial 2001 review, and a review of FCC's February 2005 modified POO, additional baseline environmental studies and characterizations have been conducted regarding key environmental subjects related to the completion of this DEIS for the proposed ICP. These additional baseline studies and characterizations have included vegetation, wetlands, wildlife, fisheries, cultural and historic resources, noise, recreation, visual, and wilderness resources, socio-economics, and expanded surface water and groundwater quality monitoring. Baseline environmental study updates regarding key elements would continue throughout the EIS process including comprehensive surface water and groundwater quality monitoring which would continue through the life of the Project.

A complete discussion of the analyses conducted by the FS and EIS multidisciplinary team has been documented in technical reports and can be reviewed at the SCNF Forest Supervisor's Office in Salmon. On the following pages the significant features of the environment that may potentially be affected by the proposed ICP are discussed. Disciplines addressed in this chapter include:

- Air Quality;
- Geology;
- Soils;
- Hydrology and Water Quality/Quantity (Surface Water and Groundwater);
- Jurisdictional Wetlands and other Waters of the U.S.;
- Aquatic Biology/Fisheries and Threatened, Endangered, and Candidate Species;
- Vegetation and Threatened, Endangered, and Candidate Species;
- Wildlife and Threatened, Endangered, and Candidate Species, including FS Management Indicator Species (MIS);
- Land Use/Management;
- Cultural and Historic Resources;
- Recreation, Visual, and Wilderness Resources;
- Noise;
- Transportation;
- Socio-Economic Resources; and
- Blackbird Mine/CERCLA.

Geology and Geotechnical Characteristics

Physiography

The Idaho Cobalt Project is located in the Rocky Mountain physiographic province. Elevations at the ICP range from 6,000 to 8,200 above sea level. Slopes range from less than 5 percent on some ridge locations to over 80 percent. Proposed mining operations are located in the upper reaches of Bucktail Creek (a tributary to South Fork Big Deer Creek, which after joining Big Deer Creek flows to Panther Creek drainage, which is a tributary to the Salmon River) and Big Flat Creek (which is a tributary of Panther Creek).

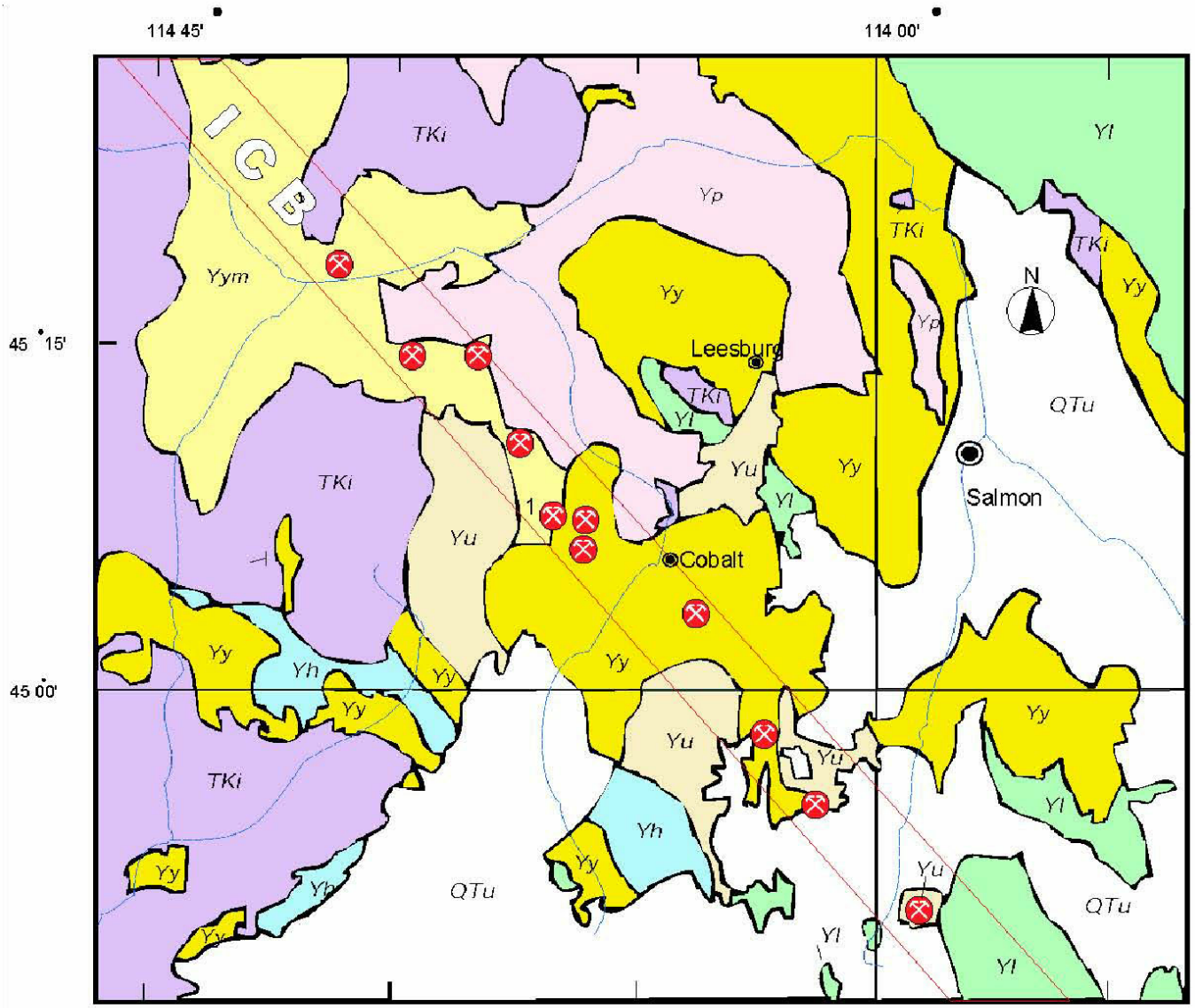
Regional Geology

The Idaho Cobalt Project is located within the Idaho Cobalt Belt (ICB), which is a 35 mile long zone containing Pre-Cambrian rocks enriched in cobalt, copper and gold aligned in a northwest trending belt in east central Idaho (Pegg, 2001) (**Figure 3-1**). These sedimentary rocks were deposited approximately 1.5 billion years ago in a sedimentary basin covering much of northern Idaho and western Montana. The basin was expanding along faults where hot fluids brought cobalt, copper and gold to the seafloor where the metals were deposited as “sedimentary exhalites” similar to black smokers that are currently active along sea floor spreading ridges. The sediments eventually metamorphosed by heat and pressure from burial by younger strata. The metamorphism changed the appearance of the rocks, more so in some places than in others, but the original composition of the rocks, including the metals, stayed the same. These sediments were then again exhumed by uplift and erosion and brought to light in the ICB. Mineralization in the ICB provides a rare opportunity to find and develop primary production of cobalt in the U.S.

Geology of the Idaho Cobalt Project Area

Quartzites, pelites and biotite-rich strata historically interpreted as Yellowjacket Formation host the Ram and Sunshine deposits (Pegg, 2001). Various authors (e.g. Link et al., 2003) have correlated these strata with the Apple Creek Formation. The quartzites and pelites are the metamorphosed sand, mud, and silt originally deposited in the Proterozoic Belt Supergroup sedimentary basin. Biotite-rich strata are interpreted as metamorphosed volcanic rocks that were episodically deposited in the basin, perhaps along the same faults that carried mineralizing fluids. Strata typically strike northwest and dip moderately to steeply toward the east (**Figure 3-2**). The Project area is transected by several steep, north-trending faults. Two of these faults, the White Shear and the Northfield appear to demark the limits of mineralization in the district. Mineralization in the Ram and Sunshine deposits typically occurs in stacked bedding parallel horizons dominated by the biotite-rich strata. Ore consists of predominantly bedding concordant cobaltite, chalcopyrite, minor pyrite +/- pyrrhotite bands, blebs, stringers and disseminations. Mineralization remobilized during metamorphism occurs in discordant quartz veinlets and stringers.

Within the Idaho Cobalt belt, the seafloor sediments were locally enriched with sulfides due to exhalation of arsenic rich copper and cobalt sulfides (principally chalcopyrite ($(CuFe)S_2$) and cobaltite (CoAsS) from hot solutions that emanated from vents called “black smokers.” Pyrite (FeS_2) is present but is not the dominant sulfide mineral in the ICP ore zones (typically less than 1 percent), making them quite distinctive in their geochemical make-up. Like many syngenetic deposits, the contact between ore and unmineralized rock is relatively sharp (Evans et al., 1995), occurring over a distance of less than one meter.



Phanerozoic

- QTu — VOLCANIC AND SEDIMENTARY ROCKS
- TKi — INTRUSIVE ROCKS, EOCENE AND LATE CRETACEOUS

Middle Proterozoic

- Yl — LEMHI GROUP
- Yu — METASEDIMENTARY ROCKS OF UNCERTAIN CORRELATION
- Yp — PLUTONIC ROCKS
- Yh — HOODOO QUARTZITE
- Yy — YELLOWJACKET FORMATION
- Yym — YELLOWJACKET FORMATION - Metamorphosed to gneiss and schist

ICB IDAHO COBALT BELT

Cobalt (Copper,* Gold) Prospects

1 Blackbird Mine / Idaho Cobalt Project

IDAHO COBALT PROJECT FORMATION CAPITAL CORPORATION, U.S. LEMHI COUNTY, IDAHO	**REGIONAL GEOLOGY** **IDAHO COBALT BELT** January, 2006	FIGURE **3-1**

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LEGEND

- MAFIC SEQUENCES
- CONTACT
- COBALT/COPPER MINERALIZATION (ZONES)
- MAIN MINE SEQUENCE MINERALIZATION (ZONES)
- FAULT
- STRIKE AND DIP OF BEDDING

YELLOW JACKET FORMATION

- Pyu UPPER UNIT
- Pym MIDDLE UNIT
- Pyl LOWER UNIT

IDAHO COBALT PROJECT FORMATION CAPITAL CORPORATION, U.S. LEMHI COUNTY, IDAHO	IDAHO COBALT PROJECT AREA GEOLOGY January, 2006	FIGURE 3-2

Mining History of Idaho Cobalt Project Area

Blackbird Mine District

Mineralization in the ICP area was discovered in 1892 when a prospector found copper mineralization along Blackbird Creek. Cobalt was recognized in 1901 but there was no market at that time. Exploration and development of copper and cobalt ores in the district has continued sporadically ever since. Several million tons of ore have been produced from both underground and surface mines in the district, primarily from the Blackbird Mine. Development at the Blackbird Mine eventually consisted of some 15 miles of underground workings, an open pit mine, and milling facilities.

Idaho Cobalt Project

Mineralization contained within ICP holdings received relatively minor attention until 1994 when the Blackbird Mining Company dropped claims peripheral to their holdings and FCC restaked those claims. Formation began exploration in 1995, completing geologic mapping, soil sampling and drilling programs. Early exploration efforts by ICP were focused on the Sunshine Deposit that Calera Mining Co. identified and explored in the 1950's. Formation identified mineralization in the Ram deposit area through geologic mapping and soil sampling. ICP plans on producing from the Ram and Sunshine deposits and ongoing exploration may identify additional mineralization. As of September 2006, FCC had completed 184 drill holes totaling approximately 123,213 feet of drilling, collected 8,427 soil samples and 1,025 rock chip samples.

Formation completed a pre-feasibility study in 1998 and updated the study in 2001, 2005 and 2006 incorporating additional metallurgical, geotechnical, and drill hole data. Mineral resources identified to date and described in the Plan of Operations (FCC, 2006) total 2,570,000 tons. This number forms the basis for sizing facilities such as the tailings-waste rock storage facility (TWSF) mine, and mill. The amount of ore that can be economically mined depends in large part on the metal prices, and could increase or decrease if metals prices change in the future. Additional undiscovered ore reserves may also be present in the FCC claim area.

Other Mining Activity

There is no significant mining production coming from the immediate ICP area. The most recent production came from the Beartrack project near Leesburg approximately 15 miles to the northwest. The Beartrack project is currently undergoing final reclamation. Historic impacts from mining operations on Blackbird Mining Company property are currently being remediated by the Blackbird Mine Site Group (BMSG) under superfund (CERCLA) authority. Exploration of other mining prospects in the area occurs when metal prices provide incentive.

Cobalt Production and Uses

Cobalt is considered a strategic metal because of its uses in the defense industry and the fact that the U.S. relies heavily on imports for supplies. It is used in industrial, high-tech, medical, environmental, and strategic applications. It is used in radial tires, prosthetic limbs, and jet engines. Demand for cobalt is expected to increase with higher demands for high-tech products such as cell phones, fuel cells, and solar panels.

The U.S. currently consumes over 20 percent of the world production of cobalt, nearly all of which is imported. U.S. production of cobalt is byproduct from mines producing other metals such as copper and nickel, and from recycling. There are no current primary producers of cobalt in the U.S. The ICP could supply up to approximately 18 percent of U.S. demand for cobalt during the life of the mines.

Property Status

The ICP property consists of 146 unpatented lode claims totaling approximately 2,529 acres of land administered by the U.S. Forest Service (**Figure 3-3**). These claims are peripheral to patented and unpatented claims held by the Blackbird Mining Company.

Existing Geotechnical Environment

Soils at the "Big Flat," within the ICP Project area, consist of a surface layer of colluvium derived from weathering bedrock. Bedrock below the colluvium is generally at a depth less than 6 feet. Slopes on the "Big Flat" are generally around 6 or 7 percent.

The upper 6 inches of colluvium consist of loose, silty sand with a trace of organics and gravels. Large cobbles and boulders are scattered throughout the site in this upper soil layer. Beneath the surface soil layer, the colluvium gradually grades to a denser, non-stratified silty sand with some subangular gravel and then to bedrock. Bedrock in the Big Flat is comprised of weathered, highly fractured, bedded siltites and greenstones with a weak fabric of mica interspersed in bands within the bedrock.

Earthquakes (Seismicity)

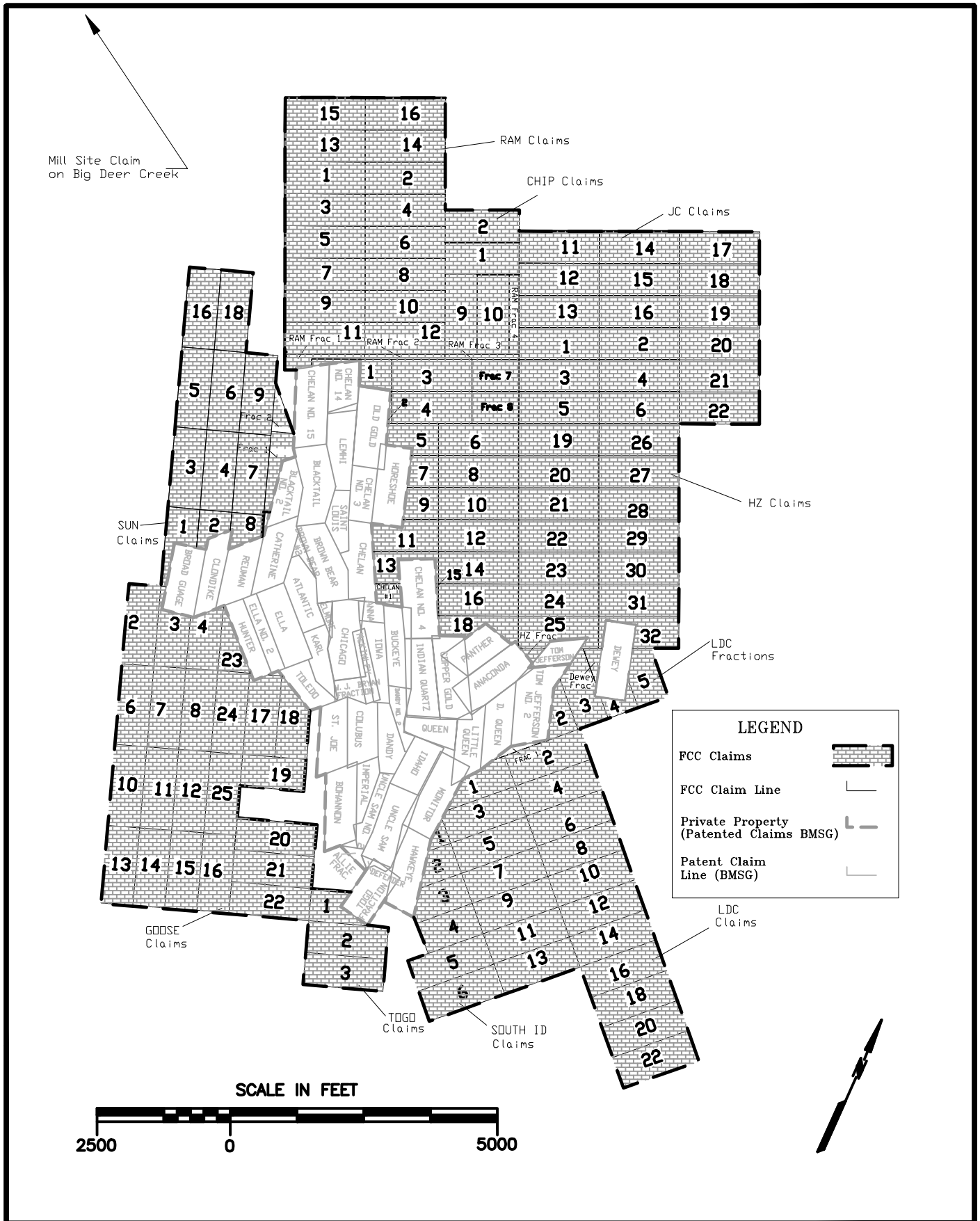
The Big Flat is located in International Building Code's (IBC) Seismic Region 2. Region 2 is often referred to as the Intermountain Seismic Belt and is classified as having 'moderate' earthquake potential. A branch of this belt, called the Centennial Tectonic Belt, extends west from Yellowstone Park, through southwestern Montana, into central Idaho and includes at least eight major active faults. Two of the largest historic earthquakes in the northern Rocky Mountains, the 1959 Hebgen Lake and 1983 Borah Peak Earthquakes, occurred along this branch of the Intermountain Seismic Belt. These earthquakes were magnitude 7.5 and 7.3 and were centered 260 and 125 kilometers from the site, respectively. The largest recorded earthquake in the past 60 years, within 100 kilometers of the site, occurred in February of 1945. The earthquake's epicenter was located approximately 99 kilometers south of the site, and had a recorded Richter Magnitude of 6.0.

Available data suggests that an earthquake as large as Richter Magnitude 6.0 can be expected within 100 kilometers of the site approximately every 60 years. On a more infrequent basis, larger earthquakes may be possible near the site. Constructed buildings must be designed to withstand the expected earthquake magnitudes associated with IBC's Region 2.

Water Resources

This section on water resources recognizes five primary categories and the interactions between these components: climate, groundwater, surface water, sediment and geochemistry. Additional information regarding project geology and mineralogy can be found in the Geology and Geotechnical Characteristics section of this Chapter. The emphasis on the description of geochemistry in this Section is placed on characterization of the potential for ore, waste rock, and tailings to impact water resources through the release of acidity and soluble metals. As identified during Scoping, the Panther Creek drainage is the area of concern for water quality. Primary streams of interest include Blackbird, Bucktail, Big Flat, Little Deer, and Big Deer Creeks. Secondary areas of concern are those streams which could be indirectly impacted by the proposal or which could be affected by accidental spills of hazardous materials along the transportation route.

The ICP lies within the Panther Creek drainage, which flows to the Salmon River near Shoup, Idaho. Panther Creek, Salmon River, and various tributaries form the Middle Salmon River-Panther Creek subbasin (HUC #17060203), which encompasses approximately 1,800 square miles with nearly



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IDAHO COBALT PROJECT PROPERTY OWNERSHIP AND CLAIMS

Jan, 2008

FIGURE 3-3

2,000 stream miles (**Figure 3-4**). Elevations of the subbasin area range from 2,085 feet in the Salmon River valley to 10,985 feet at Lemhi Peak. Other major or notable streams in the subbasin include the North Fork Salmon River, Williams Creek, and Napias Creek.

The ICP lies near the headwaters of several drainages: Bucktail Creek, Big Deer Creek, Big Flat Creek, Little Deer Creek, and Blackbird Creek. All of these drainages ultimately flow into Panther Creek. In addition, the transportation route to the ICP lies in portions of the Williams Creek and Deep Creek drainages. Williams Creek is tributary to the Salmon River upstream of the city of Salmon. Deep Creek is tributary to Panther Creek between Blackbird Creek and Napias Creek.

Past and Ongoing Actions Relevant to Current Conditions

Current water resource conditions in the ICP are affected by historic mining at the Blackbird Mine Site that occurred from the late 1800s until 1982 and cleanup actions associated with the Blackbird superfund (CERCLA) site that began in 1995 and are ongoing. The Clear Creek fire which burned most of the ICP area and a large portion of the surrounding watersheds in 2000 has also had a significant impact on the Project area. These past actions have resulted in effects to stream sediments, water quality, and watershed yield.

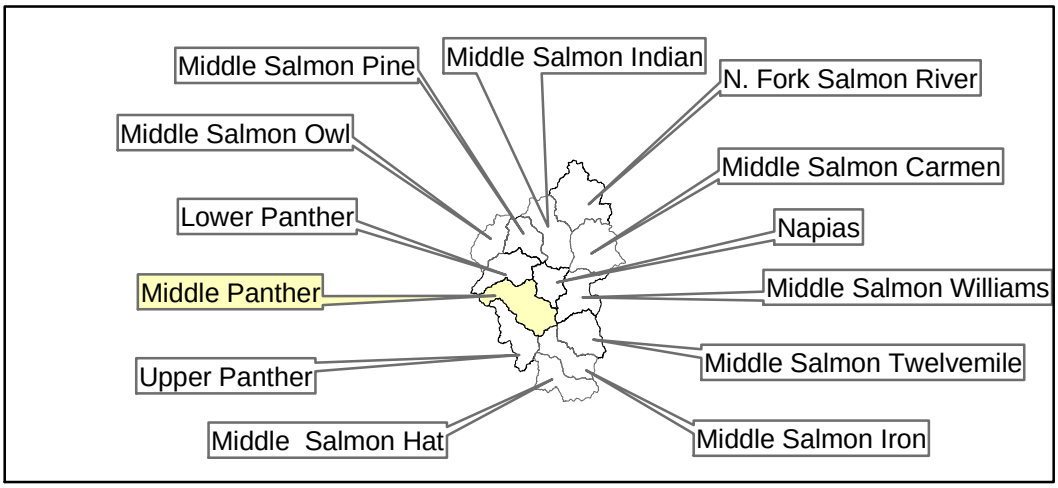
Blackbird Mine Site

The Blackbird Mine Site is an inactive mine located in Lemhi County, Idaho approximately 13 miles south of the Salmon River, 25 miles west of Salmon, Idaho and adjacent to the ICP (see **Figure 1-1).** The Blackbird Mine Site covers approximately 830 acres of private patented mining claims within the Salmon-Challis National Forest (**Figure 3-3**). Mining activity resulted in about 14 miles of underground workings, a 12-acre open pit, 4.8 million tons of waste rock deposited in numerous piles, and two million tons of tailings disposed of at a tailings impoundment.

The Blackbird Mine site spans the Bucktail Creek and Meadow/Blackbird Creek drainages. These drainages flow into Panther Creek. Acid rock drainage from waste rock piles, underground workings, a historic tailings impoundment, and tailings deposited along streams have resulted in the release of elevated levels of hazardous substances to the environment (groundwater, surface water and soils), including but not limited to copper, cobalt and arsenic. These releases have contributed to elevated levels of dissolved copper and cobalt in Panther Creek and some of its tributaries. Contaminated soil, sediments, waste rock and tailings were also released from the Blackbird Mine site during high water flows from thunderstorms and snowmelt and deposited in soil along the banks of downstream creeks (referred to as overbank deposits/soil) including Bucktail Creek, South Fork Big Deer Creek, Big Deer Creek, Blackbird Creek, and Panther Creek. Investigations show that irrigation also spread contaminated material along Panther Creek in the overbank soil as well as in pastures. Cleanup levels for overbank deposits were established in the Blackbird ROD for areas that posed a potential risk. Only overbank deposits along Blackbird Creek and Panther Creek showed a potential risk to humans. The cleanup levels for these creeks were based on whether the area was used for recreational or residential purposes. Stream sediments in portions of the area exceed the sediment cleanup levels established in the Blackbird ROD (USEPA, 2003) for arsenic, cobalt and copper of 35, 80, and 637 milligrams per kilogram (mg/kg), respectively. Because of natural mineralization in the area, the sediment cobalt cleanup level for South Fork Big Deer Creek was set at 436 mg/kg rather than 80 mg/kg.

The fisheries and aquatic resources downstream of the Blackbird Mine have been impacted by copper and cobalt releases. Dissolved copper concentrations in area creeks downstream from the mine frequently exceed the State of Idaho water quality standard (WQS) (IDAPA 58.01.02) for protection of aquatic life (Shaw, 2004; Golder, 2005). The current Idaho WQS for arsenic is 50 parts per billion (ppb). The Idaho WQS for copper for protection of aquatic life is variable depending on water hardness and is approximately 4 ppb at hardness values typically found in ICP area streams. Idaho does not currently have a water quality standard for cobalt, however EPA has proposed a cleanup level of 86 ppb (Allans, 2005) for the Blackbird Mine site.

Middle Salmon-Panther Subbasin 17060203



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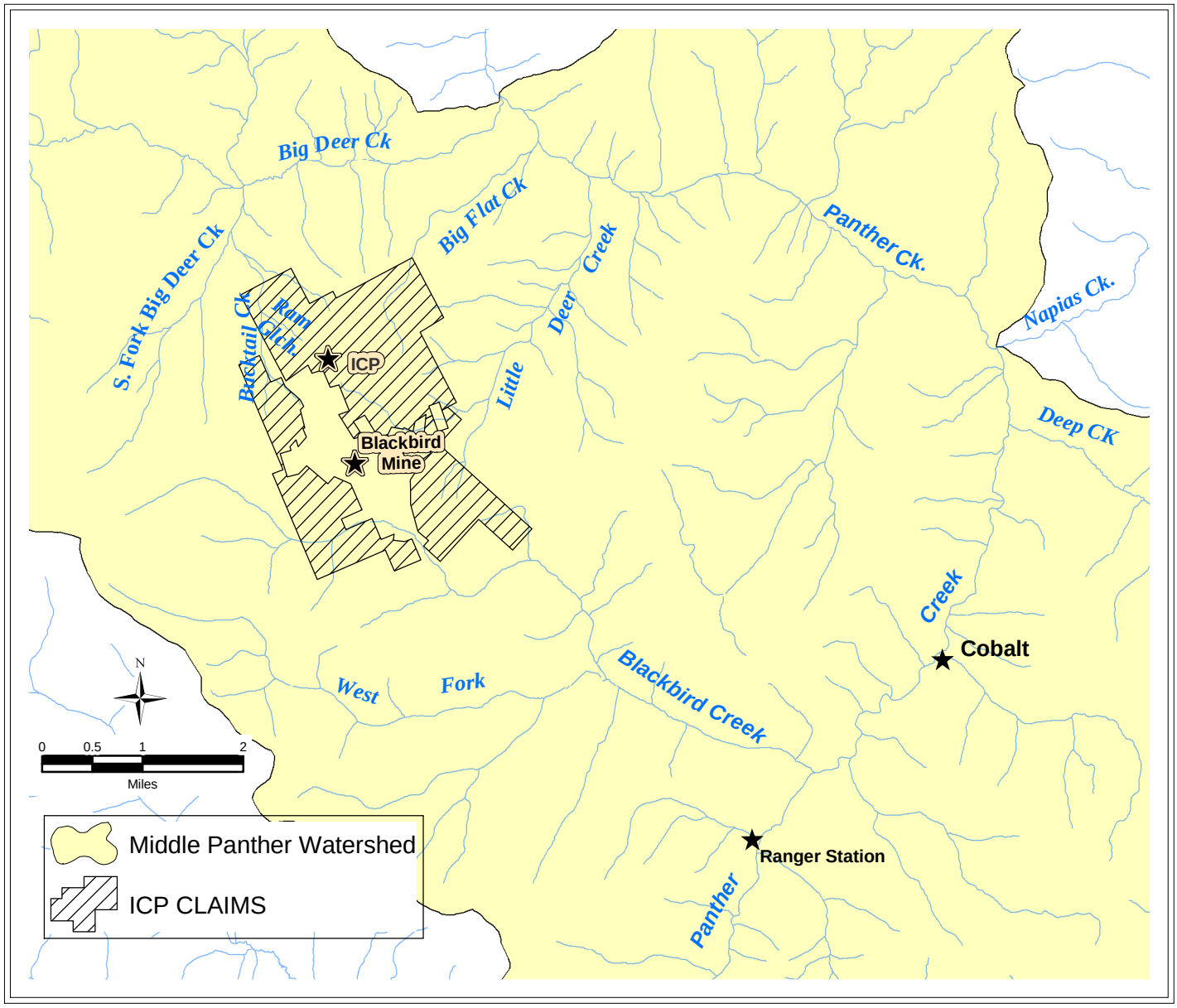


IDAHO COBALT PROJECT FORMATION CAPITAL CORP. U.S. LEMHI COUNTY, IDAHO	**STREAMS AND WATERSHED BOUNDARIES** **IDAHO COBALT PROJECT AREA** January, 2006	Figure 3-4

Ongoing CERCLA Response and Restoration Action

Several actions have been conducted and are ongoing at the Blackbird Mine Site to address the releases of contaminants and the injuries to natural resources, which resulted from the releases. In 1995, the M.A. Hanna Company, Hanna Services Company, Noranda Mining, Inc., Noranda Exploration, Inc., Blackbird Mining Company Limited Partnership, and Alumet Corporation settled litigation brought by the United States and the State of Idaho under the Comprehensive Environmental Response, Compensation, and Liability Act, the Clean Water Act, the Endangered Species Act, and State law. Under a 1995 Consent Decree, the companies agreed to take response actions at the site to clean up the contamination, and to implement a detailed natural resources restoration plan known as the Biological Restoration and Compensation Plan (BRCP) (*State of Idaho, et al. v. The M.A. Hanna Company, et al.*, Consolidated Case No. 83-4179(R) (D. Idaho, 1995)).

The Blackbird Mine Site Group (BMSG), composed of current owner/operator Blackbird Mining Company (Noranda Mining, Inc.), and former owners and operator Intalco (formerly Alumet) was formed to represent the companies in the cleanup and restoration of the site. Response actions at the site have included emergency actions to address imminent releases from the West Fork Tailings Impoundment; non time-critical removal actions (the Early Actions) conducted in the Bucktail Creek basin, in the Meadow/Blackbird Creek basin to address water quality and along Panther Creek to address human health concerns; and investigations and studies to complete the Remedial Investigation/Feasibility Study (RI/FS). A Record of Decision (ROD) for the site was issued in February 2003, and the BMSG is currently implementing the remedy outlined in the ROD under a Unilateral Administrative Order issued by EPA in 2003. There have been significant improvements in surface water and sediment quality as the result of ongoing cleanup actions, and water quality cleanup levels are being met more frequently. However, the South Fork of Big Deer Creek continues to be affected by historic mining at the Blackbird Mine Site and Big Deer Creek has not yet been shown to consistently meet water quality cleanup levels.

The BMSG continues to have significant resource restoration obligations at the site under the BRCP. The primary objective of the Blackbird cleanup is the achievement and maintenance of the copper water quality standard in Big Deer and Panther Creeks so that all life stages of salmonids may be sustained. The BRCP includes three primary components integral to the restoration of Chinook salmon to Panther Creek basin once water quality criteria have been met and maintained to the satisfaction of the Natural Resources Trustees: 1) a Hatchery Operations Plan; 2) a Smolt Survival Plan and 3) a Performance Monitoring Plan.

Clear Creek Fire

A significant portion of the Panther Creek watershed was burned during the Clear Creek fire in 2000, including a majority of the area of potential impact (12,575 acres including and adjacent to the proposed development areas), and the Project area (2,620 acres that will be affected by the mine and ancillary facilities). Prior to the Clear Creek fires, vegetation in the area of potential impact consisted of forest plant communities dominated by an overstory of Douglas-fir, lodgepole pine, subalpine fir, and Engelmann spruce (Douglas-fir and subalpine fir climax habitat types). The Clear Creek fires burned 99 percent of the area of potential impact with 60 percent of the area burning at high severity (80 to 90 percent crown or canopy removal), 30 percent burning at medium severity (20 to 80 percent crown removal), and 9 percent burning at low intensity (0 to 20 percent crown removal) (Intermountain Resources, 2004).

Fire can have significant effects on water resources, primarily on sediment yield and watershed yield. Studies of the affects of fire on watersheds document that there is an increase in surface water runoff and sediment yield after a fire. The size of the increase varies greatly, depending on the intensity of the fire, forest cover, and other basin characteristics. An analysis and comparison of pre-fire versus post-fire streamflows (*Water Resources Technical Report*; Hydrometrics, 2006) in the vicinity of the ICP indicates that current watershed yields (average annual volume of water per unit area of watershed) are approximately 50 percent higher than pre-fire conditions. Sediment yield modeling

(*Water Resources Technical Report*; Hydrometrics, 2006) estimates that the Clear Creek fire caused sediment yields to area streams to increase by a factor of two to five times over pre-fire conditions in the years immediately following the fire. By 2006, sediment monitoring data shows that sediment levels in Panther Creek have returned to pre-fire levels (Rieffenberger, 2006). The effects of the fire on surface water runoff and sediment yield will continue to decrease over time as vegetation and soils recover.

Groundwater Resources

Groundwater at the ICP site occurs primarily within fractured bedrock underlying the site and unconsolidated alluvial deposits within the drainage bottoms. These two hydrostratigraphic units are identified as individual (although interconnected) site aquifers for purposes of the ICP groundwater evaluation. Relatively minor, isolated pockets of groundwater also occur within unconsolidated materials overlying bedrock in the Big Flat area. Due to the discontinuous and seasonal nature of this groundwater, the Big Flat unconsolidated material may not be considered an aquifer.

