

Libby Jane Tunnel, Florence
Mine and M. G. Smith Mill sites
Preliminary Assessment Report

Libby Jane Tunnel, Florence Mine And M. G. Smith Mill Sites

aka

**Red Cloud No. 13 Level, and Libby Jane,
Florence, Geraldine, Passumpie,
Green Mountain Boy, Catherine, and
Eighty-Nine Patented Mining Claims**

Preliminary Assessment Report

Blaine County
State of Idaho



Department of Environmental Quality

February 2008

Submitted to:

U. S. Environmental Protection Agency

Region 10

1200 Sixth Avenue

Seattle, WA 98101



STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

1410 North Hilton • Boise, Idaho 83706 • (208) 373-0502

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

February 4, 2008

Mr. Dan Henry
308 North 2nd Street
Hailey, ID 83333

RE: Site Assessment of the Libby Jane Tunnel, Florence Mine, and M. G. Smith Mill Sites
(Aka Red Cloud No. 13 Level, and Libby Jane, Florence, Geraldine, Passumpie, Green Mountain Boy,
Catherine, and Eighty-Nine Patented Mining Claims.)

Dear Mr. Henry:

The Idaho Department of Environmental Quality (IDEQ) has completed a review of historical mining data and geological information of the above referenced mining claims. Subsequent to that review, IDEQ conducted a site visit of the Kelly Gulch mines and associated claims. During the site visit, mining facilities were mapped and sampled to complete a Preliminary Assessment (PA).

PAs are conducted according to the Federal Comprehensive Environmental Response, Compensation and Liabilities Act (CERCLA). The reasons to complete a PA include:

- 1) To identify those sites which are not CERCLIS caliber because they do not pose a threat to public health or the environment (No Remedial Action Planned (NRAP));
- 2) To determine if there is a need for removal actions or other programmatic management of sites;
- 3) To determine if a Site Investigation, which is a more detailed site characterization, is needed; and/or
- 4) To gather data to facilitate later evaluation of the release through the Hazard Ranking System (HRS)

IDEQ also completed PAs under contract with the U.S. Environmental Protection Agency in order to identify risks to human health and the environment, and make recommendations to land owners regarding how risks might be managed, if necessary.

Heavy metals concentrations in the mine and mill wastes warrant calculation of a Hazard Ranking Score for the Libby Tunnel Waste Dump and M.G. Smith Mill site, but not the Florence mine or Geraldine, Passumpie, Green Mountain Boy, Catherine, and Eighty-Nine Patented Mining Claims. In addition, risk calculations and risk management plans may be warranted. Use by the public for camping and hunting may pose unacceptable risks to human health, particularly on USDA Forest Service administered lands since the highest concentrations of metals were found on public lands at the site.

Although there is over 3,000 cubic yards of waste on the Libby Jane Tunnel Waste Dump, the wastes that pose the greatest risks are associated with the jig tails on the northern lobe of the waste dump. There are

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approximately 50 cubic yards of these jig tails in one area. Collectively, the mine wastes and jig tailings should be considered for future remedial work. At a minimum, risk management should include posting public notice of the health hazards at the dump and its wastes and restricting access.

The volume of the material in the M.G. Smith Mill could not be estimated with any certainty. However, the surface area of the site, the presence of very high concentrations of arsenic, cadmium, lead, mercury, silver and zinc warrant in depth risk analysis and possibly remedial actions.

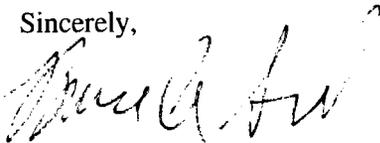
The Florence Mine workings do not appear to present any significant risks to human or ecological receptors. As with most old mine workings some physical hazards exist because of uneven ground, unstable dumps and over hanging rocks in the adits.

IDEQ did not note any dangerous openings or other physical hazards at the Libby Jane Tunnel, M.G. Smith Mill site, or Florence mine workings. However, subsidence of abandoned underground workings may threaten new construction at the site, if any.

Attached is the Preliminary Assessment Report of the property and mine facilities. The report contains a brief mine history, limited geologic information, maps and additional discussion of observations made at the property. There are also photos of the mine facilities.

IDEQ very much appreciates your cooperation and approval for our access, and looks forward to addressing any questions you may have regarding our findings. Please call me if you have any comments, questions, or I may be of any other assistance. We very much appreciate any feedback you can give us relative to our services.