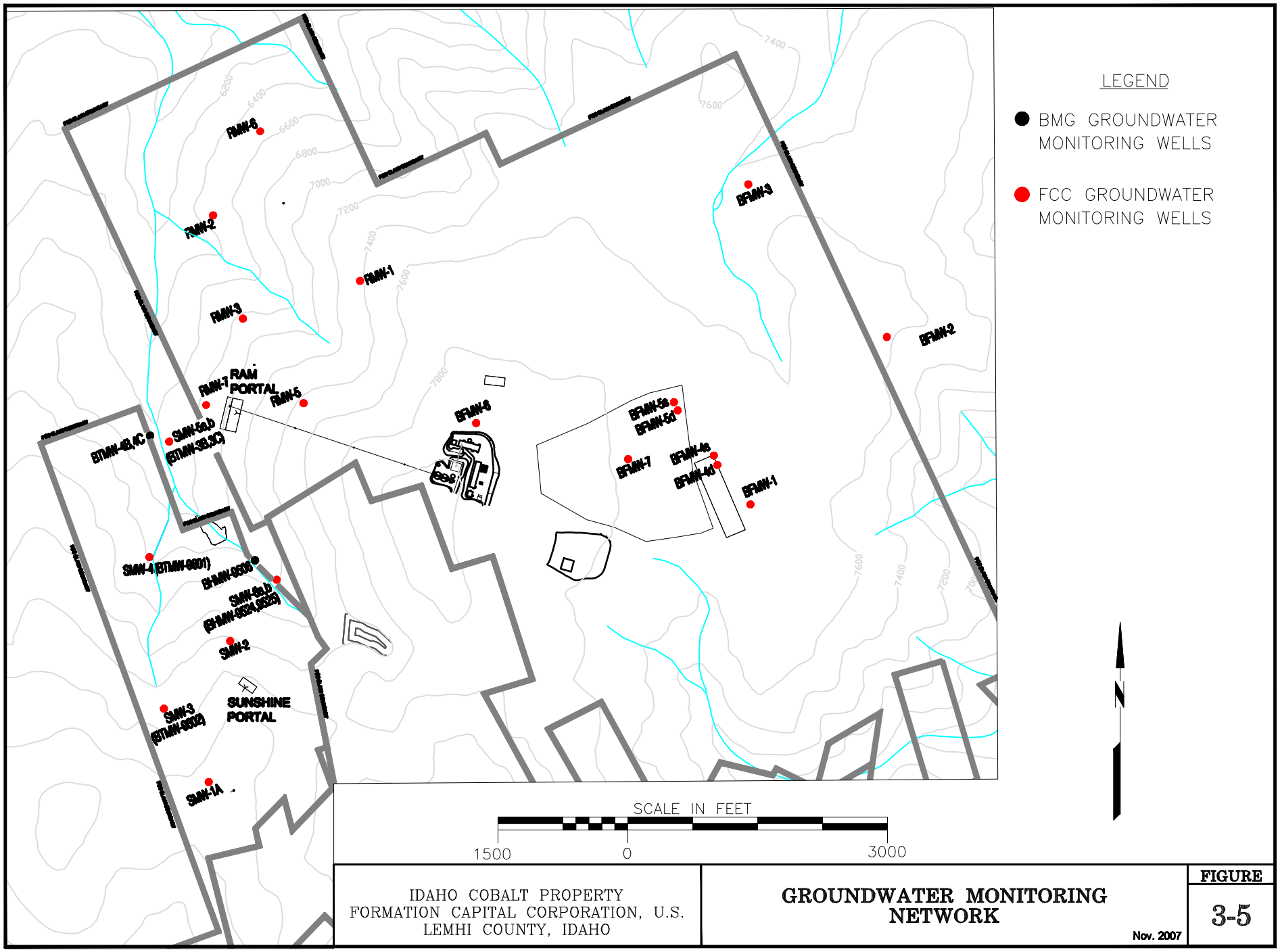
Occurrence of Groundwater

Bedrock Aquifer - The ICP bedrock groundwater occurs within the middle unit of the Precambrian Yellowjacket Formation, comprised of fine to medium grained quartzite interbedded with biotitic and chloritic tuffaceous interbeds. Groundwater flow within the bedrock, which dips to the east, occurs through fractures, with insignificant primary bedrock porosity and permeability. Groundwater flow is therefore controlled by the density, width, and interconnectivity of the bedrock fracture network. On a site-wide scale, the fracture density and interconnectivity is believed to be adequately developed so that the fractured bedrock aquifer can be approximated as an equivalent porous media aquifer (i.e., a sand or gravel aquifer) for certain analytical and evaluation purposes.

Monitoring well locations for the ICP are shown in **Figure 3-5**. Depths to groundwater in the bedrock vary with season and location across the ICP site with groundwater levels ranging from about 10 to nearly 400 feet below ground surface. In all cases, static water levels (depths to water) in bedrock monitoring wells drilled at the ICP are higher in elevation than the depth at which water was first noted during drilling. This indicates that the bedrock groundwater is under hydrostatic pressure. Additional information on the seasonal fluctuation of groundwater levels in the fractured bedrock system are provided in the *ICP Water Resources Technical Report* (Hydrometrics, 2006) and in FCC's water monitoring report (Shaw, 2005 and 2005a).

Use of Equivalent Porous Media Model - Simulating the ICP bedrock aquifer as an equivalent porous media (EPM) system is an important component of the groundwater evaluation. Although use of the EPM approach recognizes that groundwater flow is controlled by the fracture system distribution and orientation, the EPM approach also recognizes that flow through a fractured media approximates flow through a porous media (i.e., sand or gravel) aquifer provided the density and interconnectivity of fractures is sufficiently great that groundwater flow is controlled by gravity and flow directions closely follow the hydrologic and topographic gradients (i.e., groundwater flows from topographic high points to low points). If these fracture density and interconnectivity conditions are met, the mechanics of groundwater flow, and system evaluation and prediction of groundwater behavior, are greatly simplified. As summarized below, an abundance of evidence shows this to be the case for the ICP site, thus supporting use of the EPM approach. A more detailed discussion of this issue is provided in the Water Resources Technical Memorandum (Hydrometrics, 2008).

Several pieces of information from the ICP site strongly indicate that the ICP bedrock aquifer acts as an EPM on a site-wide scale. For instance, the bedrock aquifer potentiometric surface closely mimics the site topography and is relatively uniform (lacking irregular patterns) across the site, which is consistent with an EPM aquifer. If groundwater flow were strongly influenced by individual bedrock fractures or structures, the potentiometric surface would exhibit an irregular shape that would differ from the shape of the topographic surface. Secondly, if groundwater flow was controlled by discrete bedrock structures, significant variations in bedrock permeability should be evident across the site,



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GROUNDWATER MONITORING NETWORK

Nov. 2007

FIGURE

3-5

with the structures being much more permeable than the surrounding bedrock. Despite completion of more than 25 wells across the ICP site, and conducting numerous aquifer pumping tests, no significant variations in bedrock permeability have been observed. This uniform hydraulic conductivity field indicates that the bedrock fracture system has sufficient density and uniformity to act as an EPM. Third, if the north-trending faults mapped through the mine area (i.e., the No Name Fault) acted as groundwater conduits through the mine sites, there should be some evidence of northward groundwater flow, such as perennial seepage from the steep hillside north of the ICP site and south of Big Deer Creek. Although extensive monitoring has been conducted on this hillside, no such flow has been identified. Furthermore, the small seasonal seepage flows that have been documented on the hillside where the faults would be expected to daylight are of a different chemistry than groundwater in the ICP mine area, meaning the seepage does not represent groundwater flow from the ICP mine area. Fourth, inspection of drill core from the ICP area shows the bedrock to be highly fractured with abundant secondary mineral coatings on fracture surfaces, indicating groundwater flow through (and thus interconnectivity between) the fractures. The high fracture density and interconnectivity show that the system does act as an EPM when viewed at the scale of the ICP mines. Additional evidence for the applicability of the EPM approach to the ICP bedrock groundwater evaluation is provided in Hydrometrics (2006 and 2008).

Although the evidence outlined above shows that the ICP bedrock aquifer does act as an EPM, it is recognized that groundwater behavior may deviate from this generalized model on a localized scale. For example, particle transport pathways may deviate over short distances from those predicted by the EPM model. Groundwater flow also has the potential to be influenced by a number of bedrock structures identified in the ICP area (Pegg, 2001) including, from west to east, the White Ledge Shear, Meadow Creek Fault, Slippery Creek Fault, and Northfield Fault (**Figure 3-2**). A number of smaller, north-trending faults and shear zones have also been identified, including the Green Dike and No-Name faults. In general, geologic structures have the potential to affect groundwater flow through bedrock by acting either as conduits and/or barriers to groundwater flow, depending on specific characteristics of the structure and adjacent bedrock. Although all evidence suggests that these structures do not cause groundwater flow patterns to deviate from those predicted by the EPM model, multiple safeguards, in the form of hydrologic testing and monitoring requirements and backup post-mining groundwater containment measures, have been incorporated into the alternatives development process to identify potential environmental impacts caused by significant deviations from EPM model-predicted groundwater flow behavior. These safeguards are discussed in Chapters 2 and 4 as well as in the *Water Resources Technical Report* (Hydrometrics, 2006) and Memorandum (Hydrometrics, 2008).

Alluvial Aquifer - Groundwater also occurs within unconsolidated alluvial deposits occupying drainage bottoms in and around the ICP site. Major drainages containing alluvial aquifers include the Bucktail Creek/Big Deer Creek drainage system, Blackbird Creek to the south, and Panther Creek to the east. Although groundwater does occur at least seasonally in other ICP-area drainages, including Big Flat Creek and Little Deer Creek, these units are not identified as aquifers due to their size and lack of continuity.

Groundwater investigations in Upper Bucktail drainage, where the ICP mine workings would be located, show the alluvium/colluvium to range from 20 to 30 feet thick downstream of the confluence of the east and west forks (Golder, 2004 and 2004a). The saturated thickness of the alluvium as documented through well drilling and water level monitoring is on the order of 10 to 15 feet. The alluvium consists primarily of silty sand with little gravel, to interspersed coarse gravel and cobble layers. The alluvium in Upper Bucktail Creek drainage is overlain by up to 20 feet of colluvial/ landslide deposits along the drainage margins.

Aquifer Properties

Aquifer properties such as hydraulic conductivity, transmissivity and storativity determine the rate at which groundwater flows through an aquifer, and how the aquifer responds to external stresses such as pumping. Hydraulic conductivity and transmissivity determine an aquifer's ability to transmit water.

Transmissivity is equal to the hydraulic conductivity times the saturated thickness of an aquifer. Storativity measures the amount of water released from storage within an aquifer in response to a decline in potentiometric head. Aquifer properties at the ICP site have been determined through a variety of field testing programs and analytical methods including pumping tests, packer tests and slug tests.

Overall, the aquifer test results for the Project area show the bedrock aquifer to be of low permeability, with average hydraulic conductivity values from nine tests ranging from 0.006 to 12.6 feet/day with a median value of 0.13 feet/day.

Test results for the alluvium/colluvium show the hydraulic conductivity ranges from 25 to 221 feet/day with an average value of 91.75 feet/day or two orders of magnitude greater than that in the bedrock. The corresponding transmissivity values range from 357 to 3,100 feet^2/day, and average 1,237 feet^2/day. A storativity value of 0.002 was obtained from the tests, indicating that the Upper Bucktail drainage alluvial/colluvial aquifer is confined to semi-confined.

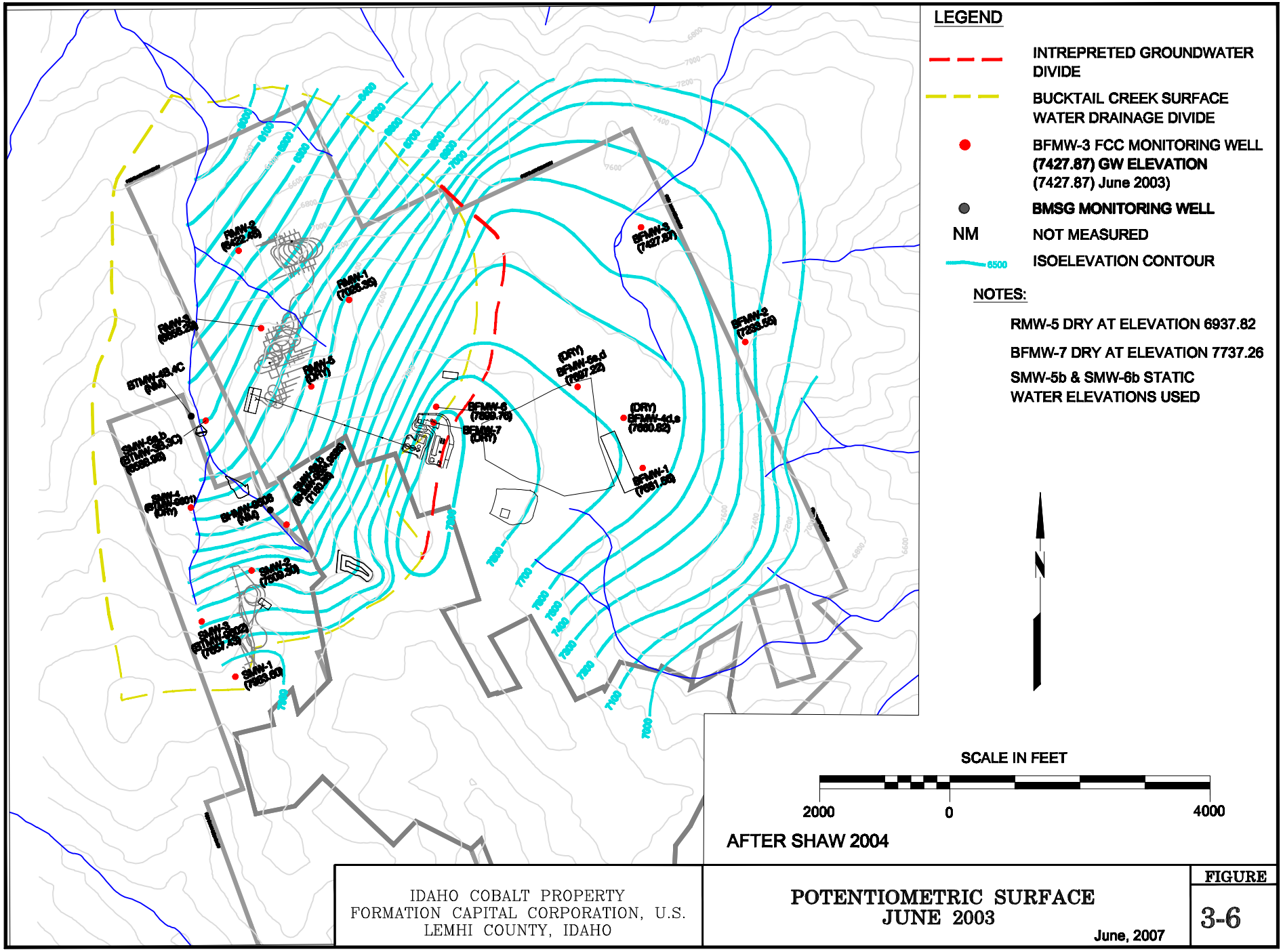
Groundwater Flow

Groundwater flow properties include groundwater flow directions and controlling factors (fracture-controlled flow verses porous media flow), groundwater flow rates (velocities and fluxes), groundwater recharge and discharge mechanisms, and surface water/groundwater interactions. Each of these properties is summarized below for the bedrock and alluvial aquifers.

Bedrock Aquifer - **Figure 3-6** shows the generalized potentiometric surface for June 2003 in the bedrock aquifer. The potentiometric surface, represented by the contour lines on the figure, shows the potentiometric head within the bedrock aquifer, or the elevation to which groundwater would rise in a well completed within the aquifer. The general direction of groundwater flow is perpendicular to the potentiometric contour lines, or from areas of high potential head to areas of lower potential head. As a result, the generalized direction of groundwater flow in the bedrock aquifer is from the topographic divide between the Big Flat area and Bucktail Creek drainage, eastward and westward towards Panther Creek drainage and Bucktail Creek drainage, respectively, and northward towards Big Deer Creek.

Groundwater flow through the bedrock aquifer generally mimics that of a porous media aquifer, and generally follows the topography (flows from areas of high elevation to areas of low elevation). In this manner, the bedrock aquifer can be approximated as an equivalent porous media (EPM) aquifer. However, on a localized scale of a few tens to possibly hundreds of feet, detailed groundwater flowpaths may deviate from this simplified model, with groundwater flow potentially occurring perpendicular to the generalized groundwater flowpaths assumed for the EPM over short distances. 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. Although prevailing information suggests that groundwater flow does closely follow the topographic gradient as assumed under the EPM approach, the potential for unacceptable environmental impacts to occur due to deviations from the EPM-predicted groundwater flow model is addressed through inclusion in the mine plan alternatives (Chapter 2) of provisions for controlling post-mining groundwater flow from the mine no matter the exact nature of groundwater flow through the mine areas.

The primary source of recharge to the bedrock aquifer is deep percolation of precipitation in the ICP site and surrounding area. Based on watershed modeling conducted by FCC (Telesto, 2005), the bedrock aquifer recharge rate is estimated at 9 percent of annual precipitation, or about 2.3 inches per year. Although not indicated by current information, it is possible that the ICP bedrock aquifer receives recharge via lateral groundwater inflow to the ICP site from the south. The bedrock aquifer discharges primarily to the alluvial groundwater/surface water systems surrounding the site (Bucktail, Big Deer and Panther Creek drainages), and through a limited number of springs and seeps.


LEGEND
INTREPRETED GROUNDWATER DIVIDE
BUCKTAIL CREEK SURFACE WATER DRAINAGE DIVIDE
BFMW-3 FCC MONITORING WELL
(7427.87) GW ELEVATION
(7427.87) June 2003)
BMSG MONITORING WELL
NM
NOT MEASURED
6500
ISOELEVATION CONTOUR
NOTES:
RMW-5 DRY AT ELEVATION 6937.82
BFMW-7 DRY AT ELEVATION 7737.26
SMW-5b & SMW-6b STATIC WATER ELEVATIONS USED
N
SCALE IN FEET
2000
0
4000
AFTER SHAW 2004
IDAHO COBALT PROPERTY
FORMATION CAPITAL CORPORATION, U.S.
LEMHI COUNTY, IDAHO
POTENTIOMETRIC SURFACE
JUNE 2003
June, 2007
FIGURE
3-6

Alluvial Aquifers - Groundwater within alluvial aquifers at the ICP site flows subparallel to the general direction of stream flow. Groundwater within the alluvial aquifer system is recharged by infiltration of snowmelt and rainfall on the alluvial surfaces, and by discharge of bedrock groundwater to the alluvium. The alluvial groundwater discharges primarily to surface water, and to a lesser extent through evapotranspiration and bedrock groundwater recharge.

Synoptic stream flow monitoring conducted by FCC and BMSG shows that streams in the ICP area are generally gaining streams, meaning that groundwater recharges the streams as opposed to stream water seepage recharging the groundwater system. Therefore, surface water/groundwater interactions at the site are characterized by the flow of groundwater from bedrock to alluvium, and discharge of alluvial groundwater to associated streams. Localized variations in the thickness and permeability of the alluvium, as well as bedrock constrictions within the drainage bottoms, can cause localized deviations from this general relationship. However, the groundwater-to-surface water flow pattern holds true on a site-wide scale.

Groundwater Quality

FCC has been collecting groundwater chemistry data from the ICP area on a regular basis since 2000. The FCC monitoring well network includes 15 monitoring wells installed by FCC in 2000 and 2001 and six wells installed by BMSG. FCC installed three additional wells (RMW-6 and RMW-7 at the Ram Mine and replacement well SWM-1a at the Sunshine Mine) in 2006. Well locations are shown on **Figure 3-5**. Although 21 wells have been included in the groundwater monitoring program through 2005, three of these wells (RMW-5 in the Ram area, and BFMW-4s and -5s in the Big Flat area) have been dry since installation and therefore have not yielded any groundwater samples. In addition to the FCC monitoring program, the State of Idaho, EPA and BMSG have conducted groundwater monitoring activities in and near the ICP Project area.

For consistency with the dynamic systems model (DSM) being employed in the EIS impacts analysis (Telesto, 2005, Hydrometrics, 2006), and to avoid discrepancies often associated with total metals groundwater data due to well completion and sampling procedures, the following discussion of current groundwater quality conditions focuses on dissolved metals concentrations. Total recoverable groundwater concentrations are presented in the *Water Resources Technical Report* (Hydrometrics, 2006), and in the *Consolidated Baseline Hydrology Report* (Shaw, 2004). **Table 3-1** includes a summary of the 2002 through 2005 groundwater quality data by area.

Ram Area - Dissolved metals concentrations in the Ram area groundwater show general increases from upgradient to downgradient of the Ram ore zone. For instance, average dissolved copper concentrations in wells RMW-1 (upgradient), RMW-2 and RMW–3 (both downgradient) are 0.007, 0.008 and 0.041 milligrams per liter (mg/L), respectively. Consistent downgradient concentration increases are also observed for iron, while arsenic and cobalt concentration trends are more variable through the Ram ore zone.

Sunshine Area - Based on dissolved metals concentrations, groundwater quality trends are variable through the Sunshine ore zone, with concentrations of some metals (copper and iron) greater at topographically upgradient well SMW-1 as compared to downgradient wells SMW-2 and SMW-3. For example, the average dissolved copper concentration is 0.023 mg/L at SMW-1, as compared to 0.006 and 0.010 mg/L at SMW-2 and SMW-3, respectively. Conversely, the average arsenic and cobalt concentrations are greatest at well SMW-2, and lowest at SMW-3. This indicates that groundwater quality in the vicinity of the Sunshine ore zone is variable with no clear upgradient to downgradient trends. Additionally, historic mine wastes in upper Bucktail drainage (and the Sunshine Mine area) have been identified as having an affect on groundwater quality (USEPA, 2003).

Upper Bucktail Drainage - Current groundwater quality in Upper Bucktail Creek drainage has been quantified through seasonal sampling of five bedrock monitoring wells by FCC. The five wells, SMW-4, -5a, -5b, -6a and -6b were originally installed and monitored by BMSG, and were

TABLE 3-1. Summary of 2002-2005 Groundwater Quality Monitoring Results by Area From the Idaho Cobalt Project

PROJECT AREA		TDS mg/L	SO_4 mg/L	Cu mg/L	Co mg/L	As mg/L	Ni mg/L	Zn mg/L
RAM AREA								
Wells RMW-1, RMW-2, RMW-3	# SAMPLES	31	30	28	28	28	28	28
	MIN	14	4	<0.0001	0.0011	0.0002	<0.001	<0.01
	MAX	252	35	0.119	0.174	0.0088	0.010	0.12
	MEAN	*108*	*21.3*	*0.022*	*0.045*	*0.0030*	*0.002*	*0.018*
SUNSHINE AREA								
Wells SMW-1, SMW-2, SMW-3	# SAMPLES	32	32	32	32	32	29	32
	MIN	13	3.0	<0.0001	<0.0001	<0.0001	<0.001	<0.005
	MAX	92	26.3	0.149	0.366	0.176	0.02	0.10
	MEAN	*51*	*11.7*	*0.013*	*0.152*	*0.046*	*0.005*	*0.02*
UPPER BUCKTAIL AREA								
Wells SMW-4, SMW-5a and 5b, SWM-6a and 6b	# SAMPLES	33	31	25	25	25	17	17
	MIN	231	128	0.025	0.023	0.0004	0.013	0.002
	MAX	2220	2010	258	60.6	0.20	1.08	1.15
	MEAN	*1092*	*740*	*57.6*	*20.3*	*0.054*	*0.388*	*0.392*
BIG FLAT AREA								
Wells BFMW-1, BFMW-2, -3, -4d, -5d, -6, and –7	# SAMPLES	61	57	52	52	52	40	37
	MIN	15	<0.5	0.0029	<0.0001	<0.0001	<0.001	<0.005
	MAX	136	9.0	0.121	0.113	0.0033	0.0071	0.13
	MEAN	*38*	*1.7*	*0.029*	*0.009*	*0.0010*	*0.0014*	*0.015*
GROUNDWATER QUALITY STANDARD		500[2]	250[2]	1.30[1]	---	0.05[1]	---	5.0[2]

TDS - Total Dissolved Solids
SO_4 - Total Sulfate
Cu - Dissolved Copper
Co - Dissolved Cobalt
As - Dissolved Arsenic
Ni - Dissolved Nickel
Zn- Dissolved Zinc

1- Idaho Primary Constituent Standard
2- Idaho Secondary Constituent Standard
--- No numeric groundwater standard exists

Below detection limit values replaced with detection limit for calculating means

incorporated into the FCC monitoring program in either 2001 or 2002. Groundwater quality in this area is impacted by historic mining activities, with dissolved metals concentrations in excess of 100 mg/L in some cases. The Upper Bucktail drainage area is the focus of ongoing remediation activities by BMSG.

The highest metals concentrations in Upper Bucktail Creek drainage have been recorded at monitoring well SMW-6a, completed in bedrock from 65 to 85 feet below ground surface in the east fork of Bucktail Creek. Maximum dissolved metals concentrations at this site include 0.02 mg/L arsenic, 60.6 mg/L cobalt, 258 mg/L copper, and 3.63 mg/L iron. Metals concentrations are also very high in complimentary well SMW-6b, completed at a depth of 151 - 171 feet below ground surface, although, with the exception of iron, not as high as those in SMW-6a.

Big Flat Area - Concentrations of dissolved metals, with the exception of copper, are generally low in the Big Flat area groundwater, especially as compared to other portions of the ICP site. Dissolved arsenic concentrations range from <0.0001 to 0.0033 mg/L for all Big Flat area wells, and dissolved iron concentrations range from <0.03 mg/L to 0.85 mg/L (**Table 3-1**). These concentrations are believed to be representative of non-mineralized, relatively undisturbed portions of the site. Although the Big Flat area is not considered to contain an ore body, copper concentrations in groundwater are similar to other mineralized areas suggesting that mineralization is present in Big Flat.

Surface Water Resources

The ICP is situated in steep, mountainous terrain within the Panther Creek drainage, a tributary of the Salmon River. The ICP site ranges in elevation from 4,200 feet to 8,100 feet above mean sea level (msl) and is drained by several perennial and intermittent tributaries to Panther Creek. The major perennial tributaries to Panther Creek near the ICP include Bucktail, South Fork Big Deer, Big Deer, Big Flat, Little Deer and Blackbird Creeks and various unnamed tributaries to these creeks (**Figure 3-4**). In addition, the transportation route to the ICP lies in portions of the Williams Creek and Deep Creek drainages. Williams Creek is tributary to the Salmon River upstream of the city of Salmon. Deep Creek is tributary to Panther Creek between Blackbird Creek and Big Deer Creek.

Streamflows

Surface water flow in streams is sustained by snowmelt, stormwater runoff and bedrock aquifer discharges to alluvium and to streambeds. Lowest streamflows occur during the fall/winter period of approximately October through March. Diverse snowmelt patterns within the watershed cause significant runoff events in the spring through early summer. Summer thunderstorm precipitation events can cause infrequent high flow in isolated drainages.

Stream segments in the Project area can be generally characterized as gaining streams in the upper portions (headwaters) and vary between locally gaining and losing segments in downstream reaches. Gaining and losing segments are dependent upon alluvial material connection with the stream channel and bedrock aquifer, potentiometric surface of the bedrock aquifer, topography, and preferential flow paths within the aquifer and streambed system. Surface flows in the lowest reach of Big Flat Creek and in unnamed tributaries to Big Deer Creek in the northern portion of the Project area “disappear” into talus-filled sections of drainages. Flow has been documented both visually and via sound within these rock-filled portions of the stream channels.

No USGS gauging stations exist for streams in the ICP area. A summary of streamflow measurements recorded by FCC consultants (Shaw, 2005; Telesto, 2006f) during the baseline monitoring period (2001 through 2005) is provided in **Table 3-2**. Under average flow conditions, flow in Big Deer Creek comprises approximately half of the flow in Panther Creek. No streamflow measurements were made during the baseline period for streams along the transportation route, Deep Creek and Williams Creek.

TABLE 3-2. ICP Area Streamflow Measurement and Estimate Summary							
	Flow Measurement Summary (1)				***Flow Estimate Summary (2)***		
Surface Water Sample Point	***# of Measurements***	***Minimum Instantaneous Stream Flow (cfs)***	***Maximum Instantaneous Stream Flow (cfs)***	***Mean Instantaneous Stream Flow (cfs)***	***Minimum Mean Monthly Flow - January (cfs)***	***Maximum Mean Monthly Flow - June (cfs)***	***Mean Annual Flow (cfs)***
Panther Creek WQ-25	*4*	*62.26*	*81*	*71.8*	*20*	*264*	*66*
Big Flat Creek WQ-7	*23*	*0.002*	*0.4*	*0.12*	*NA*	*NA*	*NA*
Little Deer Creek WQ-5	*8*	*0.63*	*5.5*	*1.86*	*0.9*	*11.1*	*2.76*
Ram Gulch WQ-10	*25*	*0.0004*	*0.075*	*0.028*	*NA*	*NA*	*NA*
Bucktail Creek WQ-21	*11*	*0.03*	*7*	*1.42*	*NA*	*NA*	*NA*
South Fork Big Deer Creek WQ-22	*12*	*0.047*	*35.51*	*10.1*	*NA*	*NA*	*NA*
Big Deer Creek WQ-24	*10*	*8.36*	*123.75*	*27.81*	*11*	*144*	*36*
Deep Creek	*NA*	*NA*	*NA*	*NA*	*6*	*80*	*20*
Williams Creek	*NA*	*NA*	*NA*	*NA*	*3*	*40*	*10*

Notes:
(1) Data Source: Consolidated Baseline Hydrology Report (Shaw, 2004 and 2005; Telesto 2006f).
(2) Data Source: Middle Salmon River-Panther Creek Subbasin Assessment and TMDL (IDEQ, 2001).
cfs - cubic feet per second

Stream Water Quality - Water quality in the Panther Creek Drainage is generally good with the exception of streams affected by historic mining. The Clean Water Act (CWA) requires that the states and Tribes restore and maintain the chemical, physical and biological integrity of the nation's waters. As mandated by the CWA the State of Idaho is required to conduct a comprehensive analysis of Idaho's water bodies every 2 years to determine whether they meet state water quality standards and support beneficial uses or if additional pollution control measures are needed. This analysis is summarized in an "Integrated Water Quality Monitoring and Assessment Report" that is submitted to the U.S. Environmental Protection Agency (EPA) for approval. An Integrated Report must be approved by the EPA before it can be used by a state to guide its management decisions. Idaho's most recent approved version is its 2002 Integrated Report. This document will continue to guide DEQ's water quality management decisions until a 2008 Integrated Report is completed by DEQ and approved by EPA.

Table 3-3 summarizes the assessment units and streams within the Panther Creek watershed that are listed in the 2002 Integrated Report as not fully supporting beneficial uses. No TMDL has been prepared for the assessment units in the 2002 report. Assessment units added to the 2002 Report will be scheduled for TMDL development starting in 2008 (IDEQ, 2003).

Over the past decade, water chemistry data for streams in the ICP area have been collected by a variety of groups including government agencies and consultants for FCC and BMSG. Data from

these efforts is included in the Consolidated Baseline Hydrology Report and subsequent annual monitoring reports (Shaw, 2005 and 2005a; Telesto, 2006f), data reports from BMSG (Golder, 2004, 2004a and 2005), the Blackbird Mine Site Remedial Investigation (Golder, 2001), Blackbird Mine Site ROD (USEPA, 2003), and the Water Resources Technical Report (Hydrometrics, 2006). The following description of ICP area surface water quality is based on data in these reports.

TABLE 3-3. Water Quality and TMDL Status of Streams in the Panther Creek Watershed

Assessment Unit	Streams Not Supporting Beneficial Uses	Pollutants	Beneficial Uses Not Fully Supported
ID17060203SL005 03 Big Deer Creek - South Fork Big Deer Creek to mouth	Big Deer Creek	Metals, pH and Siltation	Cold Water Aquatic Life
ID17060203SL009 02 Bucktail Creek – source to mouth	Bucktail Creek	Metals	Cold Water Aquatic Life
ID17060203SL010 05 Panther Creek – Napias Creek to Big Deer Creek	Panther Creek	Unknown	Cold Water Aquatic Life
ID17060203SL011 02/04 Panther Creek- Blackbird Creek to Napias Creek	Fawn Creek, Spring Creek, Panther Creek	Metals, copper and unknown toxicity	Cold Water Aquatic Life; Salmonid Spawning.
ID17060203SL012a 02 Blackbird Creek-source to Blackbird Reservoir Dam	Blackbird Creek	None listed in 2002 report	Cold Water Aquatic Life
ID17060203SL012b 02 Blackbird Creek –Blackbird Reservoir to mouth	Blackbird Creek	Metals, pH and Siltation	Cold Water Aquatic Life
ID17060203SL027 02 Trail Creek- source to mouth	Trail Creek	Unknown Pollutants	Cold Water Aquatic Life; Salmonid Spawning

Notes: Assessment Units and 303(d) Listed Streams Within the Panther Creek Watershed in the 2002 Integrated Report for Idaho (IDEQ, 2003)

Big Flat Creek and Little Deer Creeks - Water quality in Big Flat Creek and Little Deer Creeks is generally good with near neutral pH and low metal concentrations. Water quality data collected by FCC consultants for these streams is summarized in **Table 3-4.**

Bucktail Creek/South Fork Big Deer Creek/Big Deer Creek - Water quality in the Bucktail Creek/South Fork/Big Deer Creek varies greatly depending on proximity to historic mining sources in upper Bucktail Creek, the effects of the release of soluble metals from mining-impacted sediments, and dilution of metals by clean water sources (both clean groundwater inflows and surface water from tributaries to Big Deer Creek). In addition, cleanup actions by BMSG have caused significant improvements in water quality throughout the drainage. Average water quality for selected stations in the drainage for the period of 1995 through 2005 are shown in **Table 3-5**. A comparison of data in **Table 3-5** illustrates the variation in water quality with high copper and other metal concentrations in Bucktail Creek that diminish downstream in the South Fork and Big Deer Creek.

The overall improvement in water quality in the drainage in recent years is illustrated by **Table 3-5**, which shows recent sulfate and metal concentrations in Bucktail Creek, Big Deer Creek and the South Fork of Big Deer Creek. In 1994/1995 copper concentrations in Bucktail Creek were on the order of 200 mg/L. By 2000, copper concentrations had declined approximately 100-fold. In 2002

TABLE 3-4. Water Quality in Big Flat and Little Deer Creeks

Big Flat Creek and Little Deer Creek Sampling Results (2001 - 2005)																	
		Flows (cfs)		Dissolved Cobalt (mg/L)		Dissolved Copper (mg/L)		Total Sulfate (mg/L)		Dissolved Arsenic (mg/L)		Dissolved Iron (mg/L		Dissolved Nickel (mg/L)		Dissolved Zinc (mg/L)	
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
Big Flat Creek at mouth (WQ-2)		8.44	0.01	0.006	0.002	0.006	0.0015	6	3	0.0024	0.0016	0.07	0.03	<0.001	<0.001	0.008	0.006
Little Deer at mouth (WQ-5)		5.5	0.6	0.020	0.0089	0.015	0.0029	9	6	0.014	0.0081	0.16	0.03	0.001	<0.001	0.005	<0.005
Idaho Chronic Aquatic Life Criteria				None (1)		0.0033 (2)		None (3)		0.150		None		0.016		0.036	

Data Source: *2004 Water Quality Data Analysis Addendum to the Consolidated Baseline Hydrology Report* (Shaw, 2005a), *2005 Water Quality Data Summary* (Telesto, 2006f).

(1) For comparison, aquatic cleanup level for Blackbird CERCLA site is 0.086 mg/L cobalt (Allans, 2005).

(2) Criterion for copper is dependent on water hardness, value shown is for average hardness in Big Flat Creek of 24 mg/L.

(3) For comparison, federal secondary drinking water standard for sulfate is 250 mg/L.

TABLE 3-5. Water Quality in Bucktail, South Fork Big Deer, and Big Deer Creeks

Bucktail and Big Deer Creek Sampling Results (1995 to 2005)															
Site	**Date**	**Dissolved Cobalt (mg/L)**		**Dissolved Copper (mg/L)**		**Total Sulfate (mg/L)**		**Dissolved Arsenic (mg/L)**		**Dissolved Iron (mg/L)**		**Dissolved Nickel (mg/L)**		**Dissolved Zinc (mg/L)**	
		Max	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**
Bucktail at mouth BTSW-01 (WQ-21)	1995	50.4	9.39	272	40.9	344	-	-	-	-	-	-	-	-	-
	2000	1.54	1.2	1.16	0.492	148	134	<0.002	<0.002	<0.02	<0.02	-	-	-	-
	2005	0.44	0.285	0.264	0.212	75	44	0.0052	0.0037	0.04	<0.03	0.007	0.005	0.011	<0.005
SF Big Deer below Bucktail SFSW-01	1995	0.871	0.533	1.34	0.23	42.9	42.6	-	-	-	-	-	-	-	-
	2000	0.089	0.056	0.155	0.104	28.8	9.3	0.002	<0.002	0.03	<0.02	-	-	-	-
	2005	0.0568	0.0559	0.0398	0.0359	20	18	0.0014	0.0014	<0.03	<0.03	<0.001	<0.001	0.005	<0.005
Big Deer below SFK BDSW-03 (WQ-24)	1995	0.11	0.056	0.342	0.144	9.5	5.55	-	-	-	-	-	-	-	-
	2000	0.011	0.005	0.021	0.003	7.4	1.3	0.003	<0.002	0.09	<0.02	-	-	-	-
	2005	0.014	0.012	0.009	0.008	8	7	0.0006	0.0005	<0.03	<0.03	<0.001	<0.001	0.008	<0.005
Idaho Chronic Aquatic Life Criteria		None (1)		0.0037 (2)		None (3)		0.150		None		0.017		0.039	

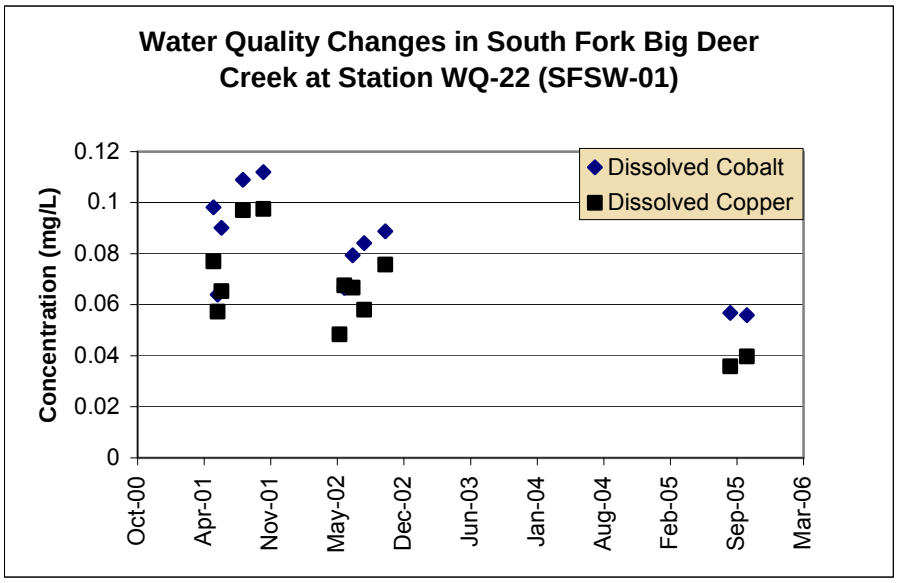
Data Source: *Final Blackbird Mine Site Remedial Investigation Report* (Golder, 2001); *Blackbird Mine Site 2004 Data Summary* (Golder, 2005); *Consolidated Baseline Hydrology Report* (Shaw, 2005); *2005 Water Quality Data Summary* (Telesto, 2006f).

Notes: 1) For comparison, aquatic cleanup level for Blackbird CERCLA site is 0.086 mg/L cobalt (Allans, 2005).
2) Criterion for copper is dependent on water hardness, value shown is for average hardness in Big Deer Creek of 27 mg/L.
3) For comparison, federal secondary drinking water standard for sulfate is 250 mg/L.

Idaho DEQ concluded, and EPA agreed, that Bucktail Creek could not be remedied to the point of meeting water quality standards in the foreseeable future (IDEQ, 2002). Although this conclusion may hold true, it is apparent from the water quality data that a significant reduction in cobalt and copper concentrations in Bucktail Creek has been achieved.

The overall improvement in water quality in the South Fork of Big Deer Creek is shown by the plot of dissolved copper and cobalt concentrations (**Figure 3-7**). Although copper concentrations in the South Fork remain several times higher than the chronic aquatic life criterion of approximately 0.004 mg/L; copper concentrations have declined approximately 50 percent over the period of 2000 through 2005. Similar declines in metal concentrations have occurred throughout the drainage.

FIGURE 3-7. Water Quality Changes in South Fork Big Deer Creek



Blackbird Creek and Panther Creek - Blackbird Creek has been and may continue to be heavily impacted by releases of acidity and dissolved heavy metals from the historic Blackbird Mine site. Water quality data (1995-2000 and 2004/2005) for Blackbird Creek and Panther Creek is summarized in **Table 3-6**. In 1995, Blackbird Creek was heavily impacted by releases and discharges of dissolved copper and cobalt to the extent that in 1997 Idaho DEQ concluded that Blackbird Creek could not be remedied to the point of meeting water quality standards in the foreseeable future (IDEQ, 1997). Although this conclusion may hold true, it is apparent from the water quality data that a significant reduction in cobalt and copper concentrations in Blackbird Creek has been achieved.

Panther Creek receives metal loadings from historic mining sources in both Bucktail Creek/Big Deer Creek and Blackbird Creek. However, Panther Creek is a much larger stream than either Big Deer Creek or Blackbird Creek and metal concentrations in Panther Creek, both historically and currently, are much more dilute than these tributary streams. Monitoring station PASW-04 (WQ-25) on Panther Creek is downstream of both Blackbird Creek and Big Deer Creek and so represents the cumulative effects of historic Blackbird and ICP area mining on the Panther Creek system. As shown in **Table 3-6**, water quality has also improved significantly in Panther Creek over the last decade. In 2004/2005, water quality in Panther Creek downstream of Big Deer Creek met water quality criteria for copper most of the year with the exception of the spring high flow period of approximately March – June. In the 2002 303(d) report to EPA, IDEQ determined that lower Panther Creek (below Big Deer Creek) meets beneficial uses.

TABLE 3-6. Blackbird Creek and Panther Creek Water Quality Data

Blackbird Mine Site Sampling Results															
		Dissolved Cobalt (mg/L)		Dissolved Copper (mg/L)		Total Sulfate (mg/L)		Dissolved Arsenic (mg/L)		Dissolved Iron (mg/L)		Dissolved Nickel (mg/L)		Dissolved Zinc (mg/L)	
Site	**Date**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**
Blackbird below treatment plant BBSW-07	1995	5.81	0.475	13.2	0.782	679	3.34	-	-	-	-	-	-	-	-
	2000	0.782	0.193	0.26	0.183	312	16.5								
	2005	0.17	0.02	0.044	0.019	6	5	-	-	-	-	-	-	-	-
Blackbird at mouth BBSW-01 BBSW-01A	1995	1.85	0.299	1.69	0.213	102	25	-	-	-	-	-	-	-	-
	2000	0.8	0.117	0.063	0.008	112	30.3	0.054	<0.002	12	0.26	-	-	-	-
	2005	0.493	0.05	0.023	0.002	66.4	12	-	-	-	-	-	-	-	-
Panther Creek below Blackbird PASW-10	1995	0.269	0.05	0.218	0.0158 B	15.1	7.89	-	-	-	-	-	-	-	-
	2000	0.78	0.019	0.025	0.003	16.5	9.2	0.003	<0.002	0.17	<0.02	-	-	-	-
Panther Creek below Big Deer PASW-04 (WQ-25)	1995	0.077	0.0144	0.068	0.0214	8.78	3.94	-	-	-	-	-	-	-	-
	2000	0.031	0.005	0.015	0.003	11.6	3.3	0.003	<0.002	0.16	0.06	-	-	-	-
	2005	<0.01	.01	0.005	0.002	14	6		0.0084	-	0.03	-	<0.001	-	0.006
Idaho Chronic Aquatic Life Criteria		None (1)		0.0038 (2)		None (3)		0.150		None		0.018		0.040	

Data Source: *Final Blackbird Mine Site Remedial Investigation Report* (Golder, 2001) and *Blackbird Mine Site 2004 Data Summary* (Golder, 2005), *Blackbird Mine Site 2005 Data Summary* (Golder, 2006), *2005 Water Quality Data Summary* (Telesto, 2006f).

(1) For comparison, aquatic cleanup level for Blackbird CERCLA site is 0.086 mg/L cobalt (Allans, 2005).
(2) Criterion for copper is dependent on water hardness, value shown is for average hardness in Panther Creek of 28 mg/L.
(3) For comparison, federal secondary drinking water standard for sulfate is 250 mg/L.

Springs, Seeps and Wetlands

Several detailed inventories of surface streams, springs, seeps, and hydraulic structures in the ICP area have been conducted. Spring and Seep inventory activities conducted to date include:

- *Spring and Seep Inventory by the BMSG – 1999;*
- *Stream Channel Transect Inventory by FCC – 1999;*
- *"Walk Down" Inventory by FCC - 2001/2002;*
- *Surface Water Monitoring from Stations Immediately Adjacent to Flow Springs by FCC - 2001/2002/2003/2004;*
- *Surficial Meteoric Water Occurrence Inventory by FCC – 2002;*
- *Comprehensive Spring and Seep Survey by FCC – 2004; and*
- *2000-2001 wetland delineation by Intermountain Resources.*

During these surveys, measurements of spring flows were made and water quality samples were collected from selected springs/seeps.

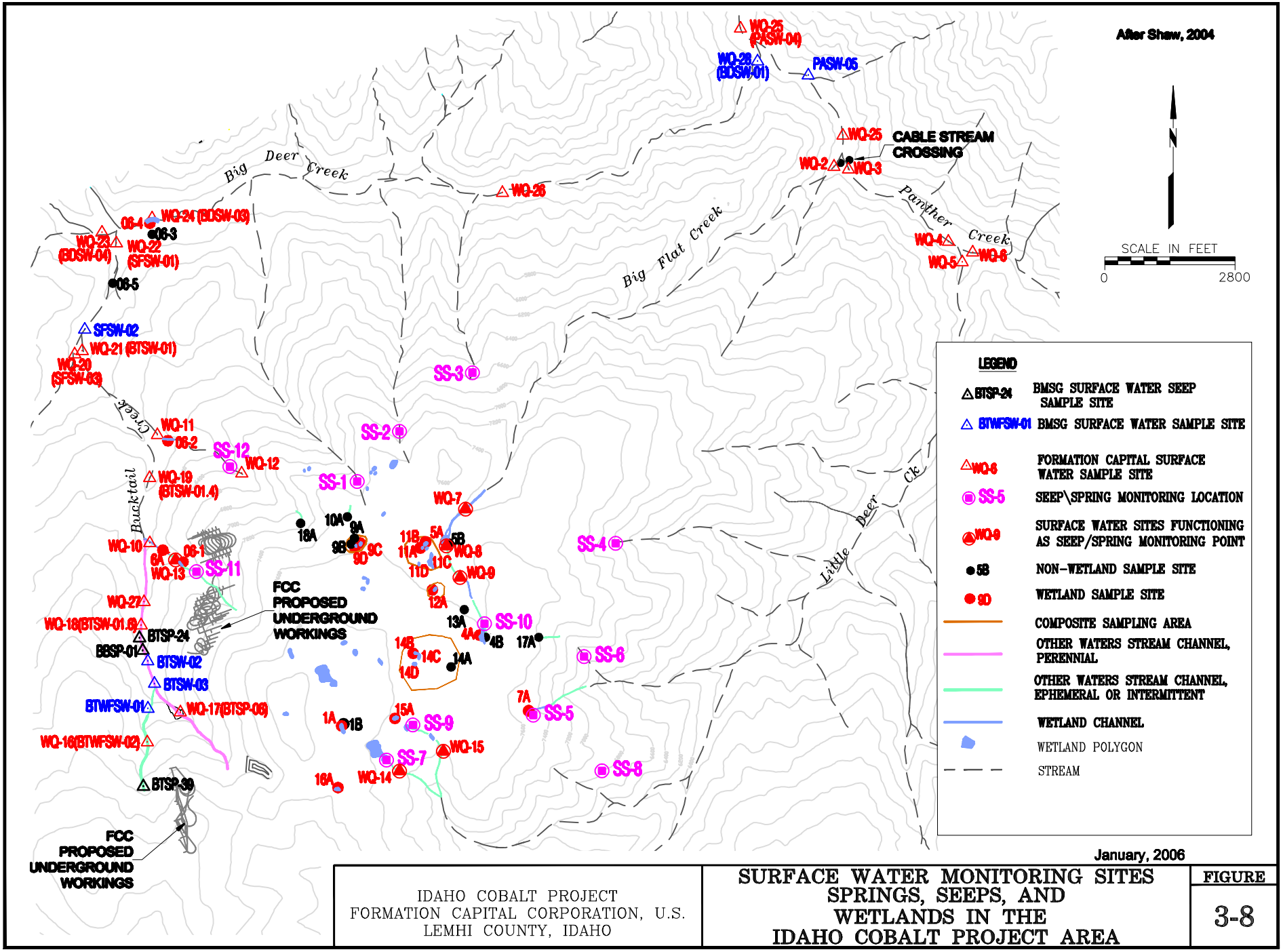
Numerous small seeps occur within the ICP area, especially on the Big Flat. Locations of prominent springs in the ICP are shown on **Figure 3-8**. As shown on **Figure 3-8**, springs occur in the headwaters of area streams. These springs are an expression of groundwater discharge to surface water that occurs where the groundwater table intersects the ground surface. Overall, spring and seep water quality is good and similar to groundwater quality in the area. Exceptions are springs and seeps in the Bucktail drainage, where groundwater quality is impacted by historic mining, and Ram Gulch spring (SS-11 and WQ-10) where water quality is naturally affected by proximity to the Ram ore body.

Wetlands are regulated under Section 404 of the Clean Water Act as a subset of waters of the United States. Wetlands are defined by the Army Corps of Engineers (COE) as those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Wetlands in the Project area have been inventoried in accordance with COE procedures (Intermountain Resources, 2004 and 2004a; US Corps of Engineers, 2004). Both jurisdictional (connected to other waters of the U.S. and subject to COE 404 regulations) and non-jurisdictional (isolated and not subject to COE 404 regulation) wetlands have been identified and mapped in the Project area.

Wetlands in the Project area are associated with seeps and intermittent drainages that receive water from surface runoff and shallow groundwater discharge. They are small areas (less than 0.5 acres) on slopes and flats dominated by sedges, rushes, and other herbaceous vegetation. Common wetland species include aquatic sedge, arrow-leaf groundsel, smooth scouring-rush, five-stamened mitre-wort, small white violet, and dagger-leaf rush. There are about 3.6 acres of jurisdictional wetlands within the Project area surveyed by Intermountain Resources (2004). The US Corps of Engineers (2004) indicated that FCC's original Plan of Operations did not require a 404 permit. However, changes to ICP's Plan resulted in a survey of areas outside of the 2004 inventory and identification of additional wetlands along a tributary to Bucktail Creek and in the riparian zone along Big Deer Creek where the water discharge pipeline is proposed. These additional lineal wetlands were found to be jurisdictional (Elliott, 2006; Intermountain Resources, 2006). Additionally, 1.3 acres of non-jurisdictional, isolated wetlands were identified in the original Project area in the Big Flat (**Figure 3-8**).

Non-vegetated channels and ponds that originate in the Project area and are interconnected with navigable waters downstream in the watershed are jurisdictional under the Clean Water Act as non-wetland waters of the United States. Non-wetland waters of the U.S. in the study area are ephemeral channels that have a defined bed and bank and transmit water, sediment, and litter during periods of



January, 2006

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SURFACE WATER MONITORING SITES SPRINGS, SEEPS, AND WETLANDS IN THE IDAHO COBALT PROJECT AREA

FIGURE 3-8

high precipitation and runoff. Non-wetland waters of U.S. do not support wetland vegetation over their entire length but may have patches of wetland on sites that retain water for a sufficient period in the growing season (usually one week or longer). Non-wetland waters of U.S. must be connected to navigable interstate waters to be jurisdictional under the Clean Water Act. Non-wetland waters of the U.S. comprise about 1.5 acres in the Project area.

Sediment Yield and Quality

Sediment Yield - Sediment is produced from a number of natural and man-caused sources. Roads and other large scale land disturbances can be significant sources of sediment to streams. A broad scale sediment model was used to characterize erosion of sediment from area drainages, and to assess the cumulative effects of the proposed Idaho Cobalt Project. BOISED is an empirical model where erosion and sediment yield data from research are extrapolated to areas with similar characteristics to predict the effects of alternative watershed disturbances (USDA, 1978). The BOISED model is a local adaptation of the sediment yield model developed by the Northern and Intermountain Regions of the U.S. Forest Service for application to forested watersheds associated with the Idaho Batholith. The model provides an estimate of on-site erosion, sediment delivery to stream channels, and routing of sediment downstream to critical reaches where interpretation of sediment impacts can be made (USDA, 2006). It should be noted that BOISED model results were not calibrated to actual sediment sampling results discussed in the Fisheries section of this chapter. The modeling results are only intended to show theoretical differences in the behavior of the watershed to naturally and man-induced changes that influence the sediment production and delivery processes in the watershed. The reader is cautioned not to infer that there are immediate or lingering effects from sediment on a receiving stream if additional sediment delivery over natural conditions is indicated by the BOISED model.

The BOISED model is applied using landtypes to stratify the watersheds. Landtypes are units of land with similar landform, geologic, soil, and vegetative characteristics. Dominant erosion processes, including surface and mass erosion, are evaluated for each landtype in a watershed to provide estimates of natural sediment yields for undisturbed watersheds and sediment yields resulting from management activities (USDA, 2006). The BOISED Model was applied to the Big Flat and Bucktail drainages, as sediment production from these two drainages will be directly impacted by the ICP.

Big Flat Creek is a 1.65 square mile watershed that is a tributary to Panther Creek. Existing disturbances in this watershed include small exploration pits and mine exploration roads. In 2000 the Clear Creek fire burned the entire Big Flat Creek drainage, except for a few small areas (less than several acres). Fire severity was variable and ranged from low to high.

Bucktail Creek is a 1.59 square mile watershed. Bucktail Creek is a tributary to the South Fork of Big Deer Creek. Big Deer Creek is a tributary to Panther Creek. This watershed has been substantially impacted by activities at the Blackbird Mine. Existing mine facilities in this watershed include the Blacktail Pit, mine waste dumps, mine adits, mine roads, and water collection and transport facilities. Collection facilities include a dam at the 7,000 foot elevation that routes contaminated water from the Bucktail drainage through underground workings to the Blackbird Creek drainage to a water treatment plant. In 2000, the Clear Creek fire burned the entire Bucktail Creek watershed with fire severity ranging from medium to high.

Sediment yields in tons per year were estimated for the undisturbed watershed (pre-mining) and the existing condition. The effects from the Clear Creek fire in 2000 and subsequent vegetation recovery are also captured by the sediment modeling. Additional sediment modeling was performed for the proposed “action” alternatives (see Chapter 4). The model provides an output for delivered sediment (tons/year) and total sediment delivered to a critical stream reach. This output is shown for sediment from natural erosion and sediment induced from disturbances (tons/year). **Table 3-7** summarizes the BOISED results for pre-ICP conditions.

TABLE 3-7. BOISED Model Results for Pre-ICP Conditions						
Drainage	**Natural Condition (tons/year)**	**1995-Pre Blackbird Reclamation (tons/year)**	**1999-post Blackbird Reclamation (tons/year)**	**2000-Following Clear Creek Fire (tons/year)**	**2004-post Fire (tons/year)**	**2006-Existing Condition (tons/year)**
Big Flat	9.6	N/A	N/A	25	9.6	9.6
Bucktail	13	118	59	86	53	52

In the Big Flat watershed, BOISED estimated sediment delivered to the stream from the undisturbed watershed to be 10.5 tons/year. Sediment delivered to the stream is estimated to be 9.6 tons/year. Following the fire in 2000 the model estimated that an additional 15 tons per year of sediment were delivered to the stream. The total natural and fire related sediment delivery is estimated to be 25 tons/year following the fire. This is an increase of 162 percent over natural conditions. By 2004 the model indicated that fire effects diminished and the sediment levels were back to pre-fire conditions. For existing conditions (2006), the model results for Big Flat estimated that only 0.1 tons/year of sediment over natural levels was delivered to the stream. This is an increase of 1 percent over natural conditions (USDA, 2006).

In the Bucktail Creek watershed, BOISED estimated sediment yield from the undisturbed watershed to be 14 tons/year. Sediment delivered to the stream is estimated to be 13 tons/year. In 1995, 1 year prior to Blackbird Mine reclamation, the model estimates the sediment delivered to the stream to be 118 tons/year. In 1996 during the peak of the mine cleanup activities at the Blackbird Mine there was a substantial increase in sediment yield due to road construction and reconstruction, and construction of water collection and transport facilities. During this period the model indicates an increase in sediment delivered to the stream to be an additional 26 tons/year. The total natural and induced sediment in 1996 is estimated to be 158 tons/year, resulting in an increase of 1,125 percent over natural conditions. By 1999 BOISED estimates the total sediment delivered to the stream to be 59 tons/year resulting in a yield that is 355 percent over natural conditions. In 2000 the Clear Creek fire burned most of the Bucktail Creek watershed. Following the fire BOISED estimates that the sediment delivered to the stream increased to 86 tons/year resulting in a yield that is 566 percent over natural conditions. By 2004 the fire effects diminished and the sediment delivered to the stream decreased to a total of 53 tons/year. This level is a 311 percent increase over natural conditions. The model results for Bucktail Creek in its existing condition (2006) shows the total sediment yield to be 52 tons/year. This shows an increase of 305 percent over natural conditions (USDA, 2006).

Sediment Quality - Sediment quality in the Panther Creek watershed is variable with concentrations depending on the local geology of the area, extent of natural mineralization, and historic mining impacts. Sediment quality is generally best in areas unaffected by natural mineralization and historic mining and generally worst downstream of historic mining (USEPA, 2003). In addition, to the direct effects of high sediment metal concentrations on aquatic biota and habitat, metal-bearing sediments have been shown to release significant amounts of dissolved metals to the water column in some stream reaches.

Streambed and overbank sediment quality in the Panther Creek watershed and the vicinity of the ICP was extensively characterized during the remedial investigation for the Blackbird CERCLA action and was not further characterized during baseline investigations for the ICP. Sediment descriptions in this section are based on the Final Blackbird RI (Golder, 2001), the Final Aquatic Ecological Risk Assessment (CH2MHill, 2001), and the Blackbird ROD (USEPA, 2003).

Geochemical modeling was used to determine the potential for significant releases of metals to the water column in area streams (USEPA, 2003). In Bucktail and South Fork Big Deer Creek most of the metals are in the form of copper carbonates which would be easily re-dissolved and re-mobilized if metal concentrations were reduced in the overlying water column.

In Big Deer and Panther Creek drainages the metals are mostly in the form of minerals, which have a strong adsorption to iron and manganese oxyhydroxides in the sediments. Desorption from iron and manganese oxyhydroxides in Big Deer and Panther Creeks may result in some trace metal loading if metal concentrations were reduced in the overlying water column.

There are metals in the stream sediments and adjacent overbank deposits (including debris flow deposits) along Bucktail Creek. Most of these metals are in the form of copper carbonates. These copper carbonates can be comparatively easily redissolved and re-mobilized under conditions of reduced metals concentrations in the overlying water column. If the copper concentrations in Bucktail Creek waters are substantially reduced, it is likely that the copper carbonates in the sediments will re-dissolve and be released to the surface waters. In addition, the copper carbonates in the overbank deposits are likely to be easily re-dissolved and flushed into Bucktail Creek during rainfall and/or snowmelt.

In South Fork Big Deer Creek, trace metal release from sediments is believed to be primarily responsible for the current observed increases in copper and sulfate concentrations between the confluence with Bucktail and Big Deer Creeks. Copper carbonate dissolution is likely to be the primary mechanism responsible for dissolved copper loading. Sulfate loading is likely the result of desorption or sulfate mineral dissolution.

Geochemistry

The most important issues pertaining to existing conditions and potential impacts of mining on water resources relate to acid rock drainage (ARD) generation and prediction; metals leaching from ore, waste rock, and tailings; and sulfur speciation. The baseline geochemical characterization program for the ICP was organized to address these issues. All of these issues are determined by the geochemical characteristics of ore, waste rock and tailings from the ICP and how these rocks are managed and stored as part of the mining operation. At the historic Blackbird Mine the combination of ore/waste rock/tailings geochemistry and improper management has resulted in widespread water resource impacts.

The baseline geochemistry program, results of which are described here, utilized a phased approach which began with identification and testing of a small number of samples, followed by selection of a larger and more representative sample set for detailed testing. The phased geochemical testing program was designed to characterize whole-rock chemistry, mineralogy, acid-forming potential and metal mobility for the ICP ore and waste materials (Telesto, 2004). A more detailed discussion of ICP geochemistry and results of geochemical/water resource modeling efforts are outlined in more detail in the Water Resources Technical Report (Hydrometrics, 2006).

Geochemical Testing Program

An extensive geochemical testing program was conducted by the ICP in order to predict and understand the geo-environmental characteristics of mine waste rock, tailings, and underground mines. Representative samples of Ram and Sunshine ore, development rock, Ram and Sunshine tailings (with and without cement added), and grab samples of analogous rocks from the Blackbird mine were submitted for a wide spectrum of tests (**Table 3-8**). For a complete discussion of geochemical testing and test results, refer to Appendix B - Geochemistry And Environmental Risks Associated With The Proposed Idaho Cobalt Project of the Water Resources Technical Report (Hydrometrics, 2006).

TABLE 3-8. Summary of Geochemical Tests Conducted on Samples from the Ram and Sunshine Deposits		
Test Method / Description	**Number of Samples**	**Sample Description**
Static Tests	136	Ram drillhole samples
	101	Sunshine drillhole samples
	25	Blackbird waste rock grab samples
Net Acid Generation pH	94	Ram drillhole samples
	78	Sunshine drillhole samples
Water Extraction Tests (Soluble Metals)	10	Ram samples
	10	Sunshine samples
	7	Tailings (some with chemical amendments)
	1	Blackbird composite
	2	6,920 portal seep samples
Total Metals	136	Ram drillhole samples
	103	Sunshine drillhole samples
	3	Tailings
Kinetic columns	5	Development rock
	1	Tailings
Metallurgical tests	3	Tailings – locked cycle tests
Petrographic analysis	>200	Ore samples from core

Comparison to Blackbird Mine

The historic Blackbird Mine site is the source of extensive surface and groundwater contamination caused by release of metals, acidity and sediments from mining wastes and associated mine disturbances. The geo-environmental setting of the Blackbird deposits were described by Evans et al. (1995). Waters draining Blackbird waste rock had a wide range of pH from less than 3.0 to around 7.0, and dissolved metals 1 to over 1,000 milligrams per liter (1,000 to over 1,000,000 micrograms per liter) total metals.

Given the geoenvironmental risk posed by Blackbird mine waste, and the proximity of ICP to the Blackbird Mine, the potential similarity of ICP mine waste and Blackbird mine waste was carefully evaluated (Telesto, 2004). Twenty-five samples of mine waste were collected from surface deposits at the Blackbird mine by Hydrometrics in 2003. The clasts within the samples were geologically logged and samples that were lithologically similar to the ICP deposit were submitted for analysis of soluble metals, pH and acid base potential. The 15 samples that were representative of the ICP development rocks had an average total sulfur of 0.013 percent, an average extract pH of 5.0, and variable levels of metals. Overall, the environmental risk of mine waste samples from the Blackbird site that were most representative of the ICP deposit were on the low end of the range observed at the Blackbird site.

The lower environmental risk associated with representative ICP samples is likely due to the relatively low pyrite levels contained in typical development rock (less than 1 percent pyrite in ICP vs. 3 to 10 percent in Blackbird: see Appendix H, Telesto, 2004). Pyrite (FeS_2) is typically the most abundant mineral contained in acid generating mine waste. In contrast, the suite of sulfides found in ICP development rock is relatively low in pyrite. The primary ore zone at the Blackbird Mine differs from ICP rocks in that pyrite, from secondary enrichment, was abundant. The pyrite accounts for the lower pH and higher metal levels found in Blackbird rocks.

The flotation process proposed at ICP is non-selective in that it removes a high percentage of the sulfide minerals from the tailings and yields a non-acid generating tailings. In contrast, the flotation process used at the Blackbird Mine was selective, meaning that copper and cobalt sulfides were

removed but pyrite was left in the tailings yielding an acid-generating tailings. Therefore tailings material produced at the ICP, like development rock, would have a lower environmental risk than Blackbird tailings.

Acid Generation Risk

The geo-environmental risk of mine waste is related to the pH or acidity of the samples and the abundance of dissolved metals. The risk of acid generation in mine waste depends on the balance of minerals such as sulfides, which may form acidity during weathering, and acid neutralizing minerals such as calcite. Conventional test methods used to assess acid rock drainage (ARD) risk are based on the measured levels of sulfide sulfur and the acid consumption within a sample (Sobek et al., 1978). The amount of acidity that may be produced by sulfide oxidation depends on the kinds of sulfide minerals present. Pyrite, which is the most abundant sulfide mineral at most mines yields four units of acidity for each unit of sulfide sulfur. The ICP mineralogy is dominated by chalcopyrite and cobaltite, which produce one-half as much acidity as pyrite. Consequently, the net neutralization potential (NNP), a measure of ARD risk, was defined for ICP rocks as:

NNP=Acid Neutralization Potential (ANP) - Acid Generation Potential (AGP) [1]
AGP = pyritic sulfur percent times 15.6
ANP = kilograms per metric ton as $CaCO_3$

A large proportion of samples tested had no detectable sulfide sulfur, and the median sulfide sulfur level was only 0.02 percent in the Ram and 0.03 percent in the Sunshine. Though ICP rocks are low sulfur, they are also low in neutralizing capacity. The median Acid Neutralizing Capacity (ANP) was only 2.4 to 2.9 kg/t in the Ram and Sunshine. The Sunshine rock samples had slightly higher average sulfide sulfur than Ram rocks, but in both deposits, the majority of samples were classified as non acid-generating. Overall about 17 percent of the 239 rock samples collected from the Ram and Sunshine deposits (**Figure 3-9**) were potentially acid generating (PAG), while the remaining samples were either weakly acid neutralizing (80 percent) or in an uncertain zone (3 percent).

Metallurgical tests designed to simulate the ore processing proposed by the ICP were conducted on several representative samples of Ram and Sunshine ore (Scales and King, 2002). The Ram and Sunshine deposits will generally not be mined and processed at the same time. Cobalt and copper will be removed by crushing and grinding the ore, then separating the sulfide grains from the remaining material (gangue) using a flotation process. When certain chemicals are added to a slurry of crushed ore and water, and then injected with air, the sulfide grains are trapped by the air and rise to the surface where they form a froth layer that can be physically separated. A “bulk flotation” process, which will be employed at ICP, removes all sulfides mineral types, and therefore leaves very low sulfide in tailings.

The sulfide content of Ram and Sunshine ore samples ranged from 0.2 to 1.4 percent, while the corresponding tailings had only 0.02 to 0.05 percent sulfur content. In comparison, the flotation process used at the Blackbird Mine was selective, meaning that copper and cobalt sulfides were removed but pyrite was left in the tailings. Therefore, tailings material produced at the ICP, like development rock, would have a lower geoenvironmental risk than Blackbird tailings (also see Hydrometrics, 2006).

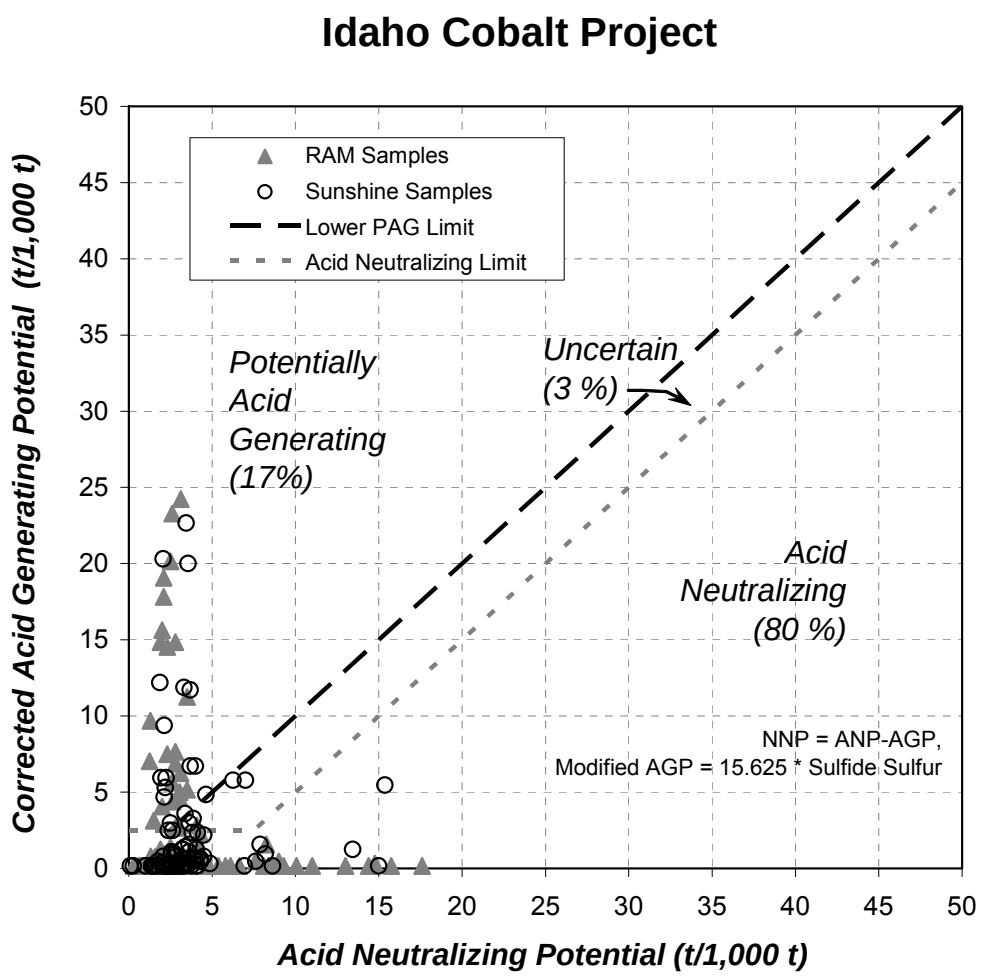


FIGURE 3-9. **Acid Generation Potential and Acid Neutralizing Potential of Ram and Sunshine Development Rock Samples from the ICP**

Metals Leaching Risk

The abundance of soluble metals dissolved in water that contacts mine waste is the second factor (in addition to pH) that determines geoenvironmental risk. Extensive geochemical testing was conducted to determine the rate and quantity of metals that may be accumulated in contact water.