Sincerely,



Bruce A. Schuld
Mine Waste Projects Coordinator
Waste Management and Remediation Division

Attachments

cc: Ken Marcie – U.S. Environmental Protection Agency
Bruce Wicherski – IDEQ State Office
Megan Stelma – Blaine County
Jeff Gabardi – USDA Sawtooth National Forest
Maggie Manderbach – USDA Forest Service Region IV
file

Section 1 Introduction

The Idaho Department of Environmental Quality (IDEQ) was contracted by Region 10 of the United States Environmental Protection Agency (EPA) to provide technical support for completion of preliminary assessments at various mines within the Mineral Hill Mining District in Blaine County, Idaho.

IDEQ often receives complaints or information about sites that may be contaminated with hazardous waste. These sites can include abandoned mines, rural airfields that have served as bases for aerial spraying, old landfills, illegal dumps, and abandoned industrial facilities that have known or suspected releases.

In February 2002, IDEQ initiated a Preliminary Assessment Program to evaluate and prioritize assessment of such potentially contaminated sites. Due to accessibility and funding considerations, priority is given to sites where potential contamination poses the most substantial threat to human health or the environment.

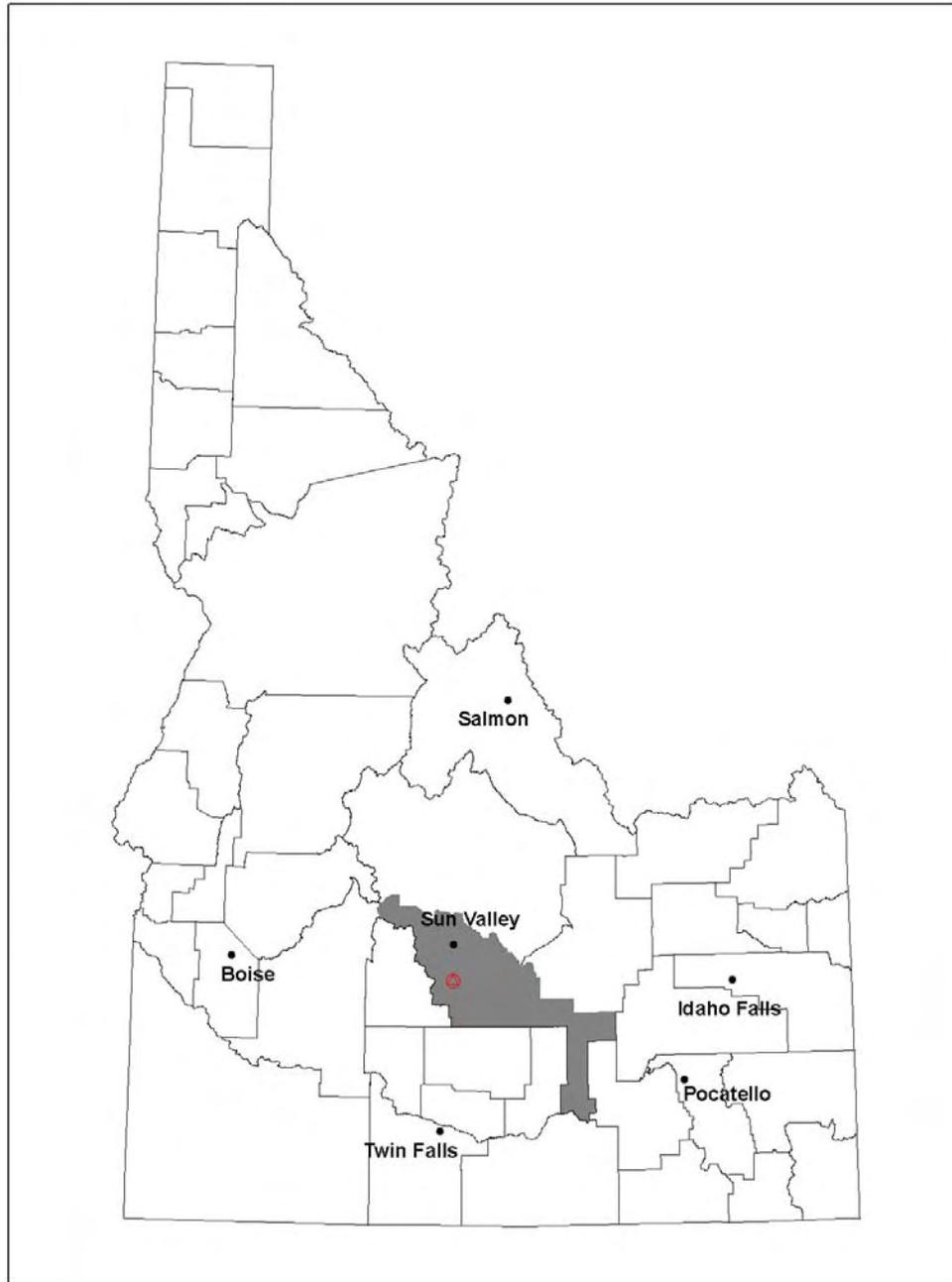
For additional information about the Preliminary Assessment Program, see the following:

http://www.deq.idaho.gov/waste/prog_issues/mining/pa_program.cfm

This document presents the results of the preliminary assessment (PA) of the Libby Jane Tunnel and Florence Mine and Mill sites (aka Red Cloud No. 13 Level and Libby Jane, Florence, Geraldine, Passumpie, Green Mountain Boy, Catherine, and Eighty-Nine patented mining claims.) Although these mine and mill sites share a common history and ownership with the Red Cloud Mine, these workings were assessed and discussed as being facilities contained in Red Cloud Gulch, as opposed to the rest of the mine whose surface disturbances exist in a distinctly different drainage.

Access to the Libby Jane Tunnel (aka Red Cloud No. 13 Level) and Florence Mine and Mill sites was given by Mr. Daniel Henry. Public access and use of the area is unrestricted by way of the Wolfstone Creek Road across the surrounding public lands which are administered by the U.S. Department of Agriculture Forest Service (USDA). No physical or posted access restrictions exist on the boundaries of the private properties which the public routinely enters.

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Location of the Libby Jane Tunnel, Florence Mines and M.G. Smith Mill sites within the State of Idaho.

Section 2 Ownership

IDEQ does not warrant the ownership research or location of property boundaries contained in this report. The information regarding ownership and property boundaries was obtained from the Blaine County Tax Assessor’s Office in Hailey, Idaho.

Within the following ownership descriptions the **“Partial Determination”** is meant to convey a very brief summary of IDEQ’s assessment of individual claims and parcels relative to human health and ecological risk factors associated with toxicological responses to mine wastes. A determination of No Remedial Action Planned or **“NRAP”** means that based on current conditions at the site IDEQ did not find any significant evidence that would indicate the potential of adverse effects to human or ecological receptors. This determination says nothing about risks associated with physical hazards such as open adits, open shafts, high walls, or unstable ground. **“Partial Determination”** of **“calculate HRS”** indicates that IDEQ has determined that there is sufficient evidence to warrant calculation of a Hazard Ranking Score (HRS) by EPA’s contractors. It also indicates that IDEQ has made significant conclusions and recommendations that additional site assessment and/or remedial actions are necessary to prevent adverse affects to human or ecological receptors. These conclusions and recommendations are contained in the final section of this report.

<u>Owner</u>	<u>Claim</u>	<u>Parcel Number</u>	<u>Partial Determination</u>
Daniel Henry	Geraldine	RP1M0000000630	No Working (NRAP)
308 North 2nd Ave	Florence	RP1M0000000630	Maj. Workings (calculate HRS)
Hailey, ID 83333	Libby Jane	RP1M0000000630	Maj. Workings (calculate HRS)
	Passumpie	RP1M0000000630	No Workings (NRAP)
	Green Mtn Boy	RP1M0000000640	No Workings (NRAP)
	Catherine	RP1M0000000630	No Workings (NRAP)
	Eighty-nine	RP1M0000000630	No Workings (NRAP)

Section 3 Overview

The patented claims, Libby Jane Tunnel (aka Red Cloud No. 13 Level), Florence Mines and M.G. Smith Mill sites are located in the mouth of Red Cloud Gulch which is tributary to the lower Wolftone Creek. The mouth of this drainage is approximately 1 mile above the confluence of Wolftone and Deer Creek.

The location of the Libby Jane Tunnel and Florence Mines and M. G. Smith Mill sites is approximately Latitude 43 31.177’ N and Longitude 114 27.663’ W, within Section 8 in T2N R17E. The closest town to the mine site is the City of Hailey, approximately seven miles by road. The facilities are located mostly on private lands, but parts of the facilities, specifically the jig mill sites, are located on public lands administered by the USDA Forest Service.

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The mine and mill facilities can be reached from Hailey by driving north to the Deer Creek Road then west for about six miles to the mouth of Wolfstone Creek. Once one turns onto the Wolfstone Creek the road turns from improved dirt to unimproved non-maintained FS Road 111, which requires a four wheel drive vehicle to pass through a non-armored stream channel crossing of Deer Creek. From the mouth, one travels upstream on Wolfstone Creek approximately one mile where FS 111 crosses the debris flow that is the tailings from the Libby Jane Tunnel (aka Red Cloud Level No. 13) and Florence Mines and M.G. Smith Mill sites.

Local waters are dominated by surface water and near surface ground water which is recharged by seasonal precipitation. Annual precipitation for Hailey, Idaho, located approximately five miles to the east, is 16 inches, predominately during the winter months, with an average annual snowfall of 81 inches (WRCC, 2006).