In theory, fresh unweathered samples would tend to have fairly low levels of soluble metals because the sulfides have not weathered, and the metals contained in the sulfides are relatively insoluble. As the sulfides weather, the metals are oxidized, meaning they are chemically converted into secondary minerals that are more soluble than the sulfides. Consequently, when water contacts weathered rock, metals may be released. The concentration of metals in water in contact with sulfide bearing rock depends on several factors including the sulfide abundance in the original rock, the pH of the system, and the amount of metal removal that has already occurred by rinsing.

Generally, as pH decreases, the concentration of metals that dissolves in contact water increases. While the inverse relationship of pH and metal solubility generally holds true for copper, cobalt, zinc,

and many other metals, arsenic concentrations often increase as pH increases (at least in the pH range of 4 to 9). Column tests on development rock show that the "first flush" of weathered rock by contact water tends to have the greatest metal concentration, and the concentration gradually decreases as the sample is further rinsed (Telesto, 2004). Owing to the limited solubility of many secondary minerals, especially at near-neutral pH, weathered mine waste may continue to contribute metal loading to contact water for a long period of rinsing.

Numerous factors may affect metal concentration in contact water. As a result, predicting the concentration of metals that may develop at the proposed ICP is complex. Predictive tools must account for the variable quantity of sulfides in the rocks, the solubility control exerted by pH, the tendency for metal levels to diminish upon continued rinsing, and the potential for metals to be sorbed by soils or sediments if the contact water migrates.

The metals routinely observed at elevated concentrations in contact water from geochemical testing of ICP waste rock, ore, and tailings samples included principally **copper** and **cobalt**, while to a lesser degree **arsenic**, **nickel**, and **zinc** were sometimes found at elevated concentrations. Arsenic concentrations, though elevated, were much lower than was expected based on the relative abundance of arsenic in the ore (often several hundred milligrams per kilogram). Evans et al. (1995) also reported that arsenic levels in contact water at the Blackbird Mine were relatively low in comparison to their abundance in the ore, and attributed this to sorption of arsenic by iron oxyhydroxide precipitates. These five elements are considered the most likely to adversely impact receiving waters, and are considered the primary constituents of concern for evaluating potential impacts from the ICP.

Another important consideration when evaluating metals leaching risk is the time required for rocks to weather sufficiently to become acidic. In most systems, two factors determine the "lag period," which is the duration of the weathering period required to create acidic conditions (in PAG samples). Sulfide oxidation rate, the first factor influencing the lag period, is generally slow in ICP samples, favoring long lag periods. The amount of neutralization capacity is the second factor affecting lag period. The low ANP levels found in ICP rocks favor shorter lag periods. Overall, the lag period is expected to have a moderate duration meaning acidification, if it occurs, will likely be observed within 1 to 5 years after rock placement.

Soil Resources

Soils of the Salmon National Forest have been delineated by U.S. Forest Service Landtype mapping conducted at a third-order intensity (USDA, 1980). Landtypes are units of land with similar landform, geology, soils and vegetation characteristics. Landtype map units include descriptions of landforms, geology, and soils and a discussion of landtype management implications. A more intensive second order soil survey was conducted for the Project area.

Soils Study Area

In 2001, Project area soils were delineated in a second-order level soil survey (Intermountain Resources, 2002). This survey identified a total of seven soil mapping units, including five mapping units in Mountain Slope Sites and two mapping units in the Big Flat area. Soils in the Big Flat area were further evaluated as part of investigations into the design of a proposed water disposal land application system (CES, 2001 and 2005). Soils in the general Project area are also covered by the Forest third order mapping (USDA, 1980).

Project Area Land Types and Soils

The general Project area including the South Fork of Big Deer Creek, Bucktail Creek, and Big Flat Creek watersheds (**Figure 3-10**) contains a total of four general Landtypes with 11 Landtype Map Units. Landtype 109 (3 Map Units) at upper elevations and Mountain Slopeland Landtype 120 (6 Map Units) at lower elevations comprise the majority of the Landtype mapping in Idaho Cobalt area. Two other Landtypes (Landtype 111 and Landtype 124) are found within the study area.

109 - Cryic Uplands - This landtype is the broad, gently sloping ridgetops and mountain slopes that occur at the higher elevations, usually above 6,500 feet. The dominant slope forming process has been the action of freezing and thawing. Slope gradients generally range from 15 to 50 percent. These lands do not show evidence of glaciation, however the influence of glacial climates has been a very important element in their formation.

111 – Steep Glaciated Headlands - This landtype is found in steep drainage headlands at higher elevations, generally above 7,000 feet. Slopes are primarily concave on all aspects as weakly-developed cirques. Slope gradients are steep, typically ranging from 60 to 70 percent. Rock outcrops and talus slopes comprise less than 50 percent of the landtype area.

120 - Mountain Slopelands - This landtype is comprised of the moderately steep mountain slopes that have been formed primarily by stream cutting action. Slope gradients generally range between 40 and 65 percent. Slopes may be smooth or dissected by V-shaped drainages. This landtype is usually found between 4,000 and 6,500 feet.

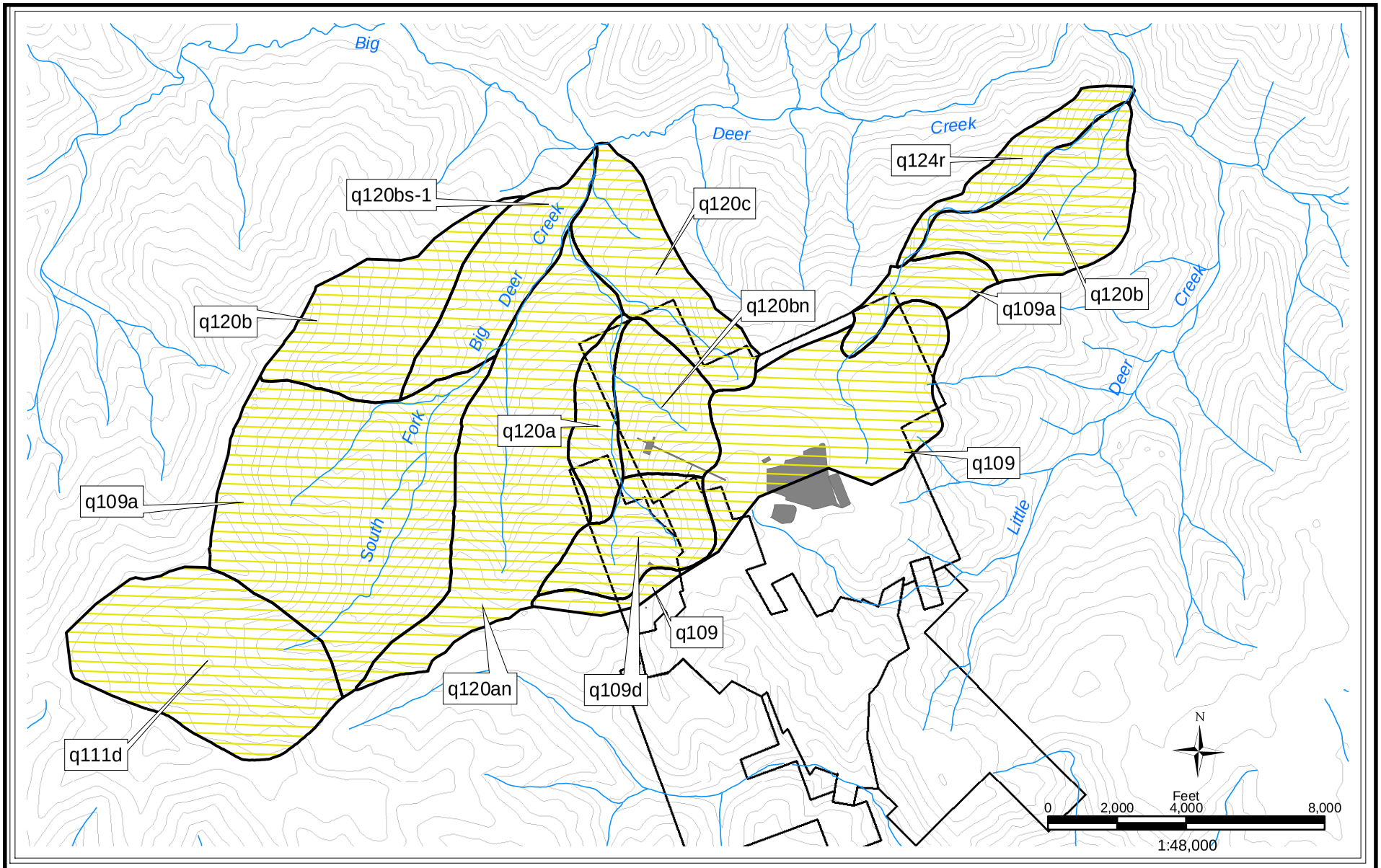
124 - Steep Canyonlands - This landtype includes the steep sideslopes of the deep canyons and the canyon bottoms that have been formed by stream cutting action. The sideslopes are very steep and generally range from 60 to 90 percent. The slopes are dissected by shallow, parallel drainages. Rock outcrops and talus slopes are frequent.

Project Area Soil Descriptions

Mountain Slope Sites

Five soil mapping units were identified in Mountain Slope Sites (Intermountain Resources, 2002) and include four Xeric Dystrochrept - Typic Cryorthent Complexes (Map Units 3D, 4CD, 5E, 6F) differentiated by slope class and a Disturbed Land - Xeric Dystrochrept Complex (Map Unit 7CF). These soil mapping units comprise 929 acres (57 percent) of the Soils Study Area. These landtypes are primarily found in the Bucktail drainage. Soils are well drained, moderately deep to deep (20 to 60 inches) on quartzite bedrock. Organic matter content is moderate in surface soils, decreasing to low levels with depth. Soil reaction (pH) ranges from neutral to slightly acid in surface soils to moderately to strongly acid with depth. Plant-available metal concentrations (zinc, iron, manganese, and copper) are generally low. Elevated concentrations of plant-available manganese (in all surface soils) and copper (through soil profiles at Map Units 6F and 7F) are noted, although relatively high soil pH limits metals mobility.

Surface soils have gravelly loam to sandy loam texture with low to moderate coarse fragment content (gravels, cobbles, stones, and boulders). Subsoils have very gravelly loam to sandy loam texture with high coarse fragment contents (gravels, cobbles, stones, and boulders). Depending on slope, these soils have erosion hazards ranging from low (less than 17 percent slope), to moderate (17 to 33 percent slope), to high (greater than 33 percent slope). Slope also limits the suitability of these soils for disturbance reclamation or cover soil salvage. Soils in low to moderate slope areas are suitable for reclamation or cover soil salvage (to a depth of 8 inches) with provisions for safe equipment operation and implementation of appropriate erosion control measures.



Legend

Watershed/ Sediment Area of Potential Impact

Stream

FCC Claim Boundary

Alternative II Facillities

q111d Land Type

IDAHO COBALT PROJECT FORMATION CAPITAL CORP. U.S. LEMHI COUNTY, IDAHO	**IDAHO COBALT PROJECT** **LANDTYPE UNITS** January, 2006	Figure 3-10

Big Flat Area

Two soil mapping units were identified in the Big Flat area during the 2001 second-order level soil survey (Intermountain Resources, 2002). These include Map Unit 1BC, a Xeric Haplocryalf - Xeric Dystrochrept Complex (637 acres / 39 percent of the Soils Study Area) and Map Unit 2B, an Oxyaquic Haplocryalf (59 acres / 4 percent of the Soils Study Area). Together, these soil mapping units comprise 696 acres (43 percent) of the Soils Study Area. Hematitic soils with little or no revegetation were identified in 2004 at three disturbed test pit locations on the Big Flat with the Project area. Further investigation in 2005 found that the hematitic soils are of a limited extent and do not represent a significant area at risk of phytotoxicity.

Climate and Air Quality

Climate

Regional climate data is available from the USDA Natural Resources Conservation District (NRCS) Morgan Creek SnoTel station, located approximately 20 air miles south-southeast of the ICP and the Cobalt townsite weather station, located 7 miles from the ICP. The Morgan Creek SnoTel station is located at an elevation of 7,600 feet above mean sea level, and has 23 years of data available. FCC collected baseline meteorology and air quality data on site.

The climate of central Idaho is characterized by a wet season in the winter (mostly snow), from November through March, and by a dry season in the summer, from July through September. The summer months are generally characterized by low relative humidity, less than 25 percent, and frequent sunshine. The mountainous terrain surrounding the proposed Project area lessens the strength of winter storms in the vicinity and generally results in a mild winter season. Elevation, topography, vegetation and available moisture all influence the local climate of the proposed Project area.

Temperature

Temperature data for the Project area are available from the ICP meteorological station (elevation 8,100 ft). Temperatures measured in the Project area during 2000-2005 indicate wide seasonal variability, ranging from a low of -11 degrees Fahrenheit (^{o}F) to a high of 90°F (FCC, 2006). The temperature extremes typically occur during December/January/February and July/August/September. Average temperature over the period 2000-2003) was 42.8^{o}F.

Temperature data is also available from the Cobalt, Idaho weather station, located 7 miles from the ICP site at elevation 5,010 feet. Based on 26 years of record, monthly average temperatures are as shown in **Table 3-9**.

Precipitation

The majority of the annual precipitation at the ICP occurs in the late fall through early spring. The predominant form of precipitation occurs as snow with thunderstorms in the summer months. The measured average annual precipitation ranges from 15 inches in the lower elevations (IDEQ, 2001), up to 24 inches at the Morgan Creek SnoTel station located at 7,600 feet elevation (Telesto, 2005a). Based on 23 years of data, average annual precipitation at the Morgan Creek station is 24.4 inches. Approximately 60 percent (14.7 inches) of precipitation at the site likely falls in the form of snow and 40 percent (9.7 inches) in the form of rain.

Total annual precipitation for the Project site that was measured during the period of baseline study (July 2000 – August 2001) was 15.82 inches.

TABLE 3-9. Average Monthly Temperatures at Cobalt, Idaho		
Month	**Mean Maximum Temperature (^oF)**	**Mean Minimum Temperature (^oF)**
January	46	3
February	49	-8
March	52	4
April	62	10
May	74	15
June	77	28
July	86	41
August	83	39
September	77	24
October	68	7
November	52	3
December	47	1

Source: 2001 to 2003 data from Gelhaus (2004).

Wind

Wind speeds in the area of the proposed Project are moderate and generally from the west. Wind speed and direction data were collected during the period of study (2000-03) at the ICP meteorological station. During that period, the predominant wind direction was from the southwest. Wind direction at the ICP site is influenced by local topography of Panther Creek and the surrounding mountains. The average wind speed during the study period was 5.7 miles per hour (mph). The resultant wind direction was from 232.1 degrees (southwesterly), and wind persistence averaged 53.1 percent. Wind patterns indicate slight variations of direction and speed associated with the time of year.

Evaporation

Pan evaporation measured at the ICP site is in the range of 25 to 30 inches per year (FCC, 2006). Free surface pond evaporation is assumed to be 70 percent of pan evaporation (Telesto, 2005a).

Air Quality

The Project site is located in the Panther Creek air quality sub-basin, which is classified as an attainment area for air quality pollutants by the Idaho Department of Environmental Quality, therefore the Panther Creek sub-basin area would be designated a Class II area under the Prevention of Significant Deterioration (PSD) regulations. The nearby wilderness (Frank Church-River of No Return Wilderness) area would be considered as a Class II designation for PSD under the Federal rules and guidelines. The PSD Class II designation allows for moderate growth or degradation of air quality within certain limits above baseline air quality, while the PSD Class I designation allows little to no growth or degradation of air quality. Therefore special attention to any potential impacts from the proposed ICP site to the wilderness area must be assessed.

There are no major sources of air quality pollutant emissions in the proposed ICP area; however, fugitive dust emissions from vehicular traffic on unpaved roads within the immediate area may contribute particulates to the ambient air in the area. Although no data are available on fugitive dust emissions for the surrounding area of the ICP site, particulate levels at the ICP site have been measured as part of the baseline studies. Data generated from the baseline study included fugitive dust

emissions from vehicular traffic within the immediate area of the ICP site and may be considered as "background" levels of particulates for the ICP site.

Particulates (PM_{10}) have been monitored in the Project area from February 2001 – October 2002. State and federal 24-hour and annual PM_{10} standards are 150 micrograms per cubic meter (µg/m^3), and 50 µg/m^3, respectively. The annual PM_{10} standard is an arithmetic average of 24-hour PM_{10} measured concentrations at a monitoring location. Data collected on site indicate that existing conditions are in compliance with both the 24-hour and annual standards. The highest (i.e., maximum) 24-hour PM_{10} measurement observed during the study period was 39.0 µg/m^3, and this was measured on August 18, 2002. The annual arithmetic average of PM_{10} concentration for the study period was 6.2 µg/m^3 during the year of 2001 and 10.2 µg/m^3 during the year of 2002.

Noise Resources

Noise

Noise levels heard by humans and animals are dependent on several variables, including distance and ground cover between the source and receiver and atmospheric conditions. Human and animal perception of noise is affected by intensity, frequency, pitch and duration, as well as the auditory system and physiology of the animal. Noise can influence humans or wildlife by interfering with normal activities or diminishing the quality of the environment.

Noise-Sensitive Receptors

The ICP is 45 road miles west of Salmon, Idaho, and the site is accessed from US 93 via a series of Forest Service Roads along Williams, Deep, Panther, and Blackbird creeks. Residences and cabins are located in Cobalt, approximately 6.5 miles southeast of the ICP and along the first 3 miles of Williams Creek Road. People use the areas surrounding the ICP for recreational uses, including snowmobiling, cross-country skiing, hunting, fishing, hiking, and camping. Three potential noise-sensitive receptor areas of concern were identified by the USFS, including: 1) the Deep Creek Campground, located 7 miles southeast of the ICP Area, 2) the confluence of South Fork Big Deer Creek and Big Deer Creek, located 2 miles north, and 3) the outfitter camp at Indian Point along the Gant Ridge Trail (Wilderness Boundary), located 5 miles to the northwest (**Figure 3-16**) (Big Sky Acoustics, 2005). The primary on-site human noise-sensitive receptors are ICP workers. Wildlife that live, forage, and pass through the ICP area are also primary noise-sensitive receptors in the immediate site area.

Ambient Noise Level Measurements

Two noise level measurements were completed in 2001 to determine the existing ambient noise levels representative of the ICP site and recreational noise-sensitive receptors (USFS, 2001). **Table 3-10** summarizes the measured ambient noise levels.

The higher noise levels measured at the Deep Creek Campground were due to the water flowing in Deep Creek, which also increases the estimated L_{dn} noise level (54 dBA). Therefore, the ambient noise levels on the Big Flat Plateau, where the ICP mill/processing and TWSF facilities will be located, are estimated to be similar to the measured noise levels at the Williams Creek Pass Summit (L_{eq} 34 dBA) (**Table 3-10**).

TABLE 3-10. ICP Area Ambient Noise Level Measurements						
9/12/01 Time (hours)	**Description**	**Approx. Distance and Direction from ICP**	**Measured L_{eq} (dBA)**	**Measured L_{90} (dBA)**	**Estimated L_{dn} (dBA)**	**Noise Sources During Measurements**
1439 to 1453	Deep Creek Campground	7 miles southeast	48 dBA	47 dBA	54 dBA	Water flowing in Deep Creek, birds, and insects. The campground was unoccupied. No vehicles passed by on roadway.
1518 to 1524	Williams Creek Pass Summit	13 miles east	34 dBA	28 dBA	32 dBA	Insects, birds, and wind in trees. No vehicles passed by on roadway.

Similar ambient noise levels have been quantified using measurements made at the north rim of the Grand Canyon (USEPA, 1971a). The study reported average 1-hour L_{eq} noise levels of approximately 40 dBA during the day and approximately 35 dBA at night, with natural sounds, such as insects, birds, and small animals as the typical dominant noise sources. However, instantaneous noise levels during the 24-hour measurement periods varied between a minimum of less than 15 dBA, when no identifiable noise sources were present, and a maximum level of approximately 68 dBA during an aircraft flyover. Based on additional EPA studies, L_{dn} levels for wilderness-type areas are typically between 30 and 40 dBA, comparable to the levels measured at the Williams Creek Pass Summit (L_{dn} 32 dBA) (**Table 3-10**). The noise levels measured near the ICP site, as well as wilderness-type noise levels documented in the EPA studies, are typical of isolated rural areas.

Vegetation Resources

Existing Vegetation

Vegetation in this EIS was evaluated for a large area surrounding and including the Project area. Vegetation in the Project area and area of potential impact varies with elevation, aspect, and history of disturbance (e.g. fires, insect infestations, and logging). Shrub and grassland communities, typically dominated by big sagebrush, mountain mahogany, bluebunch wheatgrass, Idaho fescue, and a diversity of forbs, occupy the driest sites, usually with south and west exposures. At mid and upper elevations conifer communities dominated by Douglas-fir, ponderosa pine, Engelmann spruce, subalpine fir, and lodgepole pine occupy the cooler and moister sites. Riparian vegetation composed of plants, adapted to wetter conditions along streams and intermittent drainages, is composed of water birch, alder, red-osier dogwood, cottonwood, and Engelmann spruce. **Table 3-11** presents a summary of Project area habitat types.

Fire, insects, dwarf mistletoe, and logging are the primary factors affecting the ecology of vegetation in the Project area and area of potential impact. Fire frequency and intensity has determined the structural stages, composition, and seral ecology of plant communities. Fire frequency and severity has had a dominant influence on plant community structure and composition, which substantially determines the character and quality of wildlife habitat, hydrology, sediment yield, water quality, and aquatic habitat.

TABLE 3-11. Vegetation Habitat Types in Idaho Cobalt Project Area		
Habitat Type	**Acres**	**Percent of Area**
Subalpine fir/Grouse Whortleberry	791	30.2
Subalpine fir/Sitka alder	378	14.4
Subalpine fir/Beargrass	145	5.6
Subalpine fir/Menziesia	59	2.2
Subalpine fir/Pinegrass	49	1.9
Subalpine fir/White spirea	35	1.4
Subalpine fir/Heartleaf arnica	29	1.1
Subalpine fir/Russet buffaloberry	27	1.0
Subalpine Fir/ Blue Huckleberry	18	0.7
Douglas-fir/Pinegrass	394	15.0
Douglas-fir/Blue Huckleberry	170	6.5
Douglas-fir/Ninebark	116	4.5
Douglas-fir/White Spirea	72	2.7
Douglas-fir/Bluebunch Wheatgrass	49	1.9
Douglas-fir/Mountain Snowberry	40	1.5
Douglas-fir/Common Juniper	20	0.8
Disturbed Land	226	8.6
Total	2620	100.0

Source: Vegetation and Wetland Technical Report (Elliot, 2005a).

Prior to the Clear Creek fires in 2000, vegetation in the area surrounding the ICP site consisted of forest plant communities dominated by an overstory of Douglas-fir, lodgepole pine, subalpine fir, and Engelmann spruce (Douglas-fir and subalpine fir climax habitat types). The Clear Creek fires burned 99 percent of the Area of Potential Impact with 60 percent of the area burning at high severity (80 to 90 percent crown or canopy removal), 30 percent burning at medium severity (20 to 80 percent crown removal), and 9 percent burning at low intensity (0 to 20 percent crown removal) (Intermountain Resources, 2004).

Post-fire vegetation consists mostly of standing and fallen dead trees with regrowth of trees and understory species being variable depending on slope, aspect and burn severity. Vegetation cover is lowest on south- and west-facing steep slopes where fire severity was high. Canopy cover ranges from 10 to 40 percent, with four to five lodgepole pine seedlings per acre. Dominant understory species include fireweed, pinegrass, elk sedge, grouse whortleberry, heartleaf arnica, and timothy.

On north-facing slopes and relatively flat areas there generally is good reproduction of young conifers, mostly lodgepole pine. Densities of tree seedlings on the cooler, moister sites range from 600 to 30,000 per acre. Common understory species are timothy and orchard grass, which were planted following the fire; heartleaf arnica; grouse whortleberry; pussytoes; pearly everlasting; and beargrass.

Plant communities in the area of potential impact are composed of species adapted to the relatively cool and dry conditions, ranging from mid to high-elevations (5,100 - 8,040 feet). Forest habitat types (i.e., potential climax vegetation) are dominated by Douglas-fir, lodgepole pine and subalpine fir.

Historically (i.e., pre-1900), dry Douglas-fir habitat types (Douglas-fir/Bluebunch Wheatgrass, Douglas-fir/Mountain Snowberry, Douglas-fir/Pinegrass, and Douglas-fir/Ninebark) typically burned at least once every 35 years, with low-severity, non-lethal fires (Crane and Fischer, 1986). Non-lethal fires in these habitat types killed less than 10 percent of the canopy cover.

Historically, subalpine fir habitat types burned at least once every 35 to 100 years with mixed severity. Mixed severity fires burn in a mosaic patterns with some areas being non-lethal and others experiencing stand-replacing fires. Based on tree-ring data, the last stand replacing fire in the Project area, prior to the Clear Creek fires in 2000, occurred in the 1880's (Hamilton, 2004). Fire return intervals in the cooler, higher elevation forest stands in the study area appear to be longer than the natural range of variability typical in these forest types, which is why the fires of 2000 were so severe. The longer interval between fires allowed fuel to build up to levels sufficient to sustain high-severity, stand replacing fires.

Sites within the Area of Potential Impact that burned with high severity, on steep south and west slopes, may not have sufficient numbers of seed trees to completely regenerate forest communities. Shrubs, forbs, and grasses may proliferate on burned areas where sufficient seed trees are not present. When vigorous stands of shrubs, forbs and grasses establish following fire, it is difficult for conifer seedlings to grow and dominate the site because of competition with dense ground cover (Crane and Fisher, 1986). Site visits in 2004 indicate that on most sites where conifer regeneration is poor, regrowth of shrubs and herbaceous species is patchy, with areas of rock and bare soil. In general, ecological succession on the Project area, following fire, is typical of succession in central Idaho and Montana following fire (Crane and Fischer, 1986; Fischer and Bradley, 1987).

Potential climax plant communities on the study area are Douglas-fir and subalpine fir with successional stages that include lodgepole pine and Engelmann spruce (Intermountain Resources, 2004 and 2006). Over time, if fires do not set back ecological succession, plant communities burned by the Clear Creek fires will become dominated by an overstory of Douglas-fir, subalpine fir, lodgepole pine, and Engelmann spruce. The future character of plant communities in the study area will depend on future fire intervals as well as land management practices such as logging, grazing, and mining activity.

Fire Ecology

Scientific findings from the Interior Columbia Basin Ecosystem Management Project (ICBEMP) indicate that trends related to ecosystem structure and processes at the regional level are similar to ecosystem structure and processes in the Project area and Area of Potential Impact. Broad-scale changes in the landscape that have occurred both regionally and locally include structural changes in mid-seral forest structures and increased density of some coniferous trees. The density of large, shade-intolerant trees (i.e., ponderosa pine and lodgepole pine) has decreased and density of smaller shade-tolerant trees (Douglas-fir, subalpine fir, and spruce) has increased. According to ICBEMP, prior to 1900, fire-regime severity in the watershed was mostly non-lethal (return interval 5 to 50 years). Prior to the Clear Creek fires, fire regimes in the watershed were mostly of mixed severity or lethal (return interval 30 to 300 years) in forest communities (ICBEMP, 2000).

Generally, the consensus among fire ecologists (Brown and Smith, 2000; Crane and Fisher, 1986; and Hardy and Arno, 1996) is that the structure and composition of most forest communities in the West have been altered by exclusion of natural cycles of fire. Fire suppression in the last century has reduced the frequency and spatial extent of fires in many forest communities. Fire suppression generally has lengthened intervals between fires, contributing to the creation of dense stands with high levels of fuel.

Old Growth

Prior to the Clear Creek fires of 2000, there were 998 acres of old growth stands dominated by Douglas-fir, lodgepole pine, and ponderosa pine in the area surrounding the ICP site (Intermountain Resources, 2004). The 2000 fires burned 668 acres of this old growth. Currently, there is no old growth forest in the area that would be directly affected by the proposed Project.

Noxious Weeds

Noxious weeds are defined by Idaho Statutes (Title 22, Chapter 24 – Noxious Weeds) as any plant having the potential to cause injury to public health, crops, livestock, land, or other property; and which is designated by the Idaho Department of Agriculture. It is the duty of all landowners to control noxious weeds on their land and property. Noxious weeds typically proliferate on sites where the native vegetation and soils have been disturbed (e.g. road margins, powerlines, and heavily grazed areas). There are 36 species of noxious weeds in Idaho. Three species of noxious weeds are present and abundant in the Project area, spotted knapweed, bull thistle, and Canada thistle (Intermountain Resources, 2004). These weeds are common along roads, the Noranda powerline corridor, and along Big Deer Creek.

Special-Status Species

Special-status species are those plants listed under the Endangered Species Act of 1973 or designated by the Regional Forester as "sensitive" to comply with the National Forest Management Act, as provided in Section 2670 of the Forest Service Manual (FSM). As defined in FSM Section 2670, sensitive species are those identified by a Regional Forester for which population viability is a concern. Objectives for managing sensitive plants include:

- Develop and implement management practices to ensure that species do not become threatened or endangered because of Forest Service actions;
- Maintain viable populations of all native and desired nonnative wildlife, fish, and plant species in habitats distributed throughout their geographic range on National Forest System lands; and
- Develop and implement management objectives for populations and/or habitat of sensitive species (FSM 2670.22).

Eight species of special-status plants were identified by the Forest Service that may be present in the Project area and Area of Potential Impact, including one plant listed as threatened under the Endangered Species Act (Ute Ladies' tresses). Field surveys in 2001, 2004, 2005 and 2006 of the Project area and Area of Potential Impact did not find any of these plants (Intermountain Resources, 2004a and Elliott, 2006).

Wetlands

A total of 4.9 acres of wetlands have been identified in the Project area. These wetlands are typically associated with seeps or intermittent drainages that receive water from surface runoff and shallow groundwater discharge. Common wetland species in the Project area associated with seeps and drainages that receive water from surface runoff and shallow groundwater include aquatic sedge, arrow-leaf groundsel, smooth scouring-rush, five-stamened mitre-wort, small white violet, and dagger-leaf rush. Wetlands are described in more detail in the Water Resources section of this Chapter and are shown on **Figure 3-8**.

Wildlife Resources

National Forest lands on the Salmon-Challis National Forest are used by a variety of wildlife species.

Management Direction

The Forest Plan goal for wildlife management follows National Forest Management Act (NFMA) direction to "provide a variety and diversity of habitat throughout the Forest to support viable populations of all native vertebrate species." NFMA also directs National Forests to identify Management Indicator Species (MIS) which are defined as "plant and animal species, communities,

or special habitats selected for emphasis in planning, and which are monitored during forest plan implementation in order to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent" (FSM 2620.5). MIS are generally presumed to be sensitive to habitat and population changes that are believed to indicate the effects of management activities. Forest plan direction to maintain MIS and their habitat includes "sustain populations of MIS over the long term."

The Forest Plan reflects Endangered Species Act (ESA) requirements that specify all NEPA projects be coordinated with the Fish and Wildlife Service for effects to threatened, endangered, and candidate species. Forest Plan direction for these species includes "manage threatened and endangered species habitat consistent with recovery plan objectives." Currently there is one listed species, the gray wolf (experimental/non-essential population), and one candidate species the yellow-billed cuckoo potentially present in the vicinity of the ICP Project area.

Forest Service Sensitive Species direction (FSM 2672.4) requires the Forest Service to use a biological evaluation to review all programs and activities for possible impacts to sensitive species. The Regional Forester designates species as "sensitive" because their population or habitats are trending downward, or because little information is available on their population or habitat trends. Sensitive species that may occur in the analysis area are listed in **Table 3-12**.

Analysis Area

The Idaho Cobalt Mine, which includes the portals, roads, tram and processing facilities are all located in a high severity burn area that resulted from the 2000 Clear Creek fire. The intensity of the fire resulted in stand replacement conditions in all of these areas (**Figure 3-11**). The area that will be disturbed is entirely within the severely burned area. The footprint from the proposed Project will be small (less than 340 acres under all alternatives) and the majority of disturbances will occur in a severely burned area on Big Flat and in the Bucktail Creek drainage. All primary access roads are in place and, except for a few modifications in alignment or grade, will not be changed.

The analysis of effects to wildlife and wildlife habitat focuses on threatened, endangered, Region 4 Sensitive, MIS, Idaho Species of Concern, neotropical birds, raptors, big game and other species that may occur in and adjacent to the Project area. All are species that may be directly, indirectly or cumulatively affected by the proposed Project activities. The degree to which any species may be affected will vary. The analysis of these species focuses on current habitat conditions, the amount of habitat that will be modified and to what degree and potential disturbance from human activities. The wildlife analysis area was determined based upon existing conditions, wildlife species under consideration and management direction for those species.

A review was completed for all species listed in **Table 3-12** to determine which species may occur in or adjacent to the Project area. This review included the Idaho Conservation Data Center (CDC) database information, relevant publications, consultation with agency biologists and wildlife studies in the Project area in 2001, 2002 and 2004. Based upon a review of listed species, four species have a low probability of occurrence, two species have a medium probability of occurrence and one species has a high probability of occurring in the Project area. Eighteen species do not have any probability of occurring in or adjacent to the Project area.

Affected Environment

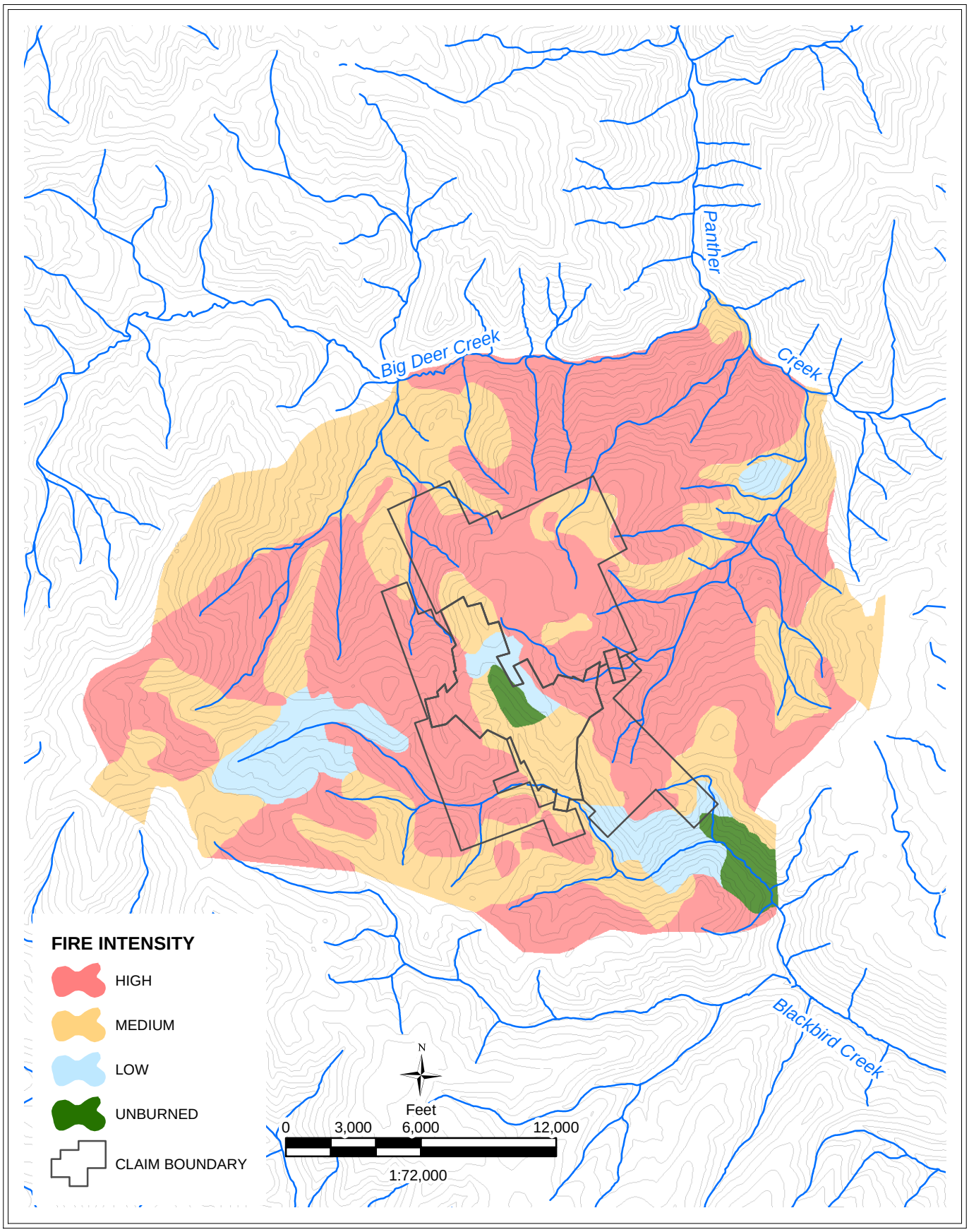
Past Events That Have Affected Current Conditions

Two factors, historic mining and a recent major forest fire in the Project area have had significant effects on current habitat conditions and wildlife activities. From the late 1800's and into the 1980's the Blackbird Mine operated at varying levels of activity. Over those years of mining mine portals were established, large tailing areas created, access roads constructed and exploration activities conducted. The combination of these activities has resulted in considerable disturbance in the area.

TABLE 3-12. Probability of Occurrence of Threatened, Endangered, Region 4 Sensitive, MIS, and Idaho Species of Concern (Lemhi County) in and Adjacent to the Project Area (some species are found under more than one Category)

Species	Scientific Name	Probability of Occurrence	Habitat Suitability
Threatened Species			
None			
Endangered			
Gray wolf	Canis lupus irremotus	Moderate	Very limited
Candidate Species			
Yellow-billed cuckoo	Coccyzus americanus	None	No Habitat
Region 4 Sensitive Species			
Wolverine	Gulo gulo	Low	Very limited
Fisher	Martes pennanti	Low	Very limited
Townsend's big-eared bat	Plecotus townsendii	None	No Habitat
Spotted bat	Euderma maculatum	None	No Habitat
Harlequin duck	Histionicus histrionicus	None	No Habitat
Bald Eagle	Haliaeetus leucocephalus	Low	No Habitat
Peregrine falcon	Falco peregrinius	None	No Habitat
Northern goshawk	Accipiter gentillis	Low	Very limited
Great gray owl	Strix nebulosa	None	No Habitat
Boreal owl	Aegolius funereus	None	No Habitat
Flammulated owl	Otus flammeous	None	No Habitat
Three-toed woodpecker	Picoides tridactylus	Moderate	Suitable Habitat
Spotted frog	Rana luteiventris	High	Suitable Habitat
Sage grouse	Centrocercus urophasianus	None	No Habitat
Pygmy rabbit	Brachylagus idahoensis	None	No Habitat
Management Indicator Species			
Pileated woodpecker	Dryocopus pileatus	None	No Habitat
Sage grouse	Centrocercus urophasianus	None	No Habitat
Spotted frog	Rana luteiventris	High	Suitable Habitat
Idaho Species of Concern			
Western toad	Bufo boreas	None	No Habitat
California myotis	Myotis californicus	None	No Habitat
Western small-footed myotis	Myotis ciliolabrum	None	No Habitat
Long-eared myotis	Myotis evotis	None	No Habitat
Long-legged myotis	Myotis volans	None	No Habitat
Yuma myotis	Myotis yumanensis	None	No Habitat
Long-billed curlew	Numenius americanus	None	No Habitat

Source: Wildlife Resources Technical Report (Monarch and Associates, 2005).



IDAHO COBALT PROJECT FORMATION CAPITAL CORP. U.S. LEMHI COUNTY, IDAHO	**FIRE INTENSITY 2000 CLEAR CREEK BURN** **SALMON-CHALLIS NATIONAL FOREST** January, 2006	Figure 3-11

Regularly used and maintained roads are common and there are numerous exploration roads and pits in the area. These activities have had a considerable influence on habitat in the area.

The second and more dramatic influence was the 2000 Clear Creek fire. Habitat conditions and wildlife activities in the area are undoubtedly significantly different than what existed prior to the fire. As a result of the stand replacement fire on Big Flat and in the Bucktail drainage, habitat and associated wildlife activity in those areas where the facilities will be located were and still are affected. Currently, wildlife use in the immediate Project area is low and will probably remain low until the various structural stages of vegetation that existed prior to the fire become reestablished.

Habitat in a majority of the Project area was significantly altered by the 2000 Clear Creek fire. The remainder of the Project area if primarily forested with lodgepole pine with an understory of grasses, forbs and shrubs. Data collected during wildlife studies for the ICP indicate that wildlife activity in the immediate Project area is low and will probably remain low for a number of years. As vegetation becomes reestablished around the proposed development wildlife use of the area will increase.

Threatened and Endangered Species

One listed species is known to or may occur in the Project area. This is the gray wolf which is listed as endangered, but as an experimental/non-essential population. The Canada lynx which is listed as a Threatened Species by the USFWS nationally, is not listed as occurring in the Salmon-Challis National Forest. As the result of the Lynx Conservation Agreement between the USFS and USFWS dated August 31, 2006, if it is determined the forest where a project is planned is unoccupied by lynx it is not necessary to show it on the species list. However, it was determined by the Salmon-Challis National Forest that the lynx should be addressed in this document. The bald eagle, was de-listed by the Department of the Interior on August 8, 2007 and is now listed as a Sensitive Species by the Forest Service. The yellow-billed cuckoo is listed as a candidate species, but is not known to occur in the area. During the wildlife studies in 2001, 2002 and 2004 potential suitable habitat conditions within the study area for these species were assessed. No evidence of these species were observed during any of the fieldwork.

Gray Wolf

All wolves in Central Idaho south of Interstate 90, whether re-introduced or naturally dispersing, have been designated as a “non-essential, experimental” population by the Secretary of the Interior to encourage experimental approaches to achieving recovery goals and to provide more flexibility, especially in dealing with animals that may prey on domestic livestock (Mack and Laudon, 1998). On January 5, 2006, a MOU was signed between the State of Idaho and the US Department of the Interior, giving Idaho primary responsibility for managing wolves in the state. Wolves remain on the Endangered Species List, and are managed under provisions of the 10 (j) rule (USDI and State of Idaho, 2006).

Wolf recovery efforts in Central Idaho are ongoing with the monitoring of telemetered re-introduced gray wolves and their offspring. There are currently three occupied wolf territories in the Panther Creek watershed. These are the Jureano, Moyer Basin and Hoodoo packs. The Jureano pack denning and rendezvous area is found east of Panther Creek and north of the confluence with Blackbird Creek. The Moyer Basin Pack denning and rendezvous area is south of Blackbird Creek in the Panther Creek drainage. This pack has been observed in the Big Deer Creek drainage. The Hoodoo Pack denning and rendezvous area is west of the Project area in the Big Horn Crags and Middle Fork drainage. This pack is beginning to move further east and will probably continue to move east into the Project area (Huffman, 2007). It is unknown whether there is any overlap of territory by the packs.

No members of any wolf pack or individual animals are known to use the proposed mine, access roads or mill areas as part of their territory. During the 3 years of studies conducted in the area no

wolf tracks were encountered. They have been observed approximately 4 miles from the Project area in the Panther Creek drainage (Wenger, per com., 2005).

The denning and rendezvous areas of all three packs are found well away from the Project area. However, there is always the possibility that any one or all three of the packs could travel through the area. There is a chance that at some point in time any one of the packs could be found in or near the Project area. This activity would probably be associated with packs traveling the borders of their territory. The chance that one of the packs would move through the area is very high and the chance of all three packs moving through the area at some point in time is also high.

Canada Lynx

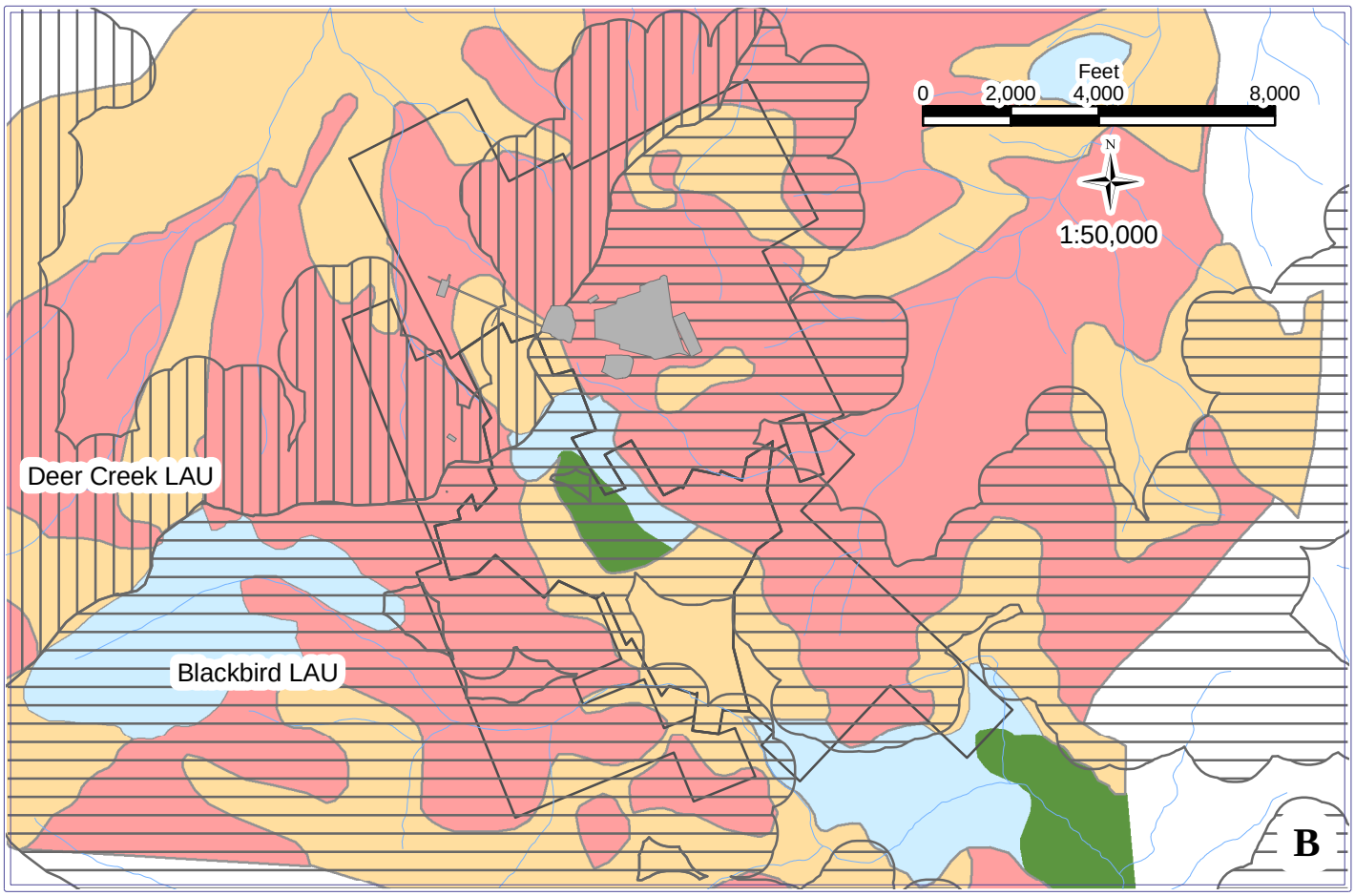
The Project area is located within the Blackbird and Deer Creek Lynx Analysis Units (LAU) (**Figure 3-12**). The LAUs encompass a total of 66,903 acres, of which approximately 36,000 acres (53 percent) was considered suitable lynx habitat prior to the Clear Creek fire in 2000. The Clear Creek fire burned approximately 85 to 90 percent of suitable habitat within the units. Even through the Project is located in mapped suitable habitat, conditions are currently unsuitable for lynx. Lynx habitat was described using criteria in the Canada lynx Conservation Assessment and Strategy (Ruedigger et al., 2000). Lynx habitat was significantly altered as a result of the Clear Creek fire in 2000. The USFS post-fire mapping shows the entire ICP Area as being burned at either moderate or high severity. The majority of the burned areas being classified as severely burned. In much of that area vegetation is just now becoming reestablished. There are some nearby stands that were not heavily burned, but these areas are dominated by lodgepole pine with little understory and lack components necessary for suitable lynx habitat. In addition, those areas where there is green timber are small, being less than 100 acres in size. Due to the fire, there is no green timber connectivity between these small areas and large unburned timbers stands a mile or more away.

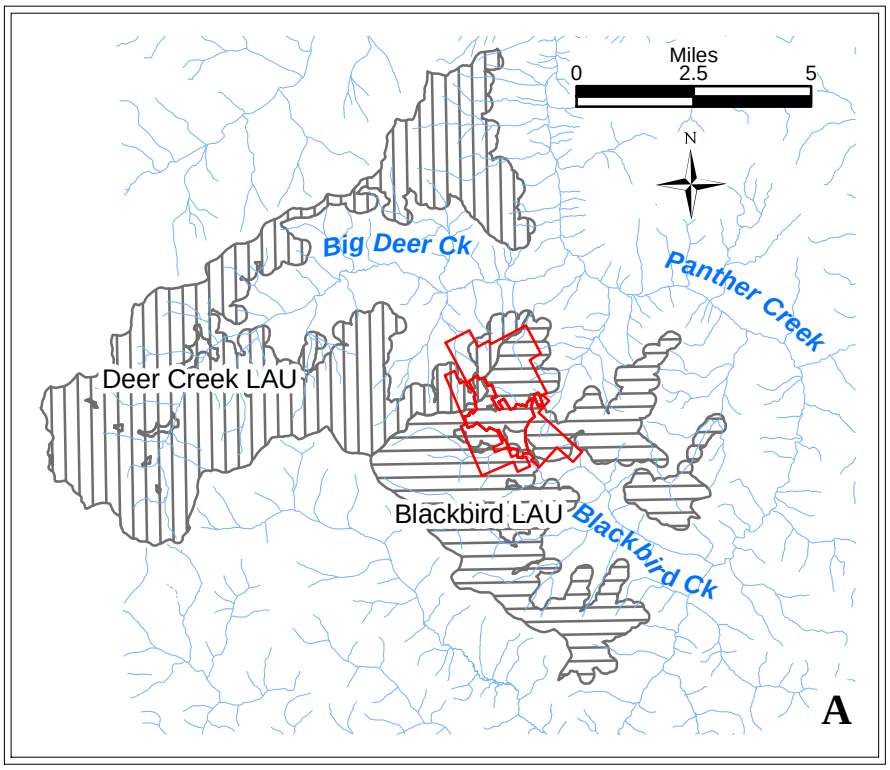
Den sites are described as occurring in mature, often multi-storied, stands, particularly subalpine fir and Engelmann spruce stands, with a high degree of canopy closure, horizontal and vertical diversity, and down, woody material loadings (Ruedigger et al., 2000). Prior to the Clear Creek fire these conditions were probably very limited in the area of the proposed Project. As a result of the Clear Creek fire, none of these conditions exist in the Project area and none are found in nearby areas.

Lynx foraging habitat is comprised of early successional forest stands with high densities of shrubs and seedlings for prey species primarily snowshoe hare. These conditions are currently lacking in the Project area. During wildlife studies in 2004 a few snowshoe hares were observed within unburned portions of the proposed Project area, but in very low numbers. Given the location and growing conditions, it will probably take two to three decades before conditions are suitable for Snowshoe hare recolonization of severely burned areas to the extent that hare numbers are high enough to support lynx in the area.

No Canada lynx occurrence has been formally documented within the proposed Project area. However, lynx or lynx tracks have been observed in the past few years in the upper reaches of the Panther Creek drainage (Wenger, 2001-2005). There is always the possibility that lynx could move through the Project area, but the lack of suitable habitat as a result of the Clear Creek fire minimizes the chances of this happening.

Even though the ICP area and surrounding lands have been mapped as lynx habitat, conditions are currently unsuitable for lynx. Further disturbance will not add to the 30 percent disturbance level conservation measure established in the *Canada Lynx Conservation Assessment and Strategy* (Ruedigger, et al. 2000). It will probably be two or more decades before conditions in and around the ICP area will be suitable as lynx denning or wintering habitat.





Blackbird LAU
Deer Creek LAU
ICP CLAIM BOUNDARY

FIRE INTENSITY

HIGH
MEDIUM
LOW
UNBURNED
STREAM

ALTERNATIVE II FACILITIES

Blackbird LAU
Deer Creek LAU
ICP CLAIM BOUDARY
STREAM

IDAHO COBALT PROJECT FORMATION CAPITAL CORP. U.S. LEMHI COUNTY, IDAHO	**LYNX ANALYSIS UNITS (LAU)** January, 2006	Figure 3-12

Yellow-billed Cuckoo

To date no yellow-billed cuckoos have been located during surveys across the Salmon-Challis National Forest. Currently, the only known populations of breeding Western yellow-billed cuckoos are in the southwestern U.S. However, a 2003-2004 study indicated it was likely some nested in five different areas of Idaho. During that same study, no nesting pairs were confirmed in central Idaho. The nearest to the Project area any of these birds were observed was north of Salmon in 2003. What habitat they use for nesting and brood rearing depends on the geographic area. Data indicate they require rather extensive stands of lowland riparian forests. No suitable nesting and brood rearing habitat for the yellow-billed cuckoo is found in or near the Project area.

Region 4 Sensitive Species

The USDA, Forest Service Region Four lists 14 terrestrial vertebrates that occur, potentially occur, or habitat for which occurs on the northern portion of the Salmon-Challis National Forest. Key to the presence or absence of any sensitive species in the study area is suitable habitat and whether the area was burned and how intensively. With the exception of a few acres, the entire Project area is within a severely burned area. As a result suitable habitat for nesting, denning and foraging for most species is lacking. The lack of basic habitat requirements reduced or in some cases eliminated the chances that the area was being used by a given species. Region 4 Sensitive Species, which were observed in the area, included the northern goshawk, three-toed woodpecker and spotted frog. Region 4 sensitive species observed or considered likely to occasionally be in the Project area are described below.

Wolverine

The wolverine is a wide-ranging species throughout the mountains of Idaho. Potential wolverine habitat includes tundra and coniferous forest zones at higher altitudes in summer, and at mid to lower elevations in winter. On the Salmon-Challis National Forest, wolverines were found principally in mixed conifer habitat dominated by lodgepole pine. They use spruce-fir stands along stream bottoms and adjacent meadows (Bachman et al., 1990). The size and distribution of this population is unknown. Home ranges tend to be very large as the animals forage over large areas. As a result, individuals seldom remain in one place for a long period of time. There are limited records of wolverine in the Panther Creek watershed.

Accumulations of down, woody material may provide denning habit, but den sites for wolverine in Idaho have most often been linked to talus and boulder fields in remote areas at higher elevation (Ruggiero et al., 1994). None of this habitat exists in the proposed Project area. Elk and deer, the primary prey species for wolverine, are currently reduced in numbers due to habitat changes following the Clear Creek fire. Field observations during 2001, 2002 and 2004 showed that most elk and deer (the primary prey) are found in lightly to moderately burned areas well away from the Project area.

No wolverine occurrence has been formally documented within the proposed Project area and no wolverine sign was found during the wildlife studies conducted in 2001, 2002 and 2004.

Fisher

Potential habitat for fisher include continuous-canopied mature to old-growth spruce-fir forests for denning, and areas with dense understories of young conifers, shrubs, and herbaceous cover for hunting and foraging. The 2000 Clear Creek fire resulted in stand replacement conditions in the Project area. Habitat conditions suitable for the fisher are now lacking in the Project area (Clark et al., 1989; Ruggerio et al., 1994). Rodents, snowshoe hares and other fisher prey species will recolonize nearby burned areas rather quickly (Smith, 2000). However, other habitat conditions necessary for fisher will take longer. No fisher occurrence has been formally documented within the proposed Project area. No fisher or fisher sign was observed in the Project area during wildlife studies conducted in 2001, 2002 and 2004.

Bald Eagle

Annual winter bald eagle counts indicate that the number of bald eagles that overwinter along the Salmon and Lemhi Rivers has risen steadily over the last decade. In spite of this increase, there are still few bald eagles nesting in the Upper Salmon and Middle Salmon-Panther subbasins.

There is no nesting or roosting habitat for bald eagles in or immediately adjacent to the Project area. The nearest known bald eagle nest is located more than 20 air miles from the proposed Project area on the Salmon River (Waterbury, 2007). Bald eagles do winter along the Salmon River within and adjacent to the Salmon-Challis National Forest boundaries. They are known to make foraging flights into the lower Panther Creek drainage and in recent years have come further up drainage in the winter to feed on wolf-killed deer and elk carcasses. Kills are usually away from roads, which reduces the risk of an eagle being hit by a vehicle. If they were to come up the Panther Creek drainage as far as the confluence with Big Deer or Blackbird Creeks, they would still be several miles from the Project area (Weatherbury, 2007). Lack of suitable habitat including nesting, roosting, foraging and winter habitat leads to the conclusion there would be no use of the Project area by bald eagles.

The transportation corridor from Salmon to the Project site traverses along a short section of Panther Creek (4+ miles) that currently receives a large amount of year around traffic. Any eagles that may use the area would probably not be affected by the traffic. Numerous studies have shown these birds readily adapt to the presence of traffic and would continue to use roosts and even nest in close proximity to access roads. There is little chance that any bald eagles would be affected by the presence of increased vehicle activity along the access road. The cable crossing on Panther Creek would be low to the water and in an area where bald eagles typically would not forage. The presence of a nearby cable crossing and crossings in other locations has not been a deterrent to these birds.

Implementation of this project would not affect nesting or foraging habitat for bald eagles or reduce the population viability of bald eagles across the forest. The Project would not impact the viability of the species, or result in a trend towards federal re-listing.

Northern Goshawk

Northern goshawks are linked to mature forest with a high degree of canopy closure for nesting (although they will use more open forest habitat, meadows, and stream corridors for foraging). Preferred habitat includes mature to over-mature coniferous forest with a 75 to 80 percent intermediate closed canopy, moderate (15 to 35 percent) slope, and northern aspect. Goshawk nests are normally found within stands of large trees with dense canopy and open understory (Squires and Ruggerio, 1996; Squires and Reynolds, 1997). Foraging activities are conducted within intermediate-closed canopy, open-understory forest, and within small forest openings.

No northern goshawk occurrence has been formally documented in the proposed Project area, but a goshawk nest with young was located 6 miles to the southeast in the Quartz Gulch drainage by Monarch & Associates in 2001 (Monarch, 2005b). During June 2004 wildlife surveys, adult goshawks were observed on several occasions in that general area, but no nests were found. An adult with one young was observed in 2002 approximately 1 mile west of the Project area in the South Fork of Big Deer Creek drainage.

As a result of the 2000 Clear Creek fire, suitable habitat for nesting and brood rearing in the Project area is lacking. There is the possibility that goshawks could nest elsewhere and forage in the area. The amount of foraging activity would be very limited as there is a lack of prey species in the heavily burned areas that dominate the Project area.

Three-toed Woodpecker

Three-toed woodpeckers are year around residents in the area. Three-toed woodpeckers are typically present at very low densities and persistence is linked primarily to the quantity and quality of snag habitat. Although three-toed woodpeckers also utilize green trees with heart rot and/or infested by insects and trees killed by insects or disease.

Three-toed woodpeckers are commonly observed for the first few years following a fire in burned areas, but over time numbers will decline in these areas. Potential three-toed woodpecker habitat is mixed-coniferous forest containing spruce, fir, tamarack, lodgepole pine, or aspen, with abundant dead and decayed trees, between 4,000 and 9,000 feet elevation. Three-toed woodpeckers are a snag-dependent species, which typically occurs at low endemic levels until abundant dead and decayed trees, in diseased and/or newly burned areas, become available. Because of the close association with fire-killed trees they are irruptive and often appear in greater number in larger burn areas one to several years after fire to take advantage of insect infestations in fire-killed or damage trees. Nest cavities are excavated in trees with heart rot, while snags with the most bark and limbs remaining on are used for foraging on wood-boring larvae of moths and beetles, caterpillars, and ants.

During the first year of wildlife studies in 2001, three-toed woodpeckers were commonly observed in the Idaho Cobalt Project area within the area intensively burned during the 2000 Clear Creek fire. By 2004 numbers of these birds declined in the immediate Project area as trees continued to die and fewer insects were available. Even though numbers have declined it is expected that a few birds will remain in the Project area. They are still found in the moderately burned areas on Big Flat.

Spotted Frog

Spotted frog potential reproductive habitat is based around permanent water such as marshy edges of ponds or lakes, in algae-grown overflow pools of streams, near slow-moving water at streamside, or near springs with emergent vegetation. Spotted frogs are well distributed across the northern portion of the SCNF and may reliably be found wherever suitable riparian or wetland habitat is located. After breeding, spotted frogs may move considerable distances from water into mixed conifer and subalpine forest, grassland, or brushland of sage or rabbitbrush. The spotted frog is thought to hibernate in holes near springs or other areas where water remains unfrozen and is constantly renewed. Suitable reproductive and foraging habitat for the spotted frog occurs within the proposed Project area.

Spotted frogs were observed at a constructed pond on Big Flat Creek during wildlife surveys conducted in June 2004.

Management Indicator Species (MIS)

The USDA Forest Service, Region Four, lists three terrestrial vertebrates, which occur, potentially, occur, or habitat for which occurs on the northern portion of the Salmon-Challis National Forest as Management Indicator Species. The purpose of this section of the report is to address these species and determine if the proposed activities are likely to affect any of these species or their habitat within the Project area.

Greater Sage Grouse

Sage grouse is an obligate species of sagebrush habitat. Sagebrush habitat does not occur within the proposed Project area. No occurrence of sage grouse has been formally documented within the proposed Project area.

Pileated Woodpecker

The pileated woodpecker is an uncommon year-around resident that is linked to mature Douglas-fir and mixed conifer forest, primarily at mid-elevations. Pileated woodpeckers require large diameter trees for nesting and roosting. Though they do well in a matrix of forest structural stages, the inclusion of some older forest with large trees in their territories appears to be necessary. The Clear Creek fire in 2000 totally removed any suitable nesting habitat within the vicinity of the proposed operation.

Pileated woodpeckers are not present in the immediate Project area. However, they were observed and heard vocalizing and drumming during wildlife surveys in June 2004 in Blackbird, Quartz Gulch and South Fork of Deer Creek drainages. The nearest to any project related facilities that one of the birds was observed was approximately 1 mile northwest of the Ram portal in the South Fork of Big Deer Creek drainage. There are suitable Douglas fir nesting trees in this drainage that were not burned during the 2000 Clear Creek fire.

Spotted Frog

This species is addressed in the Region 4 Sensitive Species section of this document.

Idaho Species of Concern

Descriptions of Idaho Species of Concern that are known to or have a probability of occurring in or near the Project area (goshawk, three-toed woodpecker, wolverine, wolverine and spotted frog) were addressed under Region 4 Sensitive Species. The boreal owl is described below; no other Idaho Species of Concern are known to occur in the Project area.

Boreal Owl

Boreal owls are most closely associated with spruce-fir habitat in the Intermountain Region. However, they are also known to use quaking aspen, lodgepole pine, Douglas-fir and mixed conifer stands, usually at mid to higher elevations (7,000 feet and above). Boreal owls are obligate secondary cavity nesters and rely mostly on cavities excavated by woodpeckers for suitable nest sites. Mature Douglas-fir stands and quaking aspen patches are especially valuable for nesting due to the higher proportion of cavities in these habitats (Clark et al., 1989). Boreal owls are known to occupy various drainages in the Panther Creek watershed year around (Wenger, per. com., 2005).

Boreal owls that may have occurred in the Project area would have been affected due to loss of nesting and foraging habitat as a result of the high severity burn. It is assumed that due to the fire, the Project area does not provide suitable habitat for boreal owls. In nearby areas of low to moderate burn severity, boreal owls may have benefited from snag creation and foraging habitat.

Migratory Birds

In 2001, Executive Order 13186 Responsibilities of Federal Agencies to Protect Migratory Birds, was signed. This order requires environmental analyses of federal action to evaluate the effects on migratory birds, with emphasis on species of concern. The Fish and Wildlife Service and Region 4 of the Forest Service agreed to use State Bird Conservation Plans as tools to identify relevant migratory birds species and habitat for project analysis.

In January 2000, the Idaho Partner in Flight program published the Idaho Bird Conservation Plan. The Idaho Bird Conservation Plan identified four high priority habitats in Idaho: riparian, non-riverine wetlands, sagebrush scrublands, and dry ponderosa pine/Douglas/grand fir forest. The riparian habitats identified are broad valley bottoms and narrow valley bottoms of low to mid elevations. Sagebrush scrublands and dry ponderosa pine/Douglas fir/grand fir forest do not exist in the Project area. There is a minor amount of riparian and wetland habitat in the Project area, but this was

drastically altered during the 2000 Clear Creek fire. These areas are only now returning to pre-fire conditions. Data collected during migratory bird studies conducted in 2001, 2002 and 2004 did not show that these areas were being selectively used by any species. Listed species (Region 4 sensitive and MIS) that were observed in these areas were addressed previously in this document.

Big Game

Fire is generally beneficial to the summer range resource by reducing conifer regeneration that competes with important summer forage species, such as graminoids and forbs, in the understory of mature conifer stands in high elevation meadows. Forage species are now coming back in the burned areas and big game species such as elk and deer will continue to benefit.

Elk

None of the Project area is classified as winter range for elk. There is a limited amount of use by elk moving through the area in early summer and again in the fall. There is no suitable calving habitat within the Project area. Currently, elk are infrequently using heavily burned areas where the Project is located. They are commonly observed in the lightly or unburned areas, all of which are found well away from those areas that will be disturbed by activities associated with the mining operations. The primary access route from the mine to Salmon does go through elk winter range in the Panther, Deep and Williams Creek drainages.

Deer

Like elk, none of the Project area is classified as winter range for deer. The lack of suitable conditions in the immediate area of the proposed mining operations due to the Clear Creek fire has resulted in very limited use by deer from spring through fall. Lack of both cover and forage in the immediate Project area will affect deer activity in the area until after cessation of mining activities. As habitat conditions improve in the area there will probably be an increase in deer use.

Moose

Moose infrequently occur in the Project area. Very little suitable habitat for moose occurs in the Project area and sign indicates they are moving through the area and do not stay. There is sufficient suitable habitat throughout the study area to support a limited number of moose.

Black Bear

Black bears are common in the general ICP area. Numbers and activity has increased over time following the Clear Creek fire. Bears and evidence of their presence were observed throughout the study area. There is considerable forage throughout the study area and within the Project area.

Big Horn Sheep and Mountain Goats

Both species were observed in the study area. One big horn sheep was observed in the Bucktail Creek drainage near where the proposed pipeline will run. All mountain goat observations were made well away from the proposed operations. Suitable habitat for both these species is lacking in the immediate Project area.

Other Species

Bats

Suitable habitat for bats is generally lacking in the study area. There is no suitable habitat in the Project area. They may forage in the area, but suitable roosting sites are lacking.

Other Mammals

Other small mammals are common in the area. As habitat conditions improve in the burn area numbers will increase. Habitat for many of the small mammals is better in riparian and wetter areas.