Dry-season rainfall occurs almost exclusively in relatively short bursts, usually related to thunderstorm activity. It is expected that except for rare flash flood-type events, almost all dry-season rainfall events would be completely absorbed by the soils and plants, without much, if any, contribution to the ground water.

Section 4 Historical Perspective

In 1930, J.B. Umpleby, L.G. Westgate and C. Ross briefly described the Red Cloud Mine which was the prelude development to the Libby Jane Tunnel aka Red Cloud No. 13 Level. In their report to the Department of Interior they said:

.....Only the lowest was accessible in 1913 and in it most of the side drifts were flooded. Except for the account of the work on the tailings in progress in 1923, the following description is compiled from published descriptions by Lindgren and Turner and from observations of Umpleby in the small part of the workings accessible to him. Between 1880 and 1902 the Red Cloud Mine produced ore of gross value of \$815,802. The period of greatest activity was between 1888 and 1889. The tailings dump was reworked in 1906, and there has been intermittent mining since then.

Production records indicate that between 1884 and 1918 1,740 tons of ore were removed from ten levels. From that 1,695 ounces of gold, 506,083 ounces of silver, 13,351,655 pounds of lead and 82,235 pounds of copper were extracted.

J.B. Umpleby, L.G. Westgate and C. Ross continued to describe:

The property has been extensively developed on 10 levels, opened by tunnels and shafts, and there is a still deeper tunnel (Libby Jane Tunnel) which with its various branches has a total length of 5,000

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feet. This tunnel is nearly 1,100 feet below the outcrop of the lode. It runs N 88 E for 1,825 feet then extends several hundred feet southward with long drifts to the east and west at several places. About 500 feet from the turn is a raise to the upper workings.

The country rock is limestone and calcareous shale of the Wood River formation. The main vein strike N 23 W and dips steeply southwest, and a branch of it, known as the hanging wall vein strikes N 46 degrees W and dips more than 60 degrees SW. Nearly all ore was mined from stopes above the level 9, which is 706 feet below the surface at the portal of No. 1 adit.

This mine has now been shut down for some time, and most of the workings are inaccessible. In the summer of 1923 M.G. Smith was setting up jigs and tables at the mouth of Red Cloud Gulch to treat tailings from the old mill. He planed to operate his machinery with water power from a ditch out of Wolftone Creek and to sluice the tailings down to his plant with water from one of the mine tunnels (Libby Tunnel). He intended to make pyrite, lead-silver, and zinc concentrates but expected to derive most of his profit from pyritic concentrate. He estimated from his own assays that the clean pyrite here carries an average of an ounce of gold per ton.

In 1950 A.L Anderson, T.H. Kiilsgaard and V.C. Fryklund, Jr. reported in their discussion of the Red Cloud Mine and their maps of the Red Cloud (after Louis W. Cramer – May 1946) that:

.....The mine has been more or less idle since the early nineteen hundreds and most of the workings are now inaccessible. In 1949 only the No. 5 and No. 13 (Libby Jane Tunnel) levels were open. Owing to inaccessibility of the mine workings, most of the following description was taken from Turner, Lindgren and Cramer.

The Red Cloud Mine was active between 1880 and 1902, and during that time produced lead-silver and gold with a gross value of \$815,802. Some tailings from the old Mill were jigged and shipped during the early twenties, and in 1941-42 some jig tailings (from Red Cloud Gulch) were shipped to the smelter. During the early forties some RFC funds were expended in opening the caved mine portals, otherwise mining activity has been negligible since the period of early operation.

The property has been developed on 11 levels. The lowest level, or 13th (Libby Tunnel) at an altitude of 7038, is 1,065 feet below the outcrop. Most of the ore came from above the No. 9 level or 706 feet below the surface as measured from the No. 1 level.

In the Red Cloud workings, the Red Cloud Vein and Hanging Wall vein have been affected by faulting at several points, but only two fault movements are described by Turner as being of any consequence. The fault with the greatest displacement occurs between the levels No. 5 and No. 6 where an ore body has been displaced N 20 W for 240 feet along a fault that dips 8 degrees NW. A lower fault cuts the hanging Wall vein at a point 15 feet above the No 9 level. A crosscut driven southwest from the No. 9 level encountered a vein at a point that showed it had been displaced 90 feet to the southwest along a fault dipping 15 degrees NW. Another fault, encountered a few feet below the No. 9 level, displaced the Hanging Wall vein, and ore bodies were not found below it in No. 10 and No 13 levels.

Three strong faults with some evidence of mineralization were founding the No. 13 level – these are the Yellow Dog, Kelly, and Vindicator. A few tons of ore were taken from the Kelly fault, but no significant ore bodies were found in any of these faults.