Raptors

Several species of raptors occur in the Project area. Species included northern goshawk, red-tailed hawk, Cooper's hawk, sharp-shinned hawk and great horned owl. These birds were most commonly observed in lightly burned or unburned areas. Observation of young of the year indicate that nesting by these species is occurring in the general area. Suitable nesting habitat for all of these species is found in unburned or lightly to moderately burned areas within remaining pockets of green trees. No suitable nesting habitat exists in the severely and moderately burned areas within the immediate Project area. Raptors nesting nearby use the Project area for foraging.

Amphibians and Reptiles

Habitat for amphibians does occur in and around the Project area. Several species of amphibians, both pre-adult and adult, were observed in ponds and small springs indicating that adult survived the Clear Creek fire and breeding has occurred. Species observed included long-toed salamander and northern spotted frog. Tailed frogs were found in lower Little Deer Creek while conducting fisheries studies in 2001 and 2004. No reptiles were observed in the immediate Project area, but western rattlesnakes, bull snakes, and western terrestrial garter snakes were observed in the study area.

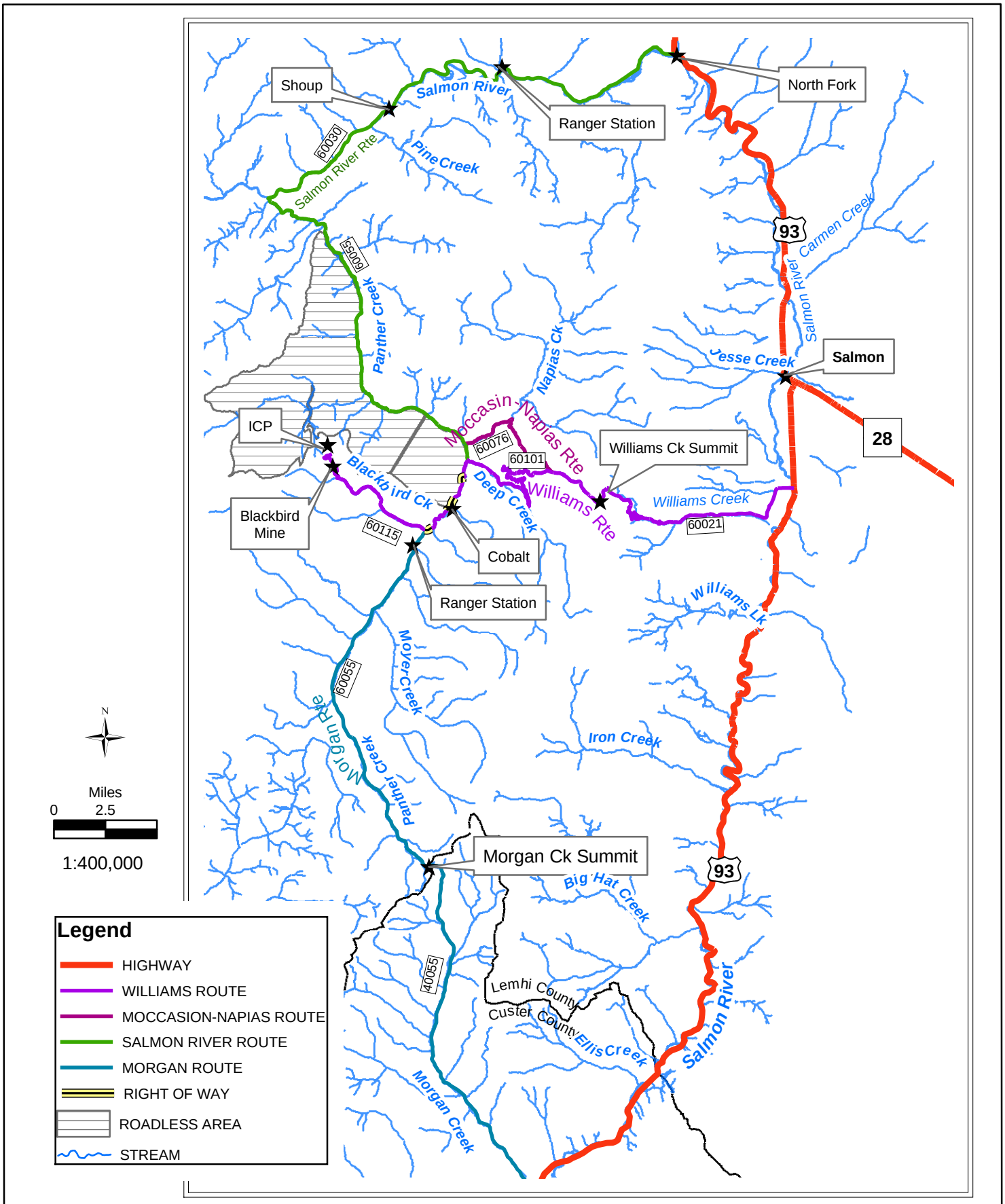
Fisheries Resources

Background

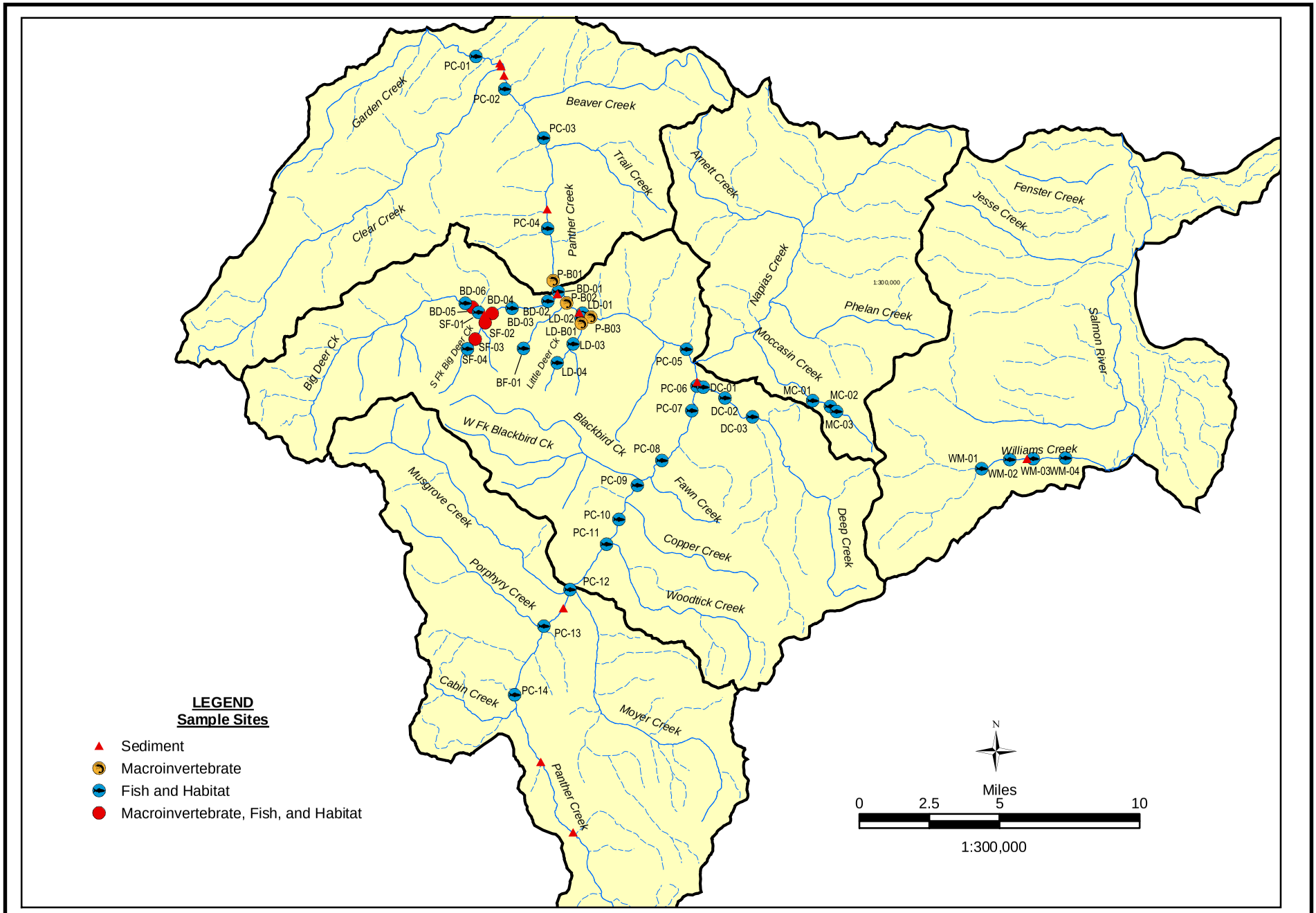
The proposed Idaho Cobalt Mine Project development is located in the Panther Creek drainage, 40 miles west of Salmon, Idaho. Panther Creek flows into the Salmon River and is part of the Middle Salmon-Panther Watershed (4th order HUC, #17060203). Most of the baseline information describing current habitat conditions and status of fish populations potentially affected by the proposed ICP is described in the Fisheries Technical Report (Kuzis, 2004).

The analysis area includes streams within or immediately downstream of the ICP area and along the transportation route. Streams near the ICP site include: Bucktail, Big Flat, Little Deer, South Fork Big Deer, Big Deer, and Panther Creeks (**Figures 3-4, 3-8**). The primary transportation route could directly affect portions of Panther, Deep, Moccasin, and Williams Creeks and indirectly affect downstream reaches of the main Salmon River (**Figure 3-13**).

Streams in the analysis area directly or indirectly currently provide habitat for indigenous spring Chinook salmon (*Oncorhynchus tshawytscha*), summer steelhead and redband/rainbow trout (*O. mykiss*), bull trout (*Salvelinus confluentus*), westslope cutthroat trout (*O. clarki lewisi*), mountain whitefish (*Prosopium williamsoni*), dace (*Rhinichthys* sp), sculpins (*Cottus* sp.), northern pikeminnow (*Ptychocheilus oregonensis*), and redside shiner (*Richardsonius balteatus*). Pacific lamprey (*Lampetra tridentatus*) were historically found in the study area. Introduced non-native brook trout (*Salvelinus fontinalis*) are also found in some streams of the study area (**Figure 3-14**).



IDAHO COBALT PROJECT FORMATION CAPITAL CORP. U.S. LEMHI COUNTY, IDAHO	**PROJECT ACCESS ROUTE ALTERNATIVES** January, 2006	Figure 3-13



IDAHO COBALT PROJECT FORMATION CAPITAL CORP. U.S. LEMHI COUNTY, IDAHO	**AQUATIC SAMPLING SITES** **IDAHO COBALT PROJECT AREA** January, 2006	Figure 3-14

Management Direction

Salmon-Challis Forest Land Management Plan

The Land and Resource Management Plan for the Salmon National Forest (Forest Plan) (USFS, 1988) identifies the following Desired Future Condition for aquatic resources and habitats:

> "Aquatic habitats will be managed at a level sufficient to meet State water quality goals and maintain habitat capability to meet species production goals for both resident and anadromous species. … Habitat enhancement will have to be conducted on an annual basis to compensate for natural and man-caused habitat deficiencies. … Resident trout and anadromous species habitats will be improved in reproductive capacity over the Plan period through reduction in sedimentation, better riparian management, and habitat enhancement." (USFS, 1988, Pg IV-89)

Additional direction addressing maintenance, restoration and enhancement of both resident and anadromous Forest fisheries resources has been identified within the Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon, Washington, Idaho, and Portions of California (PACFISH) (USDA and USDI, 1995) and the Inland Native Fish Strategy (INFISH) (USDA, 1995) aquatic and riparian management directives, which amended the Salmon National Forest Land and Resource Management Plan in 1995.

Special Status Fish Species

There are three Federally-listed salmonids in the study area: Snake River spring/summer Chinook salmon, Snake River Basin steelhead, and Columbia River bull trout. Westslope cutthroat trout were designated as a sensitive species by the Intermountain (Region 4) Regional Forester in 1995 and bull trout are a Management Indicator Species (MIS) for the Salmon-Challis National Forest. According to the U.S. Fish and Wildlife Service's (USFWS) 90-day Species List Update Letter, 2008-SL-0071, received December 03, 2007, federally listed or proposed listed fish species occurring within the Salmon-Challis National Forest include the following.

Chinook Salmon

Snake River spring/summer Chinook salmon were listed as threatened on April 22, 1992 by the National Marine Fisheries Service (NMFS) (57 FR 14653). Critical Habitat for Chinook salmon was established December 28, 1993 (58 FR 68543). Designated critical habitat for Snake River spring/summer Chinook salmon encompasses river reaches of the Columbia, Snake, and Salmon Rivers, and all tributaries of the Snake and Salmon Rivers (except for the Clearwater River) presently or historically accessible to Snake River spring/summer Chinook, except reaches above impassable natural falls and Hells Canyon Dam. With the exception of areas within the Napias Creek drainage above Napias Falls, the entire ICP analysis area lies within designated Chinook salmon Critical Habitat. The analysis area also encompasses Essential Fish Habitat for Chinook salmon, as defined by the Magnuson-Stevens Fishery Conservation and Management Act.

Sockeye Salmon

Snake River sockeye salmon were listed as endangered November 20, 1991 by the National Marine Fisheries Service (56 FR 58619). Critical habitat for sockeye salmon was established December 28, 1993 (58 FR 68543). Designated critical habitat for sockeye salmon includes only the mainstem Salmon River migration route and several lakes within the Stanley Basin and their outlet streams. No stream reaches of the Panther Creek and William Creek drainages upstream from the confluence with the Salmon River were listed. The presence of Sockeye salmon near the ICP Project area would only occur for brief periods when the adults are migrating upstream through the Salmon River and when juveniles migrate downstream through the Salmon River on their way to the ocean.

Steelhead

Snake River steelhead were listed as threatened August 18, 1997 by the NMFS (62 FR 43937). Critical habitat for steelhead was established February 16, 2000 (65 FR 7764). On April 30, 2002, the U.S. District Court for the District of Columbia approved a NMFS consent decree withdrawing critical habitat designations for steelhead. The move was in response to litigation challenging the process by which NMFS established critical habitat. Under the ESA, NMFS was required to analyze the economic impacts. On December 14, 2004 NMFS re-issued a proposed critical habitat designation for Snake River basin steelhead (69 FR 74752). The Service issued a final designation of critical habitat September 2, 2005 (70 FR 52630). Designated Snake River Basin steelhead habitat within the ICP analysis area encompasses Panther Creek and the lower reaches of Deep Creek, Williams Creek Big Deer Creek, and Little Deer Creek to endpoints.

Bull Trout

Columbia River bull trout were listed as threatened June 10, 1998 by the United States Fish and Wildlife Service (63 FR 31647). The entire Salmon River Basin Unit (including the Panther Creek drainage) has been excluded from the final critical habitat designation under provisions of Section 4(b)(2) of the ESA because of cooperative efforts being undertaken as part of the Snake River Basin adjudication and USDA Forest Service administered aquatic habitats within the PACFISH and INFISH management areas (69 FR 59996). Numbers of bull trout in the Panther Creek drainage are low and connectivity and interactions between resident populations in Napias and upper Deep Creeks have been reduced or eliminated by migration barriers (USFWS, 1999). Connectivity among resident populations is unobstructed in other portions of the Panther Creek drainage (USFWS, 1999).

Westslope Cutthroat Trout

On June 6, 1997 the USFWS received a petition to list westslope cutthroat trout as threatened throughout its range. Pursuant to a Court Order, the USFWS reconsidered an amended petition to list the westslope cutthroat trout. On August 7, 2003, the USFWS found that listing the westslope cutthroat trout as either threatened or endangered was not warranted (68 FR 46989). In the ICP Project area, westslope cutthroat trout are known to occur in Deep, Panther, Big Deer, and Williams Creeks.

Affected Environment

Actions that have Affected Current Conditions

Historic to recent mining activity, livestock grazing, roads, timber harvest, surface water withdrawals and wildfires have all had an effect on surface water resources and fishery habitats within the ICP analysis area. Detailed discussions of regional and local effects of these factors on fish habitat are provided in the Aquatic Baseline Condition Technical Report (Kuzis, 2005) as well as in the Biological Assessment (Kuzis and Bauer, 2007).

Existing Condition

Assessment of current habitat conditions for Project area streams was conducted and summarized by Kuzis (2004), based on existing reports, agency files, and data collected in 2001, 2002, and 2004. The information included assessment of riparian conditions, substrate, large woody debris, pool frequency and quality, off-channel habitat, channel width-to-depth ratios, streambank stability and floodplain condition. Additional assessments were made for fish and macroinvertebrate populations.

Data were collected and compiled and compared to the NMFS (1996) indicators of Properly Functioning Condition (PFC) and standards for future desired conditions on the National Forests. The framework of the NMFS matrix formed the basis to assess current conditions and potential impacts associated with the proposed Idaho Cobalt Project alternatives. The pathways and

associated indicators of the matrix are provided in the Fisheries Technical Report (Kuzis, 2005). Habitat conditions are summarized in the following sections for each of the streams in the analysis area followed by information on fish and macroinvertebrate communities. More specific information can be obtained in the Fisheries Technical Report (Kuzis, 2004) and the Biological Assessment (Kuzis and Bauer, 2007).

Panther Creek

Panther Creek is a fifth order stream draining approximately 529 square miles of the forested Salmon River Mountains in east-central Idaho. The stream enters the Salmon River downstream from the town of Shoup. Mean annual flow, measured near the mouth of Panther Creek over a 33 year period of record (1945-1978), was approximately 258 cubic feet per second (cfs), and ranged from 22 to 2,850 cfs. Water quality in Panther Creek has been impacted by past heavy metals introductions from Blackbird Creek and Big Deer Creek, and large portions of the lower drainage were encompassed by the 2000 Clear Creek fire.

Kuzis (2004) sampled 14 sites in Panther Creek to document fish and habitat condition. Poor habitat conditions were documented for most measured habitat elements. Panther Creek tends to be wide and shallow and the lack of large woody debris contributes to infrequent pools and poor pool quality.

Riparian habitat provides poor shade conditions throughout the stream. Maximum stream temperatures over an 11 year period (1993-2003) at five stations have varied from 16.1 to 24.7°C with slightly lower ranges reported for maximum 7-day average temperatures (14.7 to 23.6°C) (Kuzis, 2004). Natural valley bottom confinement and a road along lower Panther Creek contribute to a lack of off-channel habitat. By contrast, streambanks are mostly stable along Panther Creek, with 86 percent of the survey sites meeting or exceeding the PACFISH/INFISH Riparian Management Objective level of 80 percent stability.

The Forest Service has monitored six long-term sites along Panther Creek for fine sediment. Study sites in lower Panther Creek (below Blackbird Creek) are located with stream gradients that varied from 1 to 8 percent. Sites in upper Panther Creek (above Blackbird Creek) are located in unconfined valley bottom sites with stream gradients of 1 to 2 percent. Fine sediment levels at the three lower Panther Creek sites ranged from 16.4 to 48.9 percent between 1993 and 2006, with most samples exceeding the Salmon National Forest anadromous habitat sediment goal of 20 percent fines at depth. Highest levels of fines at the two lowermost Panther Creek sampling sites occurred after the Clear Creek fire of 2000. Recent sampling has indicated that substrate conditions at these sites have recovered to pre-fire conditions. Fine sediment levels at the three upper Panther Creek monitoring stations ranged from 7.1 to 30.3 percent with most samples meeting the Forest anadromous habitat sediment goal level.

Big Deer Creek

Big Deer Creek is a third order tributary to Panther Creek with a drainage area of approximately 44 square miles. A natural cascade approximately 0.7 miles upstream from the mouth of the creek is believed to block fish migration to the upper reaches of the stream. Streamflow, measured at water quality monitoring station WQ-24, near the confluence of South Fork Big Deer Creek, varied from 4.4 to 343.5 cfs with a mean annual flow of approximately 88.6 cfs. The lower reaches of the stream have been impacted by past metal introductions from the South Fork, and most of the drainage was encompassed by the 2000 Clear Creek fire.

Six sites were established in the Big Deer Creek watershed to describe baseline fish and aquatic habitat conditions. Properly functioning habitat was noted for large woody debris, substrate, off-channel habitat and floodplain connectivity. Poor habitat conditions were documented for pools and width/depth ratios. There were few pools and pool quality was poor throughout most sampled areas. The lack of pools in Big Deer Creek is also reflected in high (>12) width to depth ratios. Five of six survey reaches displayed streambank stability in excess of the PACFISH/INFISH Riparian

Management Objective level of 80 percent. Riparian habitat provided poor shade (<40 percent) in the high gradient confined sites and mostly good to fair shade in lower gradient areas. Maximum stream temperatures for 7 years (1996-2003) varied from 14.8 to 19.0°C with a slightly lower range reported for maximum 7-day average temperatures (14.0 to 18.2°C).

The Forest Service established two sampling sites in upper Big Deer Creek in 2001 to monitor fine sediment levels above and below the South Fork. A monitoring site in lower Big Deer Creek has been sampled infrequently since 1993 dependent upon the varying occurrence of spawning gravels at the mouth of the stream from year to year. Substrate fines at the lower Big Deer Creek site have ranged from 9.7 to 29.4 percent, meeting the Salmon National Forest anadromous production goal level of 20 percent fines during approximately half of the sampling periods. Elevated levels of fines were observed in the year immediately after the Clear Creek fire. Fine sediment levels at the monitoring site below the confluence of the South Fork have ranged from 14.8 to 30.7 percent fines, meeting the Forest's resident fish production goal level of 28.7 percent fines during the last five of seven sampling periods. The 2001 to 2006 trend at this site has been a reduction in levels of fine sediment at depth since the Clear Creek fire. Levels of fines at the monitoring site above the confluence of the South Fork have ranged from 23.5 to 29.6 percent fines, meeting the Forest's resident fish production goal in three of four samplings, and displaying a generally stable trend in fines between 2001 and 2004.

South Fork Big Deer Creek

South Fork Big Deer Creek is a second order tributary to Big Deer Creek, which drains the north side of Blackbird Mountain. Streamflow, measured at water quality monitoring station WQ-22 near the mouth of the stream, varied from 1.2 to 56.6 cfs with a mean stream flow of 11.2 cfs. The lower reach of the stream, below the confluence of Bucktail Creek has been impacted by past metal introductions from the Blackbird Mine. Most of the drainage was encompassed by the 2000 Clear Creek fire.

Four sites were established in South Fork Big Deer Creek to document baseline conditions for fish and aquatic habitats. All sampling sites in the South Fork Big Deer Creek were located in confined valley bottoms with stream gradients that varying from 6 to 15 percent. Poor habitat conditions were noted for pool frequency, pool quality, off-channel habitat, and width/depth ratios. Properly functioning habitat conditions were noted for substrate, large woody debris, and streambank condition. Riparian habitat consisted of coniferous trees, shrubs and some grasses that provided generally good shading (<60 to 80 percent) to the stream.

Bucktail Creek

Bucktail Creek is a small first order stream, which drains the north side of Blackbird Mountain and flows through two sediment control dams before entering South Fork Big Deer Creek. The stream has a drainage area of 1.59 square miles and an extremely steep gradient of 32 percent. Measured flows near the mouth (WQ-21) have ranged from 0.03 to 14.01 cfs with a mean stream flow of 4.14 cfs. No fish and very few macroinvertebrates have been found in this stream (IDEQ, 2002).

Little Deer Creek

Little Deer Creek is contained within a relatively small and steep 6.2 square mile watershed that drains directly into Panther Creek. Measured streamflow near the mouth of Little Deer Creek (WQ-05) varies from 0.10 to 17.70 cfs, with a mean annual flow of 2.94 cfs.

Baseline conditions were described at four fish and habitat sampling sites in a variety of valley confinements and bottom types. Stream gradients varied from 4 to 10 percent. Riparian habitat was characterized by burnt trees, shrubs, and grasses that provided mostly poor stream shade. Maximum stream temperatures at 10 sites in 2002 varied from 16.4 to 20.1°C with a slightly lower range reported for maximum 7-day average temperatures (15.7 to 18.9°C). Debris flows through Little Deer Creek after the Clear Creek fire probably contributed to poor habitat conditions documented for pool

frequency, pool quality, off-channel habitat, width-depth ratios and streambank condition. In contrast large woody debris was considered to be Properly Functioning at half of the study sites.

A sediment monitoring site was established in lower Little Deer Creek by the Forest Service in 2001 to track effects of the Clear Creek fire. Substrate fines at depth were found to meet Forest Plan goal levels during all samplings between 2001 and 2004, ranging between 10.1 and 13.8 percent. It is believed that the low levels of fines observed were associated with post fire channel scouring, which flushed smaller materials from the channel bed.

Big Flat Creek

Big Flat Creek is contained within a small watershed that has a drainage area of about 1.6 square miles. Stream flow in most of Big Flat Creek between the Project area and Panther Creek is subsurface and inaccessible under the large talus that fills the drainage. Flows measured in accessible areas near the mouth (WQ-02) and in the upper drainage (WQ-07) have varied from 0.006 to 0.347 cfs. No sites were established in Big Flat Creek because habitat conditions could not be measured and no fish were found during occupancy surveys in the accessible area of upper Big Flat Creek that is nearest the ICP area.

Blackbird Creek

Blackbird Creek is a third order tributary to Panther Creek, which flows southeast for about 9 miles to its confluence with Panther Creek. Mean annual flow in Blackbird Creek is 12 cfs, with mean monthly flows ranging from 4 cfs to 48 cfs (IDEQ, 2001). Recent sampling in Blackbird Creek, conducted by the Blackbird Mine Site Group (BMSG), has been used to describe current conditions (Stantec, 2003). Mebane (IDEQ, 1997) provides a summary of other fisheries related work that has occurred in Blackbird Creek. Blackbird Creek has been impacted by dissolved heavy metals loading from acid mine drainage originating from exposed sulfide-containing ore and waste rock at the Blackbird Mine site, as well as historic mine waste disposal directly into the creek (IDEQ, 1997). Habitat surveys in lower Blackbird Creek noted impaired physical habitat quality associated with grading and channelizing of the stream (Stantec, 2003). These habitat surveys indicated poor conditions for pool frequency, riparian vegetation, large woody debris, and stream width/depth ratios.

Williams Creek

Williams Creek is a tributary to the Salmon River upstream from the town of Salmon, Idaho. The stream has a mean annual flow of about 10 cfs and mean monthly flows range from 3 to 40 cfs. At times the lower portion of the stream may be dewatered by irrigation, but may contain sufficient flow for fish passage in some years (IDEQ, 2001). The drainage was not impacted by the 2000 Clear Creek fire.

Four habitat sampling sites were established to measure baseline habitat conditions. Sampling occurred in confined and moderately-confined valley bottom types with stream gradients that varied from 2 to 4 percent. Riparian habitat along Williams Creek provided good shade for the stream. Maximum stream temperatures for 11 years (1993-2003) varied from 11.3 to 14.8°C with a slightly lower range reported for maximum 7-day average temperatures (11.1 to 14.2°C) (Kuzis, 2004). Poor habitat conditions were noted for stream width/depth ratios, pool frequency, and pool quality. Better habitat conditions were documented for streambanks, floodplain connectivity, and substrate dominance. Half of the sample sites documented properly functioning condition for large woody debris and off-channel habitat.

The Forest Service has conducted sediment monitoring operations on Williams Creek since 1993. With few exceptions, the stream has consistently met Salmon National Forest sediment goal levels for both resident and anadromous fish species production capability, displaying levels of fines between 6.6 and 34.1 percent. Overall sediment trends in the drainage have been a reduction in levels of fines at depth.

Moccasin Creek

Moccasin Creek is a small tributary to Napias Creek, which is a tributary to Panther Creek. A natural falls located in Napias Creek about 0.5 miles from the mouth limits upstream fish passage into Moccasin Creek. Moccasin Creek has a short seasonally intermittent reach through talus slopes in the lower third of its length. A small portion of the lower drainage was encompassed by the Clear Creek fire.

Three fish and habitat sites were established on Moccasin. Sampling in Moccasin Creek occurred in a variety of different valley bottom types with stream gradients that varied from 4 to 6 percent. Extensive beaver dam complexes exist in the middle reaches of the stream course. Riparian habitat along Moccasin Creek provided mostly fair shade for the stream. Maximum stream temperatures for 9 years (1993-2003) varied from 13.6 to 18.6°C with a slightly lower range reported for maximum 7-day average temperatures (12.7 to 17.9°C) (Kuzis, 2004). Poor habitat conditions were noted for stream width/depth ratios, pool frequency, pool quality, and substrate dominance. Better habitat conditions were documented for streambanks, floodplain connectivity, off-channel habitat, and large woody debris.

A single sampling of fine sediment conditions (28.1 percent) in Moccasin Creek by the Forest Service in early 2000 indicated that the stream met the Salmon National Forest sediment goal level for resident fish species.

Deep Creek

Deep Creek is a third order tributary to Panther Creek with a mean annual flow of 20 cfs. Mean monthly flows can vary from 6 cfs to 80 cfs (IDEQ, 2001). Three fish and aquatic habitat sites were established on the stream to document baseline conditions. Sampling in Deep Creek was conducted in confined and unconfined valley bottoms with stream gradients that varied from 2 to 8 percent. Poor habitat conditions were noted for pool frequency, pool quality, stream width/depth ratios, and off-channel habitat. Better habitat conditions were indicated for substrate dominance, large woody debris, and streambank condition. Floodplain connectivity was limited by natural valley confinement in most sites. Riparian habitat provided good shade throughout most of the areas sampled. Maximum stream temperatures for 11 years (1993-2003) have varied from 11.6 to 16.0°C with a slightly lower range reported for maximum 7-day average temperatures (11.1 to 15.5°C) (Kuzis, 2004).

The Forest Service has conducted sediment monitoring operations in lower Deep Creek since 1993. With one exception over a 12-year period of record, the stream has consistently met Salmon National Forest sediment goal levels for both resident and anadromous fish species production capability. Overall sediment trends in the drainage have been generally stable.

Fish Populations

The Idaho Cobalt Project analysis area contains Federally-threatened, Forest Service-sensitive, and SCNF management indicator species. **Table 3-13** summarizes the presence of fish in Project area streams. Adult Chinook salmon have been observed in Panther Creek (Kuzis, 2004). Juvenile Chinook salmon have been observed in Panther Creek, lower Blackbird Creek, and lower Big Deer Creek (Kuzis, 2004; EcoMetrix, 2006). Steelhead/rainbow trout have been found in Deep, Little Deer, Big Deer, lower South Fork Big Deer, and lower Blackbird Creeks. Bull trout are known to occur in Moccasin, Deep, and Panther Creeks, and have recently been observed in lower Blackbird Creek (Beak and Golder, 2002). Westslope cutthroat trout were found in Deep, Panther, Big Deer, and Williams Creeks. Whitefish have been observed in Panther and Blackbird Creeks, dace, Northern pike-minnow, and redside shiners were found only in Panther Creek, while sculpins were found in Panther, Deep, Blackbird, and Williams Creeks (Kuzis, 2004; ExoMetrix, 2006). Non-native brook

trout were found only in upper Panther and Little Deer Creeks. No fish were found in Bucktail and Big Flat Creeks (Kuzis, 2004; IDEQ, 1997; IDEQ, 2002).

TABLE 3-13. Summary of Fish Known to be Present (P) in Project Area Streams

Stream	Chinook Salmon	Rainbow/ Steelhead	Cutthroat Trout	Bull Trout	Brook Trout	Whitefish	Dace	Shiners	Sculpin sp.	Northern Pike-minnow
Deep Creek	-	P	P	P	-	-	-	-	P	-
Moccasin Creek	-	-	-	P	-	-	-	-	-	-
Panther Creek	P	P	P	P	P	P	P	P	P	P
Little Deer Creek	-	P	-	-	P	-	-	-	-	-
Big Deer Creek	P	P	P	-	-	-	-	-	-	-
SF Big Deer Creek	-	P	-	-	-	-	-	-	-	-
Big Flat Creek	-	-	-	-	-	-	-	-	-	-
Blackbird Creek	P	P		P	-	P	-	-	P	-
Williams Creek	-	P	P	-	-	-	-	-	P	-
Bucktail Creek	-	-	-	-	-	-	-	-	-	-

In the analysis area, potential spawning areas for anadromous salmon and steelhead may include Panther Creek, Williams Creek, and the lower portions of Deep and Big Deer Creeks. Chinook are absent from many of the streams because of past mining activity and the distinction between rainbow trout and anadromous steelhead in most streams is unknown. Historically, Panther Creek had Chinook and steelhead habitat (USDA 2005a). The Lower and Middle Panther watersheds have been designated in whole or part as priority watersheds in PACFISH/INFISH for bull trout and/or anadromous salmon fisheries recovery during ESA Section 7 consultation for amending the Salmon and Challis Forest Plan. A few hatchery steelhead have been observed in the lower Panther Creek Watershed. No adult Chinook were observed spawning in lower Panther Creek following Idaho Fish and Game outplants in 2001. However, Chinook spawning (80 redds) was noted in the Panther Creek drainage upstream from Napias Creek in 2001, and surveys completed in May 2003 found juvenile Chinook salmon, which indicates successful reproduction (Stantec, 2003). Adult Chinook were observed spawning in mainstem reaches of Panther Creek as far upstream as Moyer Creek in 2005, 2006, and 2007 (Rose, 2007).

Natural barriers in lower Napias and Big Deer Creeks limit the use of these streams by anadromous fish. Because there is limited information on spawning of resident fish, such as rainbow and cutthroat trout, it is assumed that watersheds in which they occurred also provide spawning habitat. Bull trout populations are present but depressed in much of the Panther Creek drainage (Roberts and Baer, 2004). Bull trout spawning areas have been surveyed since about 1999 in the Panther Creek headwaters, Little Deep Creek, and Napias drainage. Bull trout redd counts show a slight downward trend in the Napias Creek drainage and a more noticeable decline in the headwaters of Panther Creek. Numbers of bull trout redds counted in Little Deep Creek are increasing (Salmon-Challis National Forest, 2004a).

Table 3-14 presents the mean abundance of special status species observed in ICP area streams expressed as fish per 100 square meters and fish per kilometer from surveys conducted by Kuzis (2004). In 2001, juvenile Chinook salmon abundance was low (0.08 fish/100m^2) in Panther Creek and they were only observed downstream from Blackbird Creek. More recent surveys (2002-2005) have noted an increase of juvenile Chinook salmon following successful spawning in the fall of 2001. Juvenile Chinook salmon densities increased to a mean abundance of 31 fish/100m^2 in 2002 in

Panther Creek (EcoMetrix, 2006). From 2003 to 2005 mean abundance in Panther Creek has varied from 0.7 to 8.1 fish/100m^2.

TABLE 3-14. Mean abundance estimates (fish/100m^2 and fish/kilometer) for Chinook, rainbow/steelhead, cutthroat trout, bull trout, and total fish abundance for ICP Project area streams (Kuzis, 2004). No fish were observed in Bucktail, Big Flat, and South Fork Big Deer creeks in 2001

Stream	Chinook Salmon		Rainbow/ Steelhead		Cutthroat Trout		Bull Trout		Total Fish Abundance	
	#/100m^2	#/km	#/100m^2	#/km	#/100m^2	#/km	#/100m^2	#/km	#/100m^2	#/km
Deep Ck - 3 sites	0.00	0	1.18	50	0.39	17	0.71	30	4.33	183
Moccasin Ck - 3 sites	0.00	0	0.00	0	0.0	0	2.91	78	4.49	121
Panther Ck - 7 sites Metamorphic erosional sites	0.08	9	4.11	446	0.08	9	0.0	0	5.21	590
Panther Ck - 4 sites Metamorphic depositional sites	0.00	0	4.03	728	0.04	8	0.0	0	5.51	995
Panther Ck - 3 sites Tuff depositional sites	0.00	0	1.09	69	0.0	0	0.0	0	2.08	79
Little Deer Ck - 4 sites	0.00	0	2.80	65	0.0	0	0.0	0	3.98	93
Big Deer Ck - 4 sites downstream S.F. Big Deer Ck	0.00	0	0.65	254	0.0	0	0.0	0	0.73	286
Big Deer Ck - 2 sites upstream S. F. Big Deer Ck	0.00	0	6.99	1238	0.0	0	0.0	0	9.00	1611
Williams Creek – 4 sites	0.00	0	0.16	15	0.22	20	0.00	0	2.19	203

Rainbow/steelhead are distributed throughout most of the Panther Creek drainage and Williams Creek. In 2001, no rainbow/steelhead were observed in Mocassin, Big Flat, and South Fork Big Deer Creeks. Recently, rainbow/steelhead have been observed in lower Blackbird Creek and the South Fork Big Deer Creek downstream from the confluence of Bucktail Creek (EcoMetrix, 2006). Rainbow/steelhead were observed in all sites of Panther Creek although the density (fish/100m^2) was greatest in higher gradient (erosional) sites (**Table 3-14**). In Big Deer Creek, rainbow/steelhead abundance was higher upstream from the confluence of South Fork Big Deer Creek (**Table 3-14).**

In 2001, Cutthroat trout were most abundant in Williams and Deep Creeks and a few were observed in Panther and Big Deer Creeks (Kuzis, 2004; Stantec, 2003; USFS, 2006).

Bull trout were most abundant in Deep and Mocassin Creeks (**Table 3-14**). Surveys conducted in 2005 found bull trout in Panther Creek both upstream and downstream of the Blackbird Creek confluence (EcoMetrix, 2006). No bull trout have been sampled in Big Deer Creek above the cascade (Kuzis, 2004; EcoMetrix, 2006).

Macroinvertebrate Populations

Macroinvertebrate populations are often monitored to describe the health of stream ecosystems. Macroinvertebrates were sampled in Panther, Little Deer, Big Deer, and South Fork Big Deer Creeks (Kuzis, 2004). The Idaho Department of Environmental Quality (IDEQ) has used a multi-metric index called macroinvertebrate biotic index (MBI) to indicate if streams support their beneficial uses. MBI scores that range from 3.5 to 6.0 are fully supported. When the value ranges from 2.5 to 3.5 beneficial uses are partially supported and when the values range from 0.0-2.5 beneficial uses are not supported.

IDEQ MBI scores, abundance and species richness values for Ephemotera, Plecoptera, and Trichoptera (EPT) indicate that water quality from Bucktail and Blackbird Creeks have had an adverse effect on benthic fauna downstream (**Table 3-15**). For example, in Panther Creek, MBI scores generally increase downstream from Blackbird Creek. The two sites (P-B01 and P-B02) furthest downstream from Blackbird Creek were in full support of beneficial uses while the most upstream site closest to Blackbird Creek (PBO-3) was only partially supportive of beneficial uses.

In the Big Deer Creek watershed, macroinvertebrate samples collected downstream from Bucktail Creek in Big Deer Creek (BD-04) and South Fork Big Deer Creek (SF-02) had lower MBI scores, abundance and richness values than their reference sites upstream from the influence from Bucktail Creek (Kuzis, 2004). MBI scores, abundance, and richness values in Little Deer Creek (L-B01) suggest that beneficial uses in this stream are fully supported.

TABLE 3-15. IDEQ MBI Scores Along with Total and EPT Species Abundance and Richness in ICP Area Streams (from Kuzis, 2004). Numbers in parenthesis indicate the range in values for that site.

Stream	Site	IDEQ MBI	Abundance		Richness	
			Total	EPT	Total	EPT
Panther Creek	P-B01	4.4	3,398	1,208	54	17
	P-B02	3.9	1,768	1,011	44	12
	P-B03	(2.6 - 3.2)	(9,087 - 11,352)	(1,344 - 2,515)	(23 – 31)	(5 – 11)
Big Deer Creek	BD-05	5.1	3,474	1,260	60	27
	BD-04	3.1	1,042	98	32	12
S. F. Deer Creek	SF-03	4.2	613	215	43	21
	SF-02	2.1	91	15	12	4
Little Deer Creek	L-B01	(4.4 - 5.1)	(402 - 1,172)	(224 – 758)	(38 – 58)	(16 – 25)

Road and Access Management

Access to the Idaho Cobalt Project is by unpaved Forest Service roads from either US Highway 93 or Idaho Highway 28. U.S. Highway 93 and Idaho State Highway 28 are administered by the Idaho Department of Transportation. Both Highways are paved, all-season, two-lane highways and major transportation routes for Lemhi and Custer Counties. U.S. 93 connects Salmon with Missoula, Montana to the north and Challis, Idaho to the south. Idaho State Highway 28 connects Salmon to Interstate 15 near Idaho Falls, Idaho.

Forest road routes (see **Figure 3-13**) that provide access to the Idaho Cobalt site include:

- **Moccasin-Napias Route,** taking Williams Creek Road (FS#60021) to Phelan Road (FS#60098) to Moccasin-Napias Road (FS#60076) to Morgan Creek-Panther Creek Road (FS#60055) to Blackbird Road (FS#60115) to Project site;
- **Salmon River Route,** taking Salmon River Road (FS#60030) to Morgan Creek-Panther Creek Road (FS#60055) to Blackbird Road (FS#60115) to Project site;
- **Williams Route,** taking Williams Creek Road (FS#60021) to Deep Creek Road (FS#60101) to Morgan Creek-Panther Creek Road (FS#60055) to Blackbird Road (FS#60115) to Project site; and
- **Morgan Route,** taking Morgan Creek-Panther Creek Road (FS#40055/60055) to Blackbird Road (FS#60115) to Project site.

These roads are used to access recreation, hunting, and resource management activity. The first 5.5 miles of the Williams Creek Road (FS#60021) from Highway 93 is owned and administered by Lemhi County. The first 8.88 miles of Morgan Creek-Panther Creek Road (FS#40055) is owned and

administered by Custer County. The Salmon-Challis National Forest has easements through private property at two locations on the Morgan Creek – Panther Creek Road. Negotiations for a third easement are ongoing. All remaining existing Project Access Route roads considered are owned and administered by the Salmon-Challis National Forest with the exception of a portion of the Blackbird Road, which is on private land (Blackbird Mining Company). The Williams Creek Road to Morgan Creek – Panther Creek Road to Blackbird Road Route (Williams Route) is used to access ongoing cleanup operations at the Blackbird Mine site and the Cobalt Ranger Station. The Project currently uses and proposes to continue using the Williams Route for access. Available average daily traffic data for Project Access Routes considered in the study are provided in **Table 3-16**.

TABLE 3-16. Project Access Route Average Daily Traffic (ADT) Data

Road	Period of Record	Maximum Daily Traffic	Minimum Daily Traffic	Average Daily Traffic for Period of Record
Williams Ck.[1]	6/23/97 to 12/14/97	318	63	159
Panther Ck.[2]	9/10/02 to 10/03/02	131	44	75
Panther Ck.[3]	7/02/03 to 7/20/04	93	33	66

NOTES:
(1) ADT data at mile post 7 on Williams Creek Road - 1997, 1998, 1999
(2) ADT data near Cobalt Ranger Station
(3) DT data at Forest Service Boundary – 2003, 2004
Source: Salmon-Challis National Forest, 2004.

The Forest road access bridges are generally adequate for current and projected future uses. Forest Service roads that access the Project area are also generally in adequate condition for current uses. However, much of the access road would be significantly impacted by a substantial increase in traffic (Parker, 2006) and a section of sharp switch backs at mile post 8 on the Williams Creek Road has a history of accidents and difficulty with the steep grade, particularly during winter conditions. Portions of the Morgan Creek-Panther Creek Road (FS#40055) and the Blackbird Road (#60115) experience flooding during high stream flows. Blackbird Road between mile post 35.7 and 37.4 constricts Blackbird Creek channel width.

The Leesburg East gravel pit (Section 17, T21N, R20E) near the Williams Creek Summit, is used by the Forest Service and it's contractors for a road aggregate source. A contract for continued use of the pit is being let by the Forest Service for 2008. The ICP will use aggregate from this source for road resurfacing.

Site roads are currently being used for FCC's exploration and baseline study activities. These roads are also used to access Blackbird Mine monitoring and cleanup operations. Existing site roads are generally narrower and steeper than the secondary Forest access roads and are maintained by FCC or the Blackbird Mine Site Group for local seasonal access. Currently the Blackbird Road is gated and closed to public use below West Fork Blackbird Creek. There are currently a total of approximately 26 miles of roads within FCC's block of unpatented mineral claims. Approximately 5 miles of these existing roads will be upgraded for mine use under the Project's proposal.

The nearest commercial airports are Missoula, MT and Idaho Falls, ID. Salmon and Challis, ID have airports for general aviation. There are railheads at Dubois, ID approximately 136 miles from Salmon and at Missoula, MT approximately 140 miles from Salmon.

Land Use and Recreation Resources

Land Use

The Salmon National Forest Land and Resource Management Plan (Forest Plan) (USFS, 1988) provides for "coordinated multiple-use management of outdoor recreation, range, timber, watershed, wildlife and fish, minerals, and wilderness resulting in sustained yields of goods and services for the benefit of the American people." The Record of Decision (ROD) on the Forest Plan Final Environmental Impact Statement identified the preferred Plan from a list of twelve alternatives. The Forest Plan was developed under implementing regulations of the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ), Title 40, Code of Federal Regulations, Parts 1500-1508 (40 CFR 1500-1508); and the National Forest Management Act (NFMA), Title 36, Code of Federal Regulations, Part 209 (36 CFR 219).

The FEIS ROD states that "…the Plan sets forth a strategy for managing the Forest; this is not a plan for day-to-day internal operations. It does not address administrative matters such as personnel, fleet equipment, internal organizational changes, and does not emphasize all site-specific design decisions or all specific resource outputs. Rather, the Plan prescribes general management practices for the Salmon National Forest. The intention is to achieve multiple-use goals and objectives with optimum economic efficiency."

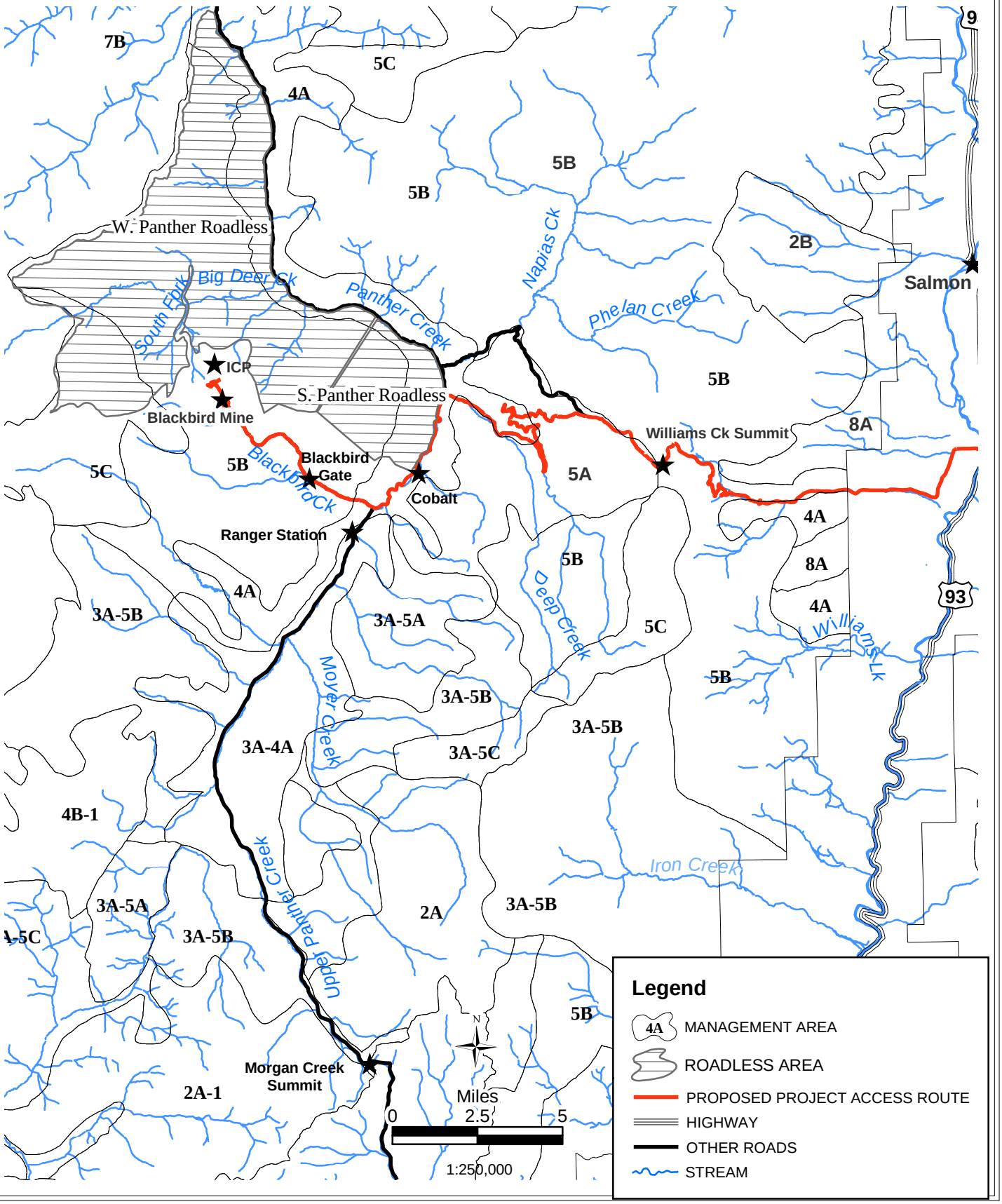
The Salmon National Forest Land and Resource Management Plan defines Management Areas (MAs) with prescriptions for visual resource management, dispersed recreation management, wildlife habitat improvement and maintenance, range improvement and maintenance, and silviculture. The MA prescriptions address issues, concerns, and opportunities (ICOs) and areas of significant public interest identified in the planning and EIS process. Issues addressed in the MA prescriptions include: management of undeveloped areas; wildlife and fish habitat management; timber economics and "below cost" timber sales; timber management-allowable sale quantity; transportation system management; watershed management; range resource; and community stability.

The Forest Plan FEIS inventoried 30 Roadless Area Review and Evaluation (RARE II) roadless areas. The FEIS evaluated impacts from resource development and road construction to the roadless areas since the 1978 RARE II inventory. Alternatives evaluated in the FEIS prescribed whether or not a roadless area, or part of a roadless area, was to be considered for wilderness designation. The roadless areas adjacent to the Project were not recommended for wilderness consideration in the ROD on the Forest Plan.

FCC holds mineral rights on 146 unpatented mineral claims comprising 2,529 acres (**Figure 3-3**). These claims are made under the 1872 Mining Law and in accordance with mineral staking regulations in the State of Idaho. Project mineral claims surround patented mining claims related to the Blackbird Mine and owned by Blackbird Mining Company.

The ICP would consist of two mines, a mill, a waste disposal facility, roads and ancillary facilities. Management Areas (MAs) affected by actions proposed by the Idaho Cobalt Project (Project) are shown on **Figure 3-15**. The Project and proposed Project Access Route (Williams Creek – Deep Creek – Panther Creek – Blackbird Creek Roads) are located in three MA prescriptions:

- 4A – Emphasis is on managing key big game winter range to insure required forage and cover conditions exist to meet big game needs.
- 5A – Emphasis is on producing long-term timber outputs through a high level of investment in regeneration and thinning.
- 5B – Emphasis is on producing long-term timber outputs through a moderate level of investment in regeneration and thinning.



IDAHO COBALT PROJECT FORMATION CAPITAL CORP. U.S. LEMHI COUNTY, IDAHO	**LAND USE MANAGEMENT AREAS** January, 2006	Figure 3-15

Two roadless areas, West Panther Creek and South Panther Creek (**Figure 3-15**), are located to the north, west and east of the Project. These roadless areas in the Project area are within MAs 4A, and 5B.

Recreation

There are numerous recreational resources in the Project area, primarily involving areas adjacent to the proposed Project transportation route. The Project site, however, offers no recreational opportunities or access for the public. The proposed Project is located on FCC's mining claims and public access to the Project site is restricted. The Project's existing site access road, and proposed operational access route above Blackbird Creek, utilizes an existing access road that passes through the adjacent Blackbird Mine site and CERCLA remediation area. Open public access on this road is not permitted to or through the proposed Project site. The proposed Project transportation route, however, is open to year around public access.

The Salmon-Challis National Forest completed a National Visitor Use Monitoring Results report (NVUM) in June 2004 based on data gathered during fiscal year 2003 (October 2002 through September 2003). The NVUM was implemented as a response to the need to better understand the use and importance of and satisfaction with national forest system recreation opportunities. Recreation use on the forest for fiscal year 2003 was 466,835 national forest visits.

The average length of stay on the forest for a national forest visit was 43.2 hrs. Over 23 percent of visitors stayed overnight on the forest. During their visit to the forest, the top five recreation activities of the visitors were viewing natural features, viewing wildlife, hiking/walking, relaxing, and driving for pleasure. The three most used facilities/areas were forest roads, forest trails and scenic byways (USDA Salmon-Challis National Forest, 2004).

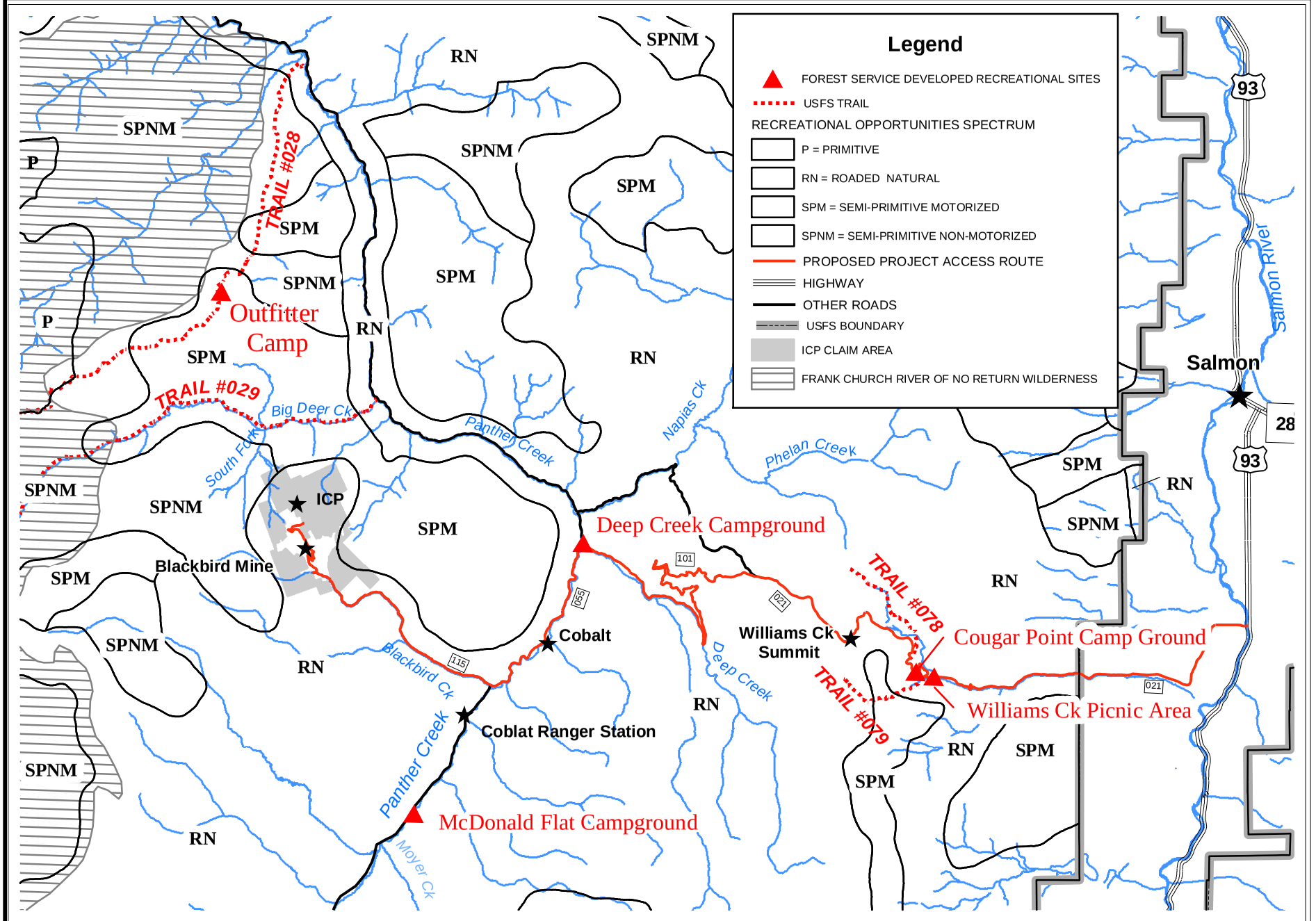
Recreation Opportunity Spectrum

The Forest Service's Recreation Opportunity Spectrum (ROS) classification contains six classes, each of which is defined by its setting and the possible recreational experiences and activities it affords. The proposed Project site and adjacent areas involves three of the six classes (**Figure 3-16**). They are: Semi-primitive Motorized, Semi-primitive Non-motorized, and Roaded Natural.

The proposed Project site, including the adjacent Blackbird Mine CERCLA site and large areas south of this area, as well as the Panther Creek Road corridor are classified Roaded Natural class of ROS. Areas in this class are characterized as a predominantly natural environment with evidence of moderate permanent alternative resources and resource utilization. Evidence of the sights and sounds of man is moderate, but in harmony with the natural environment. Opportunities exist for both social interaction and moderate isolation from the sights and sounds of man. It must be noted, however, that public vehicle access is not available to the proposed Project site above the Blackbird Mine Gate, and the adjacent Blackbird Mine CERCLA area is not open for recreational use.

Large areas east and north of the proposed Project site are encompassed by the Semi-primitive Motorized ROS class. Areas in this class are characterized by a predominantly natural or natural-appearing landscape. The size of these areas gives a strong feeling of remoteness compared to areas that are more heavily used and developed. Opportunities exist to practice woodsman and outdoor skills. Also, recreationists using areas in this class experience a moderate probability of isolation from the sights and sounds of humans, independence, closeness to nature, and feelings of self-reliance.

A large area located immediately west of the proposed Project site, including portions of the South Fork of Big Deer Creek drainage is encompassed by the Semi-primitive Non-Motorized ROS class. These areas are characteristically similar to Semi-primitive Motorized areas. The primary difference between the two is the presence or absence of vehicles. Recreationists using areas in this class experience a high probability of isolation from the sights and sounds of humans, independence, closeness to nature, and feelings of self-reliance.



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IDAHO COBALT PROJECT
FORMATION CAPITAL CORP. U.S.
LEMHI COUNTY, IDAHO

RECREATIONAL OPPORTUNITIES SPECTRUM
TRAILS & RECREATION SITES

January, 2006

Figure
3-16

Developed Federal Sites

Three developed recreational facilities administered by the Forest Service are present along the transportation route proposed for the Idaho Cobalt Project (see **Figure 3-16**):

Site Name	Site Capacity*	Utilization (%)*
Williams Creek Picnic Area	40	30
Cougar Point Campground	90	23
Deep Creek Campground	15	29

*Source: USDA June 1991.

The predominant public use of these developed facilities is associated with the big game hunting season. Summer use of these facilities is typically low and intermittent (Stauffer, 2005).

Trails

The site of the proposed Project provides no public access for trail use or recreational activities. However, Forest trails in the general area of the proposed Project and along the proposed Project transportation route, provide an important recreational resource. Hiking, horseback riding, off-road vehicle travel, snowmobiling and cross country skiing are popular forms of trail-related recreation in this area.

Primary hiking and horseback trails in the general area of the proposed Project and along the proposed Project transportation route include the following (**Figure 3-16**):

FS Trail No. 029 (Big Deer Creek Trail): This trail follows Big Deer Creek from its trailhead on the Panther Creek Road north of the proposed Project site to the Crags Campground area located southwest of the proposed Project area and adjacent to the Frank Church River of No Return Wilderness Area. The trail is popular for use by hikers during the summer months and hunters during the fall hunting season.

FS Trail No. 028 (Gant Ridge Trail): From its trailhead located on the Panther Creek Road north of the proposed Project site, this trail follows the eastern boundary of the Frank Church River of No Return Wilderness Area before entering the wilderness area west of the proposed Project site. The trail is used by hikers during the summer months and hunters during the fall hunting season.

FS Trails No. 079 and 078: These trails are located in the Williams Creek Picnic Area and Cougar Point Campground area and are lightly used.

Fish and Wildlife

Big game hunting is a popular activity in the areas adjacent to and in the general vicinity of the proposed Project site. Opportunities exist for hunting elk, mule deer, bighorn sheep, black bear, and mountain lion.

Opportunities for fishing in some of the streams in the general vicinity of the proposed Project site are very limited as a result of the adverse effects of historic mine drainage on water quality. The nearest public fishing access site is the Deep Creek Campground, located at the confluence of Deep Creek and Panther Creek (**Figure 3-16**).

Wild and Scenic Rivers

The Wild and Scenic Rivers Act was signed into law as Public Law 90-542 on October 2, 1968 and Congress established a National Wild and Scenic Rivers System (National System). To qualify, a river or river segment must be in a free-flowing condition and must be deemed to have one or more "outstanding remarkable" scenic, recreational, geologic, fish and wildlife, historic, cultural or other

similar values. Every river in the National System must be administered in such a way as to protect and enhance the values that made it eligible for the National System, but not to limit other uses that do not substantially interfere with public use and enjoyment of these values.

In March 2004, the Forest Service prepared the "Salmon-Challis National Forest Wild and Scenic River Study in Forest Plan Revision" to guide assessment of wild and scenic rivers in the Salmon - Challis National Forest Resource Management Plan revision process. The document included information regarding the eligibility, classification and suitability evaluation processes (USDA Salmon-Challis National Forest, 2004a).

Based on the results of the eligibility evaluation process, Panther Creek from its headwaters to the Salmon River (45.6 miles) was determined to meet the qualifications for the following Outstandingly Remarkable Values: Free Flowing, Scenery, Recreation, Geology, Fish, and Wildlife. As a result of the Classification/Suitability evaluation, the report concluded that Panther Creek from its headwaters to the Salmon River is eligible for a recommendation for inclusion in the National System with a classification as a Recreational River area. Recreational River areas are defined as follows:

> *"Recreational River areas: Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or division in the past."*

A portion of the proposed Project transportation route is located along Panther Creek.

Winter Sports

There are approximately 15 miles of groomed cross-country ski trails in the Williams Creek Summit, Cougar Point and Ridge Road areas that are adjacent to the Project's proposed transportation route. There are three major trailheads for the cross-country ski trails; the Big Fir Trailhead located above the Cougar Point Campground, Meadow trailhead located below Williams Creek Summit, and Williams Creek Summit. The use of these areas is primarily local. In addition to cross-country ski trails, there are several groomed snowmobile routes for which the major trailhead is located at Williams Creek Summit.

Social and Economic Resources

Socioeconomic Resources

The socioeconomic study area encompasses Lemhi and Custer Counties and the city of Salmon, the closest major community to the proposed mine site.

Social Life

The original inhabitants of the Salmon Valley were the Lemhi Shoshones. The *Agai-dika* (Shoshoni - salmon-eaters), and the *Tuku-dika* (meat eaters) the original people who lived and prospered in the Salmon River area, depended on the subsistence fisheries in the rivers and wildlife, including the big horn sheep. Although the different bands of Shoshoni, Bannock and Sheepeaters traveled throughout a larger area for other resources and for social interaction, the Salmon River area is a central component to the Tribal homelands. On September 24, 1863, the *Agai-dika*, including the Shoshone bands, Bannocks and the Sheepeaters signed the Virginia City Treaty. This established the Lemhi Reservation, where Indian people lived until 1907, when they were forced to move again, this time to the Fort Hall Reservation.

Salmon, the county seat and the most populated community in Lemhi County, lies at the confluence of the Salmon and Lemhi Rivers in the Salmon Valley. The city is surrounded by open space areas and natural landforms that are mostly managed by the federal government. The Salmon area offers both summer and winter outdoor activities, oftentimes causing the population to swell with part-time

residents, recreationists, and tourists. In spite of this influx of temporary residents primarily in the summer, local residents appear to have retained their small-town character and friendly attitude.

Area residents are not immune from the social problems that affect youth in larger cities nationally. Local programs are available to help families dealing with these situations. Many social, civic, and support groups in the study area actively work and interact to provide an improved human and natural environment in the county. Local residents and businesses also appear willing to “lend-a-hand” to families who have suffered hardships or need assistance with odd jobs such as home repairs.

The social processes of the area often are influenced by factors and interests outside of the study area. The national or world market price of commodities such as agricultural products, timber, and minerals as well as decisions concerning the nearby national forests, mining in the area, and resort developments are often made by individuals, corporations, or regulatory agencies with little or no affinity with the communities.

Residents of the area have social and commercial ties with Lemhi County, primarily because it is their place of residence. But, people often travel outside the community to shop for major purchases, especially to Montana where there is no sales tax. In addition, many youth leave the area in pursuit of jobs, training, a permanent vocation, or other opportunities.

Salmon has survived past cycles of "boom and bust" caused by the opening and closing of mining developments in the area. Property values were negatively affected during the bust cycles and employment in the area declined. However, in spite of closure of the Beartrack Mine in 1999, the unemployment rate has remained fairly stable, indicating that the economy may not be as dependent on the mining industry as it once was. The hiring of the county development director in 2002 and support of state and local officials have helped to diversify and decrease the dependency on one main industry.

Population Trends and Demographic Characteristics

The State of Idaho has continued to increase in population, climbing to an estimated population of 1,393,262 in 2004, or 5.4 percent over the 2001 population estimate. Lemhi County's population grew at a slower pace than the state between 2001 and 2004, increasing by 2.2 percent from 7,655 in 2001 to 7,820 in 2004. Unlike the slight population rises in the state and the county, the city of Salmon remained fairly stable during the 4 year period, increasing by <1 percent (**Table 3-17**). Population in Custer County and Challis has fallen slightly since 2000.

TABLE 3-17. Population Trends - State of Idaho, Lemhi County, Salmon, Custer County, and Challis

Year	State of Idaho	Lemhi County	Salmon	Custer County	Challis
Census					
1980	944,127	7,460	3,308	3,385	758
1990	1,006,734	6,899	2,941	4,133	1,073
2000	1,293,953	7,806	3,122	4,342	909
Percent Change (1980-2000)	+37.1%	+4.6%	-5.6%	+28.3%	+19.9%
Estimates					
2001	1,321,309	7,655	3,042	4,270	892
2002	1,343,124	7,757	3,064	4,166	866
2003	1,366,332	7,731	3,038	4,118	851
2004	1,393,262	7,820	3,056	4,114	853
Percent Change (2001-2004)	+5.4%	+2.2%	+0.5%	-3.7%	-4.4%

Source: U.S. Bureau of the Census, Population Division. 2004 and 2005.

In general, the 2000 demographic characteristics of Lemhi County, the city of Salmon, Custer County, and the city of Challis were fairly similar. The population was almost evenly divided between males and females and the majority of the population (>98 percent) were Caucasian. About two-thirds of the living quarters were family households, with a range of 2.21 (Challis) to 2.41 persons (Custer County) per household. Approximately one-quarter of the population residing in the two counties, Salmon, and Challis were under 18 years of age, while only 7.5 percent of the state population fell within this age category. Median age was somewhat lower in Salmon (39.9 years) than the two counties and Challis, but slightly higher than the statewide median age of 37 years.

Community Service Providers

Education

The proposed ICP is located in Salmon School District #291, which includes: Salmon Pioneer Primary School (pre-kindergarten through grade 3), Brooklyn Intermediate School (grades 4 and 5), Salmon Middle School (grades 6, 7, and 8), Salmon High School (grades 9, 10, 11, and 12), Salmon Alternative School (grades 9, 10, 11, and 12), and Salmon Juvenile Detention Center School (grades 9, 10, 11, and 12). Classes are held in antiquated buildings, which need to be renovated or replaced, most likely through construction of a new facility on school district-owned property near the existing high school (Grabowska, 2004).

Salmon School District enrollment decreased within the past 5 years by about 100 students due to the shutdown of a nearby mining development; however, within the next 2 years, enrollment is expected to increase due to upcoming large class sizes. Between the 2001-02 and 2003-04 school years, Salmon High School showed the highest decrease in enrollment (12.4 percent), while Salmon Middle School had the smallest decrease (1.1 percent). During the 2003-04 school year, the school district enrollment was at 1,077 students, including students enrolled in the alternative school and the juvenile detention center. Currently, there is an average student/teacher ratio of 22 students/teacher (Grabowska, 2004).

The Challis Joint School District in Custer County operates five schools (three elementary in Challis, Clayton, and May; one high school in Challis; and one combined elementary-junior high school in Stanley). Challis Elementary School provides education to students in pre-kindergarten through grade 6, while Challis Senior High School serves grades 7 through 12. Of the 509 students in the Challis Joint School District, approximately 182 go to the elementary school and 266 attend the high school.

Law Enforcement

The Idaho Highway Patrol, Lemhi County Sheriff's Department, Custer County Sheriff's Department, Salmon Police Department, and Challis Police Department provide law enforcement services to community residents. The Highway Patrol is responsible for enforcing traffic laws, investigating traffic collisions, assisting motorists, and conducting criminal investigation on Idaho's interstate highways, state highways, and secondary highways. The Sheriff's Departments are accountable for law enforcement activities in Lemhi and Custer Counties, including the unincorporated towns, while the Salmon and Challis City Police activities are primarily restricted to their respective city limits. Law enforcement agencies provide assistance, when requested, in performing law enforcement duties in nearby areas.