The historical information indicates that a raise in the Libby Jane Tunnel (aka Red Cloud No. 13 Level) was connected to the rest of the Red Cloud workings underground. It appears that the waste produced during development of the No. 13 level could have produced most of the volume of waste found at the Libby Jane Tunnel Adit. However, the jig tailings were most likely, (according to Umpleby's et al 1930 report) the result of tailings sluiced down from the old mill site, plus some minor amounts of ore hit in chutes developed from the No 13 level. Furthermore, the road from the Red Cloud to the Libby Jane appears as though it may have been serviceable enough to haul overland jig tailings and ore from the old mill site at the Red Cloud Mine.

Umpleby's 1923 description of M.G. Smith's plans for running jigs, tables, and sluices explains the use and plumbing of the huge ditch found running along the southern slopes of Wolfstone Creek, which were discovered purely by accident during a lunch break by IDEQ's site assessment team.

Section 5 Site Conditions

Red Cloud Gulch is a sub-watershed which was developed by a steeply sided high gradient perennial stream channel which is the dominant landform of the area surrounding the Libby Jane Tunnel, Millsite and Florence mine workings. Red Cloud Gulch generally drains north northwest to Wolfstone Creek. Red Cloud Gulch contains all or parts of ten patented mining claims, which include the Florence, Geraldine, Libby Jane, GES Location, Red Cloud, Passumpie, Green Mountain Boy, Catherine, Eighty-Nine, and Vindicator. Within Red Cloud Gulch the only significant workings occur on the Libby Jane and Florence claims and public lands administered by the USDA Forest Service.

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The Libby Jane Tunnel and M.G. Smith Mill site initially appears to be the results of operations at the Libby Jane Tunnel, from which historical information suggests that ore and wastes were sluiced through the tunnel from workings at the Red Cloud Mine and possibly the Vindicator and Regulator. Apparently some of the higher grade ores were processed at the M.G. Smith Mill site across a fairly inefficient tables, jigs and sluices, which discharged tails directly into Red Cloud Gulch and then into Wolfstone Creek. The M.G. Smith Mill facilities extend from the Libby Tunnel site all the way down to Wolfstone Creek.



Caved Libby Jane Tunnel Adit

Although the caved Libby Jane Tunnel adit is closed, mine timbers still protrude from the entrance. The entrance is thickly covered with numerous riparian species particularly willows and dogwoods. Adit discharge flows on or across the dump form two distinctively different water courses. The first splits off from the second at the adit. This first water course briefly pools in the center of the dump where a very small (< 200 square feet) wetlands has developed. The flow then disappears in the coarse waste rock dump, presumably to reappear and rejoin the second flow at narrow gap in the outcrop below. The second flow, which also contains a high volume of water, courses between the south perimeter of the dump and the fill slope of the mine road. Where this second flow leaves the upper surface of the dump and plunges down the hillside into the bottom of Red Cloud Gulch, the dump and hillside are deeply eroded to form a gully.

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Drainage from caved Libby Jane Tunnel Adit



The Libby Jane Tunnel drains two different directions. Through one channel and a pipe that appears to have been meant to drain the adit, the water flows across the center of the dump. The second pathway initially starts as a spring at the adit, and then flows along the southern contact between the dump material and the natural hillside and road.

Sedges and other wetland species are present in the wetlands that top the Libby Jane Tunnel Waste Dump. The flora appears very healthy, lush, and exhibits no indications of phyto-toxic reactions to the mine effluent.

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On the northern lobe of the Libby Jane Tunnel Waste Dump is the foundation for a cabin or building site, and the remnants of one of M.G. Smiths jig mills and possibly an assay lab. Although there are only small remnants of the cabin and assay lab, the jig is still in very good shape. This area is strewn with lots of iron and plumbing materials used in mill.



Jig Mill on Northern Lobe of Libby Jane Tunnel Waste Dump



Close-up of jig mill on Libby Jane Tunnel Waste Dump

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Bricks in and around the jig system appear to be contaminated with flux and other chemical residual that may have been part of a small smelter or kiln for assaying.



Looking southeast from the jig across the middle and south lobes of the Libby Jane Tunnel Waste Dump.

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Looking northwest across the northern lobe of the Libby Tunnel Waste Dump to the jig.



Looking due south across the top of the Libby Jane Tunnel Waste Dump

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Water cascades down from the Libby Jane Tunnel Waste Dump and Adit and enters Red Cloud Gulch and then drains into Wolftone Creek at the lower mill site.

Red Cloud Gulch has a fairly wide flood plain that varies between 150 feet and 300 feet until it reaches the debris flow near Wolftone Creek where it widens out to almost 800 feet. The material in the channel contains, mostly, a jumbled mixture of poorly sorted sandy to coarse and bouldered natural soils. However, it is obvious that the channel below the Libby Jane Tunnel probably point of entry (PPE) contains variable amounts of mine wastes and jig tailings from the Tunnel Site and upper jig system, and a large amount of mine relicts including heavy equipment, rail and other pieces of structural steel and timber from the mine.

Hydrology of Red Cloud Gulch is interesting in that there is no surface expression of flow until the PPE. The flows at the PPE are so dramatically higher than that observed at the adit, that it is assumed that a perennial stream flows from further up Red Cloud Gulch re-emerges at the PPE. It also appears that this surface expression is caused by the same outcrop of rock that constricts debris flows from the Libby Jane Tunnel Waste Dump. The natural flows in Red Cloud Gulch plus the mine discharge where flowing at volumes exceeding 5 cubic feet per minute (estimated) at the PPE. However, the surface flow submerges in the debris choked channel after approximately 1,000 feet. After another 500 – 600 feet, the stream briefly reappears for another 500 – 600 feet and then again submerges into the lower debris flow through which it travels approximately 1,500 feet to re-emerge at the toe of that alluvial fan and into Wolftone Creek. Consequently, the debris choked channel and the alluvial fan at the mouth of the Red Cloud Gulch act as deposition sites for the largest mine wastes and natural rock debris.

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*Debris Flow from the Tunnel Site into the
Unnamed stream at the PPE*

A large debris flow containing approximately 100 to 200 cubic yards of mine wastes and jig tailings is evidence that seasonal runoff delivers these materials from the Libby Tunnel Waste Dump and M. G. Smith Mill to the bottom of Red Cloud Gulch. The debris initially is eroded from the waste dump, courses through a narrow gap in an outcrop about ½ the distance between the adit and the stream, and then the debris fans out in a classic alluvial fan. Where it enters Red Cloud Gulch the banks are very unstable and there are clear signs that the toe of the fan is continuously undercut.



Cascade from the Libby Jane Tunnel Waste Dump and Adit



Upper campsite on the Lower Libby Jane Outwash

Perhaps the biggest concern stems from the fact that campers and tourists frequently use the M. G. Smith Mill site and Libby Jane Tunnel site for campsites. There are at least three large fire rings located around the lower M.G. Smith Mill site near Wolfstone Creek. It is obvious from ATV and 4WD tracks, fire rings and trash that the site is very frequently used by people. Consequently, people are setting up camps and cooking meals on top of the tailings, they are driving their vehicles on and through the tailings, which promotes suspension of fugitive dust, and they may be using the water in Wolfstone Creek for drinking and bathing.

There is abundant signs of wildlife receptors particularly deer and elk. There are no signs of cattle or sheep grazing.

Section 6 Geology

In 1930, J.B. Umpleby, L.G. Westgate and C. Ross briefly described the geology of the Red Cloud Mine and Libby Jane Tunnel area. In their report to the Department of Interior they said:

.....Only the lowest was accessible in 1913 and in it most of the side drifts were flooded. Except for the account of the work on the tailings in progress in 1923, the following description is compiled from published descriptions by Lindgren and Turner and from observations of Umpleby in the small part of the workings accessible to him.

The country rock is limestone and calcareous shale of the Wood River formation. The main vein strike N 23 W and dips steeply southwest, and a branch of it, known as the Hanging Wall Vein strikes N 46 degrees W and dips more than 60 degrees SW. Nearly

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all ore was mined from stopes above the level 9, which is 706 feet below the surface at the portal of No. 1 adit.