Fire Protection

The Salmon Volunteer Fire Department (VFD), with a membership of about 31, provides fire services for the city and Lemhi County Fire Protection District #1. District #1 covers a 5-mile fire service area around the city limits (City of Salmon, 2005). Insurance Services Office (ISO) Commercial Risk Services Inc. inspects the adequacy of fire departments nationwide to determine ratings for property covered by insurance agencies. On an ISO Commercial Risk Services Inc. scale of 1 to 10, with

class 1 being the highest rating and 10 being virtually unprotected, the Salmon VFD has an ISO rating of 5 and Fire District #1 has an ISO rating of 8-10 (Nygaard Promotions, 2004).

Ambulance Service

Lemhi County has two ambulance services--Salmon Advanced Emergency Medical Technicians (EMTs) and Leadore EMTs. The Salmon EMTs has a team of 13 members and provide Intermediate Life Support, while the Leadore EMTs are trained in Basic Life Support with a team of 24 (Idaho Department of Health and Welfare, 2005). Three Quick Response Units (QRUs) also are located in Lemhi County--Salmon Search & Rescue, Elk Bend QRU, and Gibbonsville QRU. Emergency responders of the three QRUs are trained in Basic Life Support, as well as being certified in the various emergency response areas (Idaho Department of Health and Welfare, 2005). One Community Emergency Response Team (CERT) operates out of the Elk Band area and is comprised of 13 CERT team members. About 50 Salmon citizens are also CERT trained (Nelson, 2005).

Health Care

Steele Memorial Hospital, the only licensed hospital in Lemhi County, is a fully accredited 25-bed critical access healthcare facility. Associated with the hospital is the federally designated Certified Rural Health Clinic that provides a wide range of primary care, ancillary services, and specialty services, such as immunizations, patient health education, acute and chronic illness management, routine physical examinations, well-child/development examinations, minor procedures, diagnostic laboratory procedures, mental health counseling, orthopedic services, and x-ray services. The hospital and clinic employ over 125 workers, including the medical staff a team of nurses and ancillary staff.

Construction of the new Steele Memorial Hospital in downtown Salmon was completed in 2004. The new facility is an indication of the ever-expanding medical service area of Lemhi and Custer counties. The healthcare facility offers outpatient and inpatient care, therapy department, laboratory services, medical imaging services (CT Scan, ultrasound, mammography, radiology, MRI), and surgical services (general, orthopedic, gynecological, and endoscopy procedures). Healthcare professionals also in residence include optometrists, dentists, physical therapists, chiropractors, and home-health care agencies (Nygaard Promotions, 2004).

Public Assistance

Public assistance in Lemhi County is provided through Region 7 of the Idaho Department of Health and Welfare, with its regional office located in Idaho Falls and field office in Salmon. The Department of Health and Welfare offers medical and financial assistance, child protection services, and mental health services for residents who are eligible.

Water Supply

The primary water source for the city of Salmon is surface water, serving an estimated population of 3,080. Upgrade of the Salmon city water treatment plant started in the spring of 2005. Several other community water systems use ground water as the primary water source (USEPA, 2005), while residents outside of the community water systems generally rely on wells for potable water.

Wastewater Treatment

The Salmon wastewater treatment facility serves about 3,122 people and has a designed capacity of 5,300. The existing flow is 1.570 millions of gallons per day (mgd) which is below the designed flow capacity of 2.500 mgd (USEPA, 2004). Housing units outside the city service area utilize septic tanks for wastewater disposal.

Solid Waste

The Lemhi County Landfill was certified as a Class D landfill and opened for waste disposal in 1995. It was originally estimated that the landfill had a life span of 16 years. With the addition of landfill space savers (e.g. cardboard and aluminum can baler, scrap metal removal, and vehicle battery and oil recycling), the landfill may increase that life span to 20 years. The landfill accepts waste from Lemhi and Custer counties (Searle Hart & Associates, PLLC, 2005).

Economy

Employment and Income

Employment in Lemhi County is highly seasonal. Agriculture (primarily cattle ranching) is a primary industry, with most ranches being family owned and operated. Logging also is one of the main non-agricultural industries along with tourism and mining. Custer County is known as one of the richest mineral belts in North America and is the economic center of mines, ranches, farms, government, and tourism. Mineral resources of the area include molybdenum (a hardening agent for steel), gold, and silver along with 40 other minerals worthy of being mined commercially.

Major employers in Lemhi County include Discovery Care Center, Lemhi County, Q.B. Corporation, Salmon Public School District #291, Saveway Market, Steele Memorial Hospital, and the federal government (Nygaard Promotions, 2004). The number of business establishments in Lemhi County increased by 2.3 percent between 2001 and 2002 (301 businesses in 2001 and 308 businesses in 2002). Eighty-eight percent of the county businesses (266 establishments) were located in Salmon. Seventy-one percent of the Salmon businesses employed one-to-four workers, while, at the other end of the spectrum, only one establishment employed between 100 and 249 workers (U.S. Bureau of the Census EPCD, 2005). In a recent inventory of local businesses, 269 businesses had registered with the City of Salmon and it was expected that at least 25 had not yet licensed their businesses. The 269 local businesses employed an estimated 1,250 workers (City of Salmon, 2005).

Major employers of Custer County include Challis Joint School District, Custer County, L&W Stone Corporation, Redfish Lake Lodge, The Industrial Company (TIC), Thompson Creek Mining, U.S. Forest Service, and Village Inn/Challis Lodge/Village Square (Nygaard Promotions, 2004).

During 2003, approximately one-third of the jobs in Lemhi County were in government (federal, state, or local), followed by retail trade (14.2 percent) and the accommodation and food service industries (10.4 percent). The transportation and warehousing sector was the fastest growing industry in the county, rising by 80.6 percent between 2000 and 2003. The utilities sector showed the largest decline in employment (50 percent); however, the decline was from only four to two employees. The largest decline in actual number of employees was in the manufacturing sector, which lost 33 employees between 2000 and 2003.

Over the past 5 years (2000-04), the unemployment rate in Idaho peaked to 5.4 percent in 2002, then decreased to the 2000 average of 4.7 percent in 2004. Lemhi County fluctuated from its highest unemployment rate (7.8 percent) in 2000 to its lowest rate (6.8 percent) in 2004 during the 5 year study period. Similar to the state, the Custer County unemployment rate was at its peak of 6.8 percent in 2002 and declined to 5.4 percent in 2000 (Idaho Department of Labor, Research & Analysis and Public Affairs, 2005).

Mining jobs were the highest paying jobs in Lemhi County in 2003, paying workers an annual average wage of $57,558. The next top paying jobs were in the Management of companies and enterprises sector ($51,872) and the Federal Government sector ($42,761). The accommodation and food service industry was at the lower end of the spectrum ($8,639). Average annual wage for all industries in 2003 was $21,899 in Lemhi County, lower than the statewide average of $28,667.

Lemhi County ranked 25th among the 44 Idaho counties, but lagged below the state average per capita income between 2000 and 2002. In 2002, per capita income in Lemhi County was $21,645 compared to the state ($25,476) and the United States ($30,906).

Housing

Housing stock in Salmon ranges from 1800-vintage mining shacks to elegant Victorian-style homes. During the past century, housing has developed in and around Salmon, primarily on land with views of the valley and the Bitterroot Range. Other housing developments are occurring in outlying areas to the north and south of Salmon; however, water and sewer limitations may eventually curb this residential growth (City of Salmon, 2004).

Over the past couple of years, housing has become very limited in the Salmon and Challis area. Realtors reported that once listed an average home is sold in about two weeks (Gilliam, 2005). The expansion of the nearby Thompson Creek Mine with the hiring of approximately 40 new employees, has also added to the limited amount of housing. Many of the newly hired workers were former employees who had moved from the area, but needed housing when returning to work at the mining operation (Gilliam, 2005).

During 2000, the U.S. Bureau of Census recorded 4,154 housing units in Lemhi County, comprised of 82.7 percent 1-unit structures, 0.6 percent 2 to 4 unit structures, and 16.7 percent mobile homes or "other" housing units. Approximately 21 percent of the housing units were vacant and, of the 936 vacant units, 52.2 percent were classified by the U.S. Bureau of the Census as seasonal, recreational, or occasional use housing units. Similarly, 47.2 percent of the vacant units in the state were identified as seasonal, recreational, or occasional use units.

In Custer County, there were 2,983 housing units of which 78 percent were occupied units and the remaining 31 percent were vacant units. The majority of the occupied units (69.3 percent) were owner occupied, while most of the 115 vacant units were classified as seasonal, recreation, and occasional use units (30.4 percent), followed by rental units (26.1 percent).

Temporary housing in the area includes approximately 235 motel and bed-and-breakfast accommodations in Salmon and 172 rooms in Challis. Private/public campgrounds and recreational vehicle (RV) courts also provide short-term housing in both of the areas (IDOC/Idaho Division of Tourism Development, 2004).

Heritage Resources

Heritage Resources are defined as Historic Properties, under the National Historic Preservation Act. Section 106 of the National Historic Preservation Act requires federal agencies to identify any Historic Properties that might be affected by a federally licensed, permitted or assisted undertaking. An undertaking refers to any federal action, activity, or program, or the approval, assistance, or support of any action, activity, or program, including those involving a federal lease, permit, license, or other entitlement for use. Consultations to identify, evaluate and address potential impacts to Heritage Resources/Historic Properties, can involve the applicants for federal licenses, permits or assistance; the federal agencies issuing such licenses, permits or assistance; the State Historic Preservation Officer (SHPO); interested Indian Tribes, and members of the public in general. Once identified, Potential Historic Properties are evaluated by the federal agency in consultation with the State Historic Preservation Officer, and other interested parties, to determine whether or not the property is eligible for listing on the National Register of Historic Places (NRHP). If it is determined to be eligible, the federal agency must determine whether or not the property will be adversely affected by the activity. If the proposed activity would affect any property either listed on the NRHP or eligible for such listing, the agency must address the effects of the action through such means as avoidance by project redesign or mitigation of effects by archaeological data recovery and recording of historic

architectural-engineering resources. Heritage Resource Management plans are prepared by the federal agency and are reviewed by the SHPO, interested Indian Tribes, and other consulting parties, which may include the Advisory Council on Historic Preservation. The federal agency is required to take into consideration the comments of these parties in making a decision on the proposed action.

Federal responsibilities to consult with Indian Tribes are included in the National Historic Preservation Act, Native American Graves Protection and Repatriation Act, and the American Indian Religious Freedom Act. Also, Presidential Executive Orders 12875 and 13007 call for consultation with Tribal governments.

Public disclosure of the location of certain types of Historic Properties is exempted under 16 USC 470 Sec. 9(a)(1)(2). The purpose of this exemption is to protect Historic Properties from potential vandalism and to retain as confidential, the location and nature of Historic Properties, including those that are of cultural significance to Indian peoples.

Cultural Resource Inventories

Twenty-two cultural resource inventory projects have been conducted within the general ICP area. Most previous inventory projects have been small in scale and associated with Blackbird Mine exploration or cleanup. Several recent inventories, however, have been conducted specifically for the Idaho Cobalt Project (Renewable Technologies, Inc., 2001, 2006; Dickerson, 2005). These inventories include intensive surface field studies for proposed activities such as roads, exploration drill sites and environmental cleanup associated with the Blackbird Mine as well as an intensive cultural resource inventory within the boundary of the proposed Project area.

The inventories have identified 12 historic and two prehistoric properties in or immediately adjacent to the ICP Project area that are eligible or are likely eligible for nomination to the NRHP. The historic properties range in function from trails to mining camp ruins dating primarily to the first half of the 20th century. None of these resources will be directly impacted, as the Project is currently designed. Those historic properties closest to impact areas (a portion of the Thunder Mountain Trail, a dump at an early 20th century mining camp ruin, and a log hoist house) have been carefully mapped to insure avoidance.

The two prehistoric archaeological properties within the ICP Project area are located adjacent to planned support facilities outside the FCC claim boundary. The first, initially recorded in 1991, is a lithic tool-making debris scatter containing a single projectile point fragment and multiple pieces of toolstone debitage. The second was a temporary camp, also containing a significant amount of toolstone debitage. Both appear to contain elements of significance to archaeological research for the general area. Project design at each location is now such that the Project will avoid the important portions of both properties and so will pose no adverse effect.

Consultations With American Indian Tribes

American Indian Tribes are afforded rights under various federal statutes that include the National Historic Preservation Act (NHPA)(16 U.S.C. 470, et. seq.), the *Native American Graves Protection and Repatriation Act* (NAGPRA) (25 U.S.C. 3001 et seq.), and the *American Indian Religious Freedom Act* (AIRFA) (42 U.S.C. 1996). Federal guidelines direct federal agencies to consult with modern American Indian Tribal representatives who may have concerns about federal actions that may affect religious practices, other traditional cultural uses, as well as cultural properties and remains associated with American Indian ancestors. Any Tribe whose aboriginal territory occurs within a Project area is afforded the opportunity to voice concerns for issues governed by NHPA, NAGPRA, or AIRFA. Federal responsibilities to consult with Indian Tribes are included in Executive Orders 12875 and 13007. Executive Order 12875 calls for regular consultation with Tribal governments; and Executive Order 13007 requires consultation with Indian Tribes and religious representatives on the access, use, and protection of Indian sacred sites.

SCNF consulted with the Shoshone-Bannock and Nez Perce Tribes throughout the process of project scoping and evaluation from 2001 through 2007, including informational presentations to the Shoshone-Bannock Tribal Council and staff, periodic project update letters, and other meetings, and on-site tours involving representatives of the Shoshone-Bannock Tribes and the Nez Perce Tribe. This included providing all documents requested by the Tribes on Heritage Resources identification on the Project, as well as other documents related to the total scope of environmental analysis of the proposed Project. Site inventory work has identified no Traditional Cultural Properties in the Project area or in consultations with tribal representatives conducted by SCNF.

Roadless/Wilderness and Visual Resources

Roadless and Wilderness Resources

The boundary of the Frank Church River of No Return Wilderness (FCRNRW), at its nearest, is approximately 4 miles to the west of the proposed ICP Project and facilities (**Figure 3-17**). The wilderness area was established in 1980 when congress passed the Central Idaho Wilderness Act, and covers over two million acres in Central Idaho. The Frank Church River of No Return Wilderness is the largest contiguous wilderness in the lower 48 states, and the largest in the National Forest System. A portion of the FCRNRW was designated as a "Special Mining Management Zone," which allows continued prospecting and exploration for, and development or mining of cobalt and associated minerals subject to requirements consistent with regulation of other Forest Service lands.

The majority of wilderness recreation users are river floaters on the Salmon and Middle Fork Rivers. Both rivers manage recreation use with a permit system during the summer season. During the summer seasons, noncommercial float boating permits are randomly assigned by a lottery system, and the commercial operators are assigned a set number of launches for each river in their special use permits. Over 17,000 people float these two rivers each year.

The Forest Service designated West Panther Roadless Area lies to the north and northwest of the ICP and the South Panther Roadless Area lies to the southeast (**Figure 3-15**). The roadless areas, although in generally rough terrain and difficult to access, provide wildlife habitat and dispersed recreational opportunities for backpackers and hunters.

Visual Resources

Management Direction

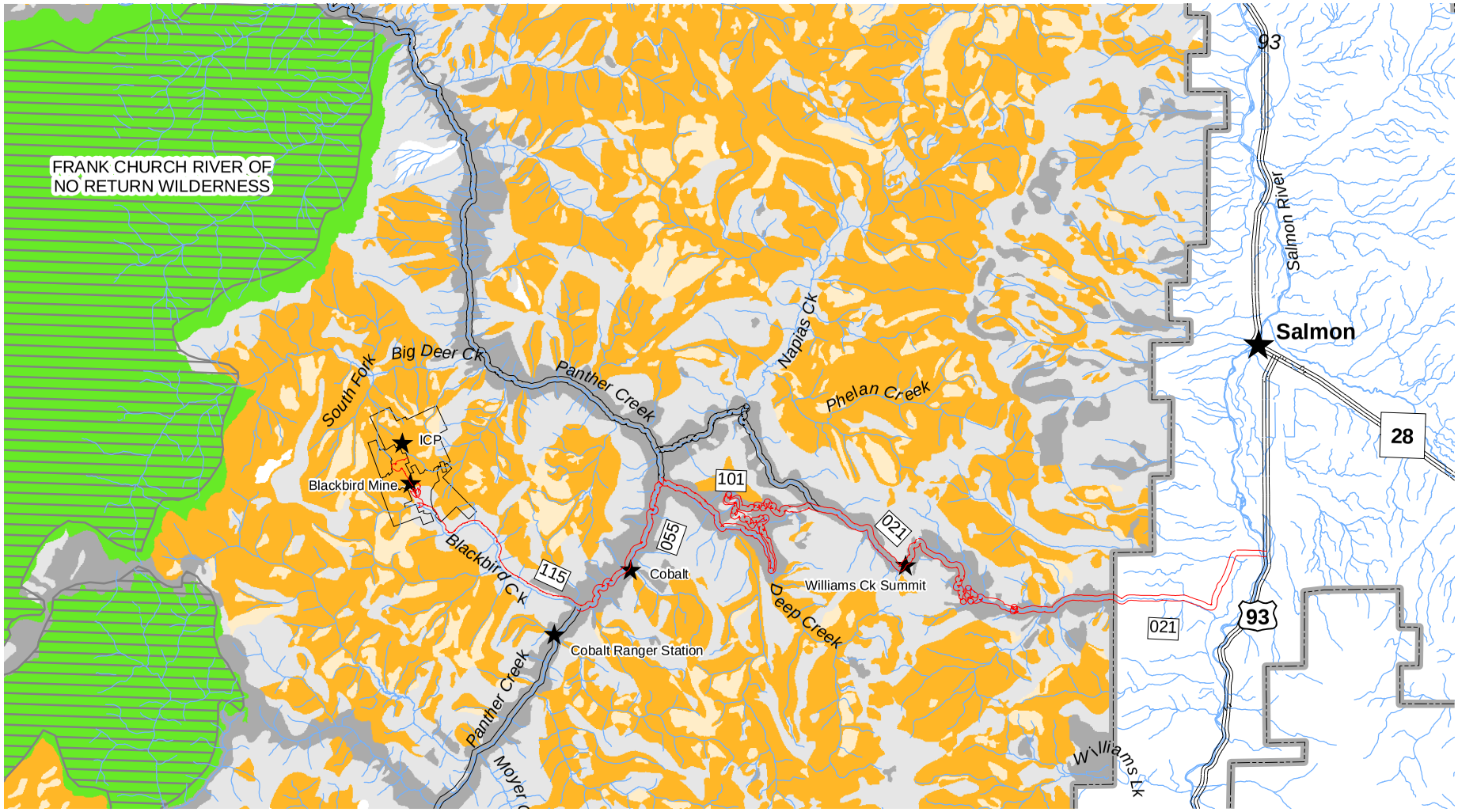
The Salmon National Forest Land and Resource Management Plan directs the Forest to apply the Forest Service's Visual Management System to all lands administered by the Forest. The Forest Service implements its Visual Management System through the use of Visual Quality Objectives (VQOs). The proposed ICP Project site and adjacent areas are located in Management Prescription Area 5B.

Management direction for this prescription area directs the Forest to meet the VQOs established in the Salmon National Forest Land and Resource Management Plan (USFS, 1988).

Visual Quality Objectives

Visual Quality Objectives are designed to establish measurable standards or objectives for the visual management of forest lands. They are represented by five terms, which can be defined as visual resource management goals. The objectives are:

- P Preservation;
- R Retention;
- PR Partial Retention;
- M Modification; and
- MM Maximum Modification.



Legend

VISUAL QUALITY OBJECTIVES

- Preservation
- Retention
- Partial Retention
- Modification
- Maximum Modification

- FRANK CHURCH RIVER OF NO RETURN WILDERNESS
- USFS BOUNDARY
- IDAHO COBALT PROJECT CLAIMS
- PROPOSED PROJECT ACCESS ROUTE
- HIGHWAY
- OTHER ROADS

- 021 Williams Creel Road
- 101 Deep Creek Road
- 055 Morgan-Panther Road
- 115 Blackbird Road

N

Miles

2.5 1.25 0 2.5

1:250,000

IDAHO COBALT PROJECT FORMATION CAPITAL CORP. U.S. LEMHI COUNTY, IDAHO	**VISUAL QUALITY OBJECTIVES** January, 2006	Figure 3-17

VOQs for the area of the proposed Project and adjacent areas are shown on **Figure 3-17**.

The majority of the areas near the proposed Project site, including the proposed Project site, have a VQO of Modification (M).

> *"Under the modification VQO, management activities may visually dominate the original characteristic landscape."* (USDA, 1974)
>
> Several smaller areas with a VQO of Partial Retention (PR) are located in the general Project area, including a larger area located east and northeast of the proposed Project site and extending to the Panther Creek Road corridor.
>
> "Management activities remain visually subordinate to the characteristic landscape when managed according to the partial retention visual quality objective." (USDA, 1974)

The Panther Creek Road corridor has a VQO of Retention (R) and a Sensitivity Level designation of Level 1. A VQO of Retention (R), and a Sensitivity Level 1 is described as follows:

> *"This visual quality objective provides for management activities which are not visually evident."* (USDA, 1974)
>
> *"Sensitivity Level 1 includes all seen areas from primary travel routes, use areas, and water bodies where, as a minimum, at least one-fourth of the Forest visitors have a major concern for the scenic qualities."* (USDA, 1974)

The FCRNRW area, located west of the proposed Project site and adjacent areas, has a VQO classification of Preservation (P).

> *"This visual quality objective allows ecological changes only. Management activities, except for very low visual impact recreation facilities are prohibited."* (USDA, 1974)

Hiking trails in the Salmon-Challis National Forest in the general area of the proposed Project site are located in, and provide foreground, middle ground, and background views of areas with VQO's of Partial Retention, Modification, and Preservation. Ridge-top trails, as a result of the local mountainous topography and terrain, offer a limited opportunity for long distance views of the proposed ICP Project area. No established public vista areas are located along the roads of the proposed ICP Project area, including the proposed transportation route.

Blackbird Mine Site Activities

Blackbird Mine Site History

The Blackbird Mine is an inactive mine located in Lemhi County, Idaho approximately 13 miles south of the Salmon River and 25 miles west of Salmon, Idaho and adjacent to the ICP (see **Figure 1-1**). The Blackbird Mine CERCLA Site includes approximately 830 acres of private patented mining claims and adjacent unpatented mining claims within the Salmon-Challis National Forest on which hazardous substances were released and/or came to be located as a result of historic mining activities at the Blackbird Mine.

Mining activities at the Blackbird Mine began in the late 1800s and continued until 1982. Mining created about 14 miles of underground workings, a 12-acre open pit, 4.8 million tons of waste rock deposited in numerous piles, and two million tons of tailings disposed of at a tailings impoundment. Mining and surface disturbances at the Blackbird Mine site span two drainages: Bucktail Creek and Meadow/Blackbird Creeks. These drainages flow into Panther Creek, which flows into the main stem

of the Salmon River. Acid rock drainage from waste rock piles, underground workings, the tailings impoundment, and tailings deposited along area creeks have resulted in the release of elevated levels of hazardous substances to the environment (groundwater, surface water, soils), including but not limited to copper, cobalt and arsenic. These releases have contributed to elevated levels of dissolved copper and cobalt in Panther Creek and its tributaries. Contaminated soil, sediment, waste rock and tailings were also released from the Blackbird Mine site during high water flows from thunderstorms and snowmelt and deposited in soil along the banks of downstream creeks (referred to as overbank deposits/soil) including Panther Creek and its tributaries. Investigations show that irrigation also spread contaminated material along Panther Creek in the overbank soil as well as in pastures. The fisheries and aquatic resources downstream of the Blackbird Mine have been impacted by arsenic, copper and cobalt releases. Dissolved copper concentrations in area creeks downstream from the mine frequently exceed the State of Idaho water quality standard (WQS) for protection of aquatic life regarding this metal.

Mining History

Minerals in the Blackbird area were discovered and first began to be developed in 1893, when the Blackbird Copper-Gold Mining Company consolidated several small prospects and conducted the first significant mining activities from 1893 until 1907. Mining continued until 1982 as follows:

- From about 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.
- In 1938 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 (a subsidiary of Howe Sound, which was also actively involved in the mining operations) purchased the Blackbird Mine property in 1943. Full-scale mining activity was initiated in 1949 and was expanded during the 1950s and included the construction of a 1,000 ton/day mill.
- In 1954, Calera initiated open pit activities in the Blacktail Pit. Excavation of the open pit resulted in the deposition of approximately 3.8 million tons of waste rock in the headwaters of Blackbird and Bucktail Creeks.
- Prior to full-scale mining, tailings from the mining operation were deposited directly in Blackbird Creek. After 1950, tailings were deposited behind the West Fork Tailings Impoundment, but some tailings “spills” are known to have occurred. It is estimated that 20,000 cubic yards of tailings were deposited or spilled along Blackbird Creek, and an estimated two million cubic yards of tailings are impounded behind the West Fork Tailings Impoundment. Underground mining operations during this period also resulted in the formation of a number of waste piles outside mine adits, totaling approximately one million tons. Subsequent to mining operations, debris flows, erosion, and acid rock drainage (ARD) have resulted in the spreading of arsenic, cobalt, and copper from the original mining waste disposal areas to downstream locations.
- The Calera Mining Company suspended mining operations and sold its interest in the Blackbird Mine to Machinery Center Company in 1963. Between 1963 and 1967, Machinery Center produced copper from the mine primarily through leasing operations. Machinery Center sold controlling interest to the Idaho Mining Company, a subsidiary of the Hanna Mining Company, in 1967. 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 re-open the mine.
- The Calera Mining Company was a wholly-owned subsidiary of the Howe Sound Company, which later changed its name to Howmet Corporation and was acquired by Pechiney.
- 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

responsible for re-opening the mine. During this same time period, Idaho Mining Company sold all its real and personal property to Hanna Services Company.

- Noranda Exploration and then the Blackbird Mining Company conducted exploration activities from 1978 to 1982. Exploratory drilling activity included increases to the main Haynes-Stellite Adit openings in order to allow exploration equipment to access the interior of the adit. The Blackbird Mining Company conducted pilot activities at the mine from 1980 to 1982 to determine the feasibility of full-scale operation of the mine.
- A wastewater treatment plant was constructed in 1981 to treat mine drainage from the 6,850-foot level of the mine. The Blackbird Mining Company also diverted mine drainage from the 7,400, 7,200, and 7,100-foot levels to the 6,850-foot level for treatment by the wastewater treatment plant.
- In 1981, the Blackbird Mining Company suspended all pilot operations at the Blackbird Mine and in 1982 ceased all underground activities upon completion of the pilot program. Poor market conditions were identified as the reason that full-scale re-opening of the mine was not pursued by the Blackbird Mining Company.

Summary of CERCLA Actions

In 1983 the State of Idaho initiated a natural resource damage assessment (NRDA) for the Blackbird Mine and clean up pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). In 1992, the State of Idaho filed an action pursuant to CERCLA and various Idaho laws for cleanup, cost recovery and natural resource damage action pursuant to CERCLA. Subsequently, the United States joined the suit, bringing claims for cleanup, cost recovery, and natural resource damages under CERCLA and the Clean Water Act, and alleging violations of the Endangered Species Act. In 1995, a Consent Decree (No. 83-4179 *State of Idaho, et al. v. The M.S. Hanna Company et al.*) was lodged committing the defendants (the BMSG) to implementing a restoration plan; meeting water quality standards; restoring water quality in Panther Creek and Big Deer Creeks to levels capable of supporting anadromous and local fisheries by a specified date; and implementing the CERCLA remedy and other response actions selected by EPA through separate consent decrees or administrative orders. EPA has negotiated or required the BMSG to conduct emergency response actions to address imminent releases from the West Fork Tailings Impoundment; non time-critical removal actions (the Early Actions) conducted in the Bucktail Creek basin and in the Meadow/Blackbird Creek basin to address water quality and along Panther Creek to address human health concerns; and investigations and studies to complete a Remedial Investigation/Feasibility Study (RI/FS). EPA issued the Record of Decision (ROD) for the Site in 2003**.**

Emergency Response Actions were conducted in 1993 at the West Fork Tailings Impoundment to minimize the potential for release of tailings into Blackbird and Panther Creeks. These actions were conducted pursuant to an Administrative Order on Consent (AOC) issued by EPA to the Blackbird Mine Site Group (BMSG – a consortium of companies with environmental liability at the Blackbird site) 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 Response Actions included construction of a new lined channel and spillway for the West Fork of Blackbird Creek over the tailings impoundment.

From 1995 to 2002 additional non time-critical removal actions (Early Actions) were conducted pursuant to an AOC issued by EPA to the BMSG in June 1995 (EPA Docket No. 10-95-0083). From 1995 through 1998 Early Actions were focused on controlling sources of acid rock drainage that were impacting water quality. From 1999 to 2001, Early Action activities consisted of sediment removal along Panther Creek and Blackbird Creek to mitigate potential risk to human health associated with elevated levels of arsenic present in mine related deposits. These actions have also reduced potential risk to terrestrial and aquatic ecological receptors. During the fall of 2002 additional collection and diversion of waters, and waste rock isolation in the Bucktail Creek and Meadow Creek drainage basins that were not intercepted during previous actions, was completed to reduce contact

of clean surface water with metal bearing sediment. The water treatment plant that treats water from the Blackbird mine and is located approximately 1,200 feet downstream from the confluence of Meadow Creek and Blackbird Creek was also upgraded and expanded. The upgraded treatment plant has a capacity of 800 gpm and discharges treated water to Blackbird Creek.

Early Actions activities in the Bucktail Creek drainage immediately adjacent to the ICP included:

- Construction of an earth fill clay-core dam (7,000 level dam) and pipeline and open-channel spillway to collect, store, and divert contaminated water to the water treatment plant via the 6,930 level adit to the underground mine workings. The 7,000 level dam is approximately 70 feet high and impounds a reservoir with a maximum surface area of 0.52 acre and a maximum storage capacity of 5.85 acre-feet.
- Construction of a new adit at elevation 6,930 to connect to the 6,850 level of the old mine workings. The 6,930 level adit extends approximately 1,300 feet into the mountain and is used to transport the contaminated water from the Bucktail Creek basin into the mine, where it can be conveyed to the water treatment plant.
- Construction of a pump station and pipeline located downstream of the 7,000 level dam. The pump station and pipeline is used to collect and convey springs and dam seepage and pump it to the 6,930 adit for transport through the mine to the water treatment plant.
- Relocation of waste rock piles, with disposal in the Blacktail Pit.
- Creation of a waste rock repository (Blacktail Pit), including a foundation drainage system to drain water entering the former pit into the old mine workings and to the water treatment plant.
- A series of clean water ditches and pipelines to divert clean water around the waste rock dumps and the 7,000 level dam reservoir, and transport the clean water to Bucktail Creek downstream of the 7,000 level dam.
- The 7,200 level collection ditch to collect contaminated water from the remainder of the West Lobe waste rock dump and direct the contaminated water toward upper Bucktail Creek upstream of the 7,000 level dam.
- A series of sediment control ditches within the waste rock to remain in place.
- Debris traps located in the Bucktail Creek channel to reduce the risk of debris flows.
- Two temporary sediment control dams to settle out sediment generated during construction activities and sediments from residual debris flow materials along Bucktail Creek. The upper sediment control dam located just upstream of the upper access road crossing of Bucktail Creek and downstream of the pump back station was removed in 2005. The lower sediment control dam is located just upstream from the lower access road crossing of Bucktail Creek.
- Relocation of a portion of the debris flow material along Bucktail Creek between the upper and lower sediment dams. This debris flow material was disposed of in the Blacktail Pit.
- Rehabilitation of the 6,850 level to allow for the transport of contaminated water from the Bucktail drainage to the water treatment plant and allow for ingress/egress of men and materials to the 6,850 bulkhead.
- Construction of a cutoff wall in Bucktail alluvium, seepage collection and pipeline to pump captured water to water treatment.

Remedial Investigation/Feasibility Study (RI/FS) - EPA RI/FS activities have been conducted pursuant to an AOC issued by EPA to the BMSG in November 1994 (U.S. EPA Docket No. 10-94-0222). The RI was initiated in 1995; however, much of the data collection (especially water quality data) concentrated on the period after Phases I through III of the Early Actions were completed in 1998. The Early Actions improved water quality in the area creeks downstream from the mine, and the focus of the RI was to address contamination remaining after completion of the Early Actions. The RI was completed in November 2001. The FS evaluated alternatives to address the contamination remaining after the Early Actions were completed. The FS was completed in June 2002.

Remedial investigations were conducted from 1995 through 2001 and are described in detail in the Final Blackbird Mine Site Remedial Investigation Report and in the Remedial Investigation Addendum - 2001 Sample Results. Remedial investigations included studies to determine the nature and extent of contamination in waste rock deposits, tailings deposits, surface waters, in-stream sediments, overbank soils, and groundwater at the Blackbird Mine site and surrounding area. These investigations included an evaluation of the quantity and concentrations of metals (mass loading) released from known or potential sources during various hydrologic conditions. The Early Actions have resulted in a reduction in dissolved metals transported in surface water from the mine area. A major focus of the investigations was to determine the mass loading of metals from residual and remaining sources following implementation of the Early Actions. The RI investigations conducted during 1995 included comprehensive investigations to evaluate the nature and extent of contamination prior to implementing Early Actions. Post-Early Action investigations to evaluate improvements to water quality began in the spring of 1998 for the portion of the Site that includes Meadow and Blackbird Creeks, and in the fall of 1998 for the portion of the Site that includes Bucktail, South Fork Big Deer, and Big Deer Creeks. Information developed during the RI was also used to complete both human health and ecological risk assessments.

Remedial Actions in Bucktail Creek Drainage - Additional collection of Bucktail Creek groundwater using wells and seep collection and construction of the lower Bucktail pumpback system have been initiated to increase capture of metal load in Bucktail drainage. Phase II pumpback wells were installed in the Bucktail drainage in fall 2006. The ROD contemplates construction of a diversion utilizing a buried pipeline (BT-5 diversion) that would divert remaining Bucktail drainage water around South Fork Big Deer to Big Deer Creek. This diversion is scheduled for construction in about 2010.

Contingent Actions - Contingent Actions are activities described in the ROD that might be initiated if cleanup standards are not being met by the previous and remedial actions. The range of Contingent Actions in the Bucktail/South Fork Big Deer drainages includes additional sediment removal, additional water/seep collection, installation of passive or semi-passive treatment systems and additional measures as necessary to meet water quality cleanup levels. The need for or timing of any Contingent Actions is not known and would be determined based on long-term monitoring of South Fork Big Deer, Big Deer and Panther Creeks.