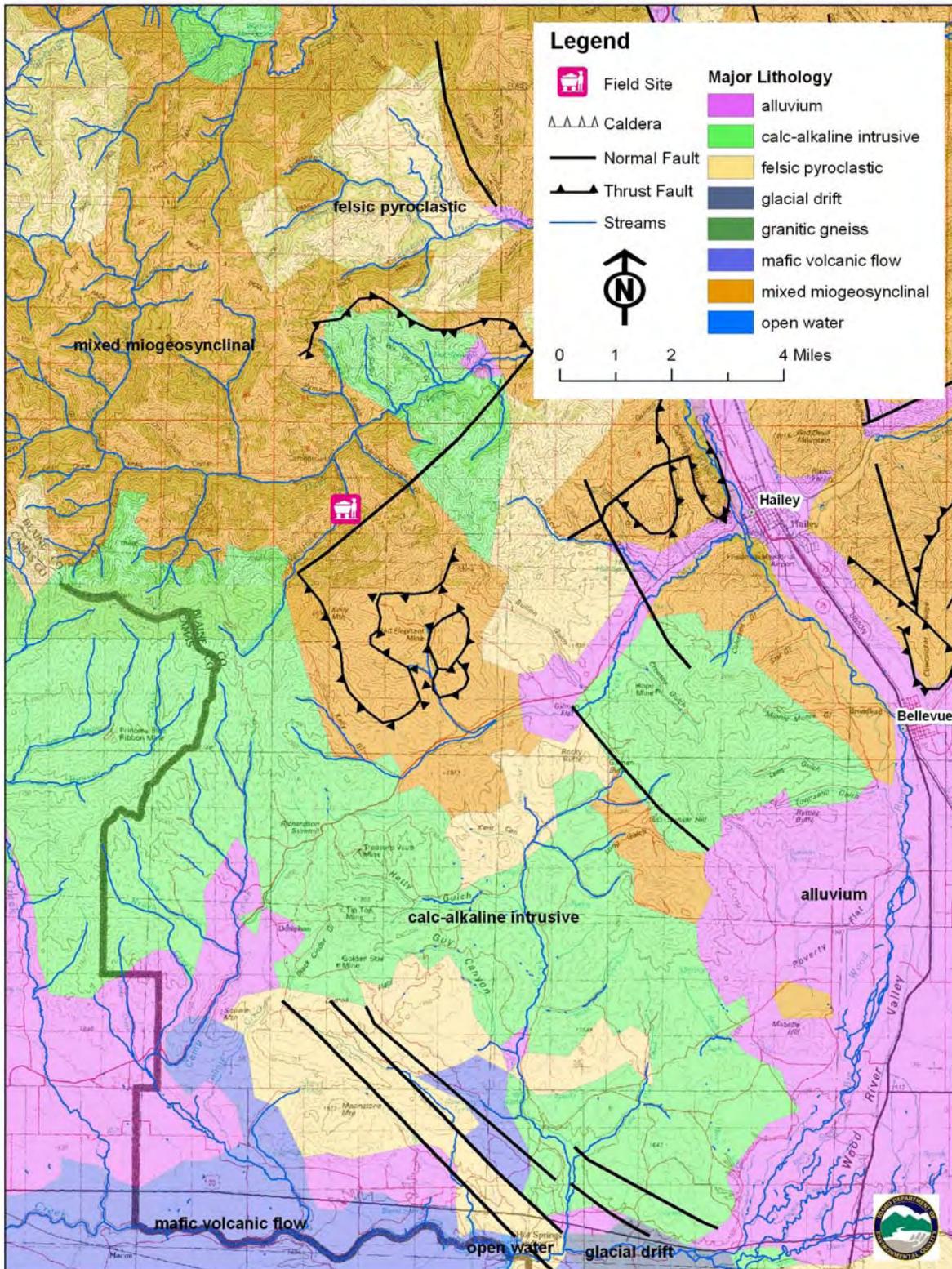
The ore as seen on the lower dump and near the old mill consists of sphalerite, galena, pyrite, arsenopyrite, and small amounts of tetrahedrite and chalcopyrite in a siderite-quartz gangue. In this ore, as in that from the North Star Mine, the sphalerite and siderite have been extensively brecciated and cemented, largely by pyrite and arsenopyrite. The ore contains any partly replaced inclusions of the limestone wall rock. Although worked for the lead and silver, the ore carries a noteworthy amount of gold.

In 1950 A.L. Anderson, T.H. Kiilsgaard and V.C. Fryklund, Jr. reported in their discussion of the Red Cloud Mine and their maps of the Red Cloud (after Louis W. Cramer – May 1946) that:

The country rock is dark limy argillite of the Wood River Formation. There are three prominent veins on the property – the Ridge Vein, the Red Cloud Vein, and the Hanging Wall Vein. Of these, the Red Cloud and Hanging Wall Veins have produced practically all of the ore. The Red Cloud Vein strikes N 23 W and dips at a high angle to the west. The Hanging Wall Vein branches off of the Red Cloud Vein to the northwest, striking N 50 W and dipping southwest at about 60 degrees. The Ridge Vein, which is explored by several short tunnels, strikes N 45 W and dips 70 degrees 90 degrees southwest. It appears to be cutoff by the Ridge fault at depth.

In the Red Cloud workings, the Red Cloud Vein and Hanging Wall Vein have been affected by faulting at several points, but only two fault movements are described by Turner as being of any consequence. The fault with the greatest displacement occurs between the levels No. 5 and No. 6 where an ore body has been displaced N 20 W for 240 feet along a fault that dips 8 degrees NW. A lower fault cuts the Hanging Wall Vein at a point 15 feet above the No 9 level. A crosscut driven southwest from the No. 9 level encountered a vein at a point that showed it had been displaced 90 feet to the southwest along a fault dipping 15 degrees NW. another fault, encountered a few feet below the No. 9 level, displaced the Hanging Wall Vein, and ore bodies were not found below it in No. 10 and No 13 levels.

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Three strong faults with some evidence of mineralization were found in the No. 13 level – these are the Yellow Dog, Kelly, and Vindicator. A few tons of ore were taken from the Kelly fault, but no significant ore bodies were found in any of these faults.

Turner, thinks the Yellow Dog may be a major fault, upon which the upper productive area has been moved to the southwest. He also considers that the Kelly Vein might be a continuation of the Hanging Wall Vein. Furthermore, he reasons that the large mineralized outcrop east of the upper Red Cloud workings might be the upward projection of one of the faults found on the No. 13 Level.

The Hailey-Bellevue mineral belt is underlain by a varied assemblage of sedimentary and igneous rocks, which, except for volcanics of mid-Tertiary age and some still younger unconsolidated sedimentary rocks, are all older than the ore deposits. The earlier rocks include fairly wide exposures of the Milligen and Wood River formations-the host of so many of the ore deposits in the Wood River region-and also rather large intrusive bodies of diorite and quartz monzonitic rock which are regarded as outliers of the Idaho batholith. There is also a younger group of intrusive rocks which are of more pertinent interest because of their close association with the mineralization....In addition to the Milligen formation (Mississippian age) and the Wood River formation (Pennsylvanian age), the area contains some strata in and beneath a series of Tertiary volcanics (Oligocene) and much poorly consolidated and unconsolidated slope wash, terrace gravels, and stream alluvium of Quaternary age. (Anderson, 1950, p. 2)

Anderson (p 7) went on to note that, “*The folding within the area is comparatively simple and consequently faulting constitutes the outstanding feature.*”

Numerous previous studies of the geology and mineral resources of the Wood River and adjacent areas have been made. Geologic studies have been conducted to investigate mineral deposits (Lindgren, 1900 & 1933; Umpleby et al, 1930; Anderson and Wagner, 1946; Anderson et al, 1950; Hall et al, 1978; Wavra and Hall, 1989; Link and Worl, 2001; Worl and Lewis, 2001); individual formations and units (Hall et al, 1974; Sandberg et al, 1975; Wavra and Hall, 1986; Worl and Johnson, 1995); quadrangles (Batchelder and Hall, 1978; Mitchell et al, 1991; Kiisgaard et al, 2001) and to compile regional information (Rember and Bennett, 1979). Preliminary and environmental assessment investigations have been conducted to assess current and potential impacts from historic mining in the region (Mitchell and Gillerman, 2005; IDEQ, 2002 & 2006; IDEQ & USEPA, 2006 & 2007). Link and Worl (2001) reviewed previous geologic and historic information relating to stratigraphy and mineralization relationships in the Mineral Hill district, including Red Elephant Gulch.

Fryklund (1950, pp. 65-66) noted the following in regards to the structure of the rocks:

The most obvious and significant structural features of the area are the major faults or fault zones which divide the area into a number of distinct blocks...The age of the oldest faults are to be placed as pre-intrusive and possibly all the major faulting is

pre-intrusive...All of the major faults are probably pre-mineral as well as pre-intrusive.

Section 7 Current and Potential Future Land Uses

Current land uses in the area include biking, hiking, hunting, horseback riding and off-road vehicle touring. Red Cloud Gulch is accessible from Wolfstone Creek Road. The mines are also accessible from the Narrow Gauge Gulch and the Red Cloud Mine by the remnants of a mine road that has been kept open to ATV.

Fish Species Observed

Fish presence/absence studies have not been conducted in Red Cloud Gulch to confirm any fish species that may reside in this stream. Visual observations in Deer Creek and Wolfstone Creek confirm the presence of brook trout [*Salvelinus fontinalis*]. Redband rainbow trout [*Oncorhynchus mykiss gairdneri*], mountain white fish [*Prosopium williamsoni*], wood river sculpin [*Cottus leiopomus*], and brook trout [*Salvelinus fontinalis*] are present within the Big Wood River (IDFG, 2000). These are the closest official observations of fish to the mine site. Commercial or subsistence fishing does not occur within the 15-mile downstream distance, but sport fishing does.

Apparent Wetlands

Wetland surveys near the site were reviewed (USFWS, 2007) along with aerial photographs. These indicate that the nearest wetlands are at the mouth of Red Cloud Gulch adjacent to the M.G. Smith Mill site. Overland transportation of mine and mill waste entering both the stream in Red Cloud Gulch and Wolfstone Creek does occur with frequency.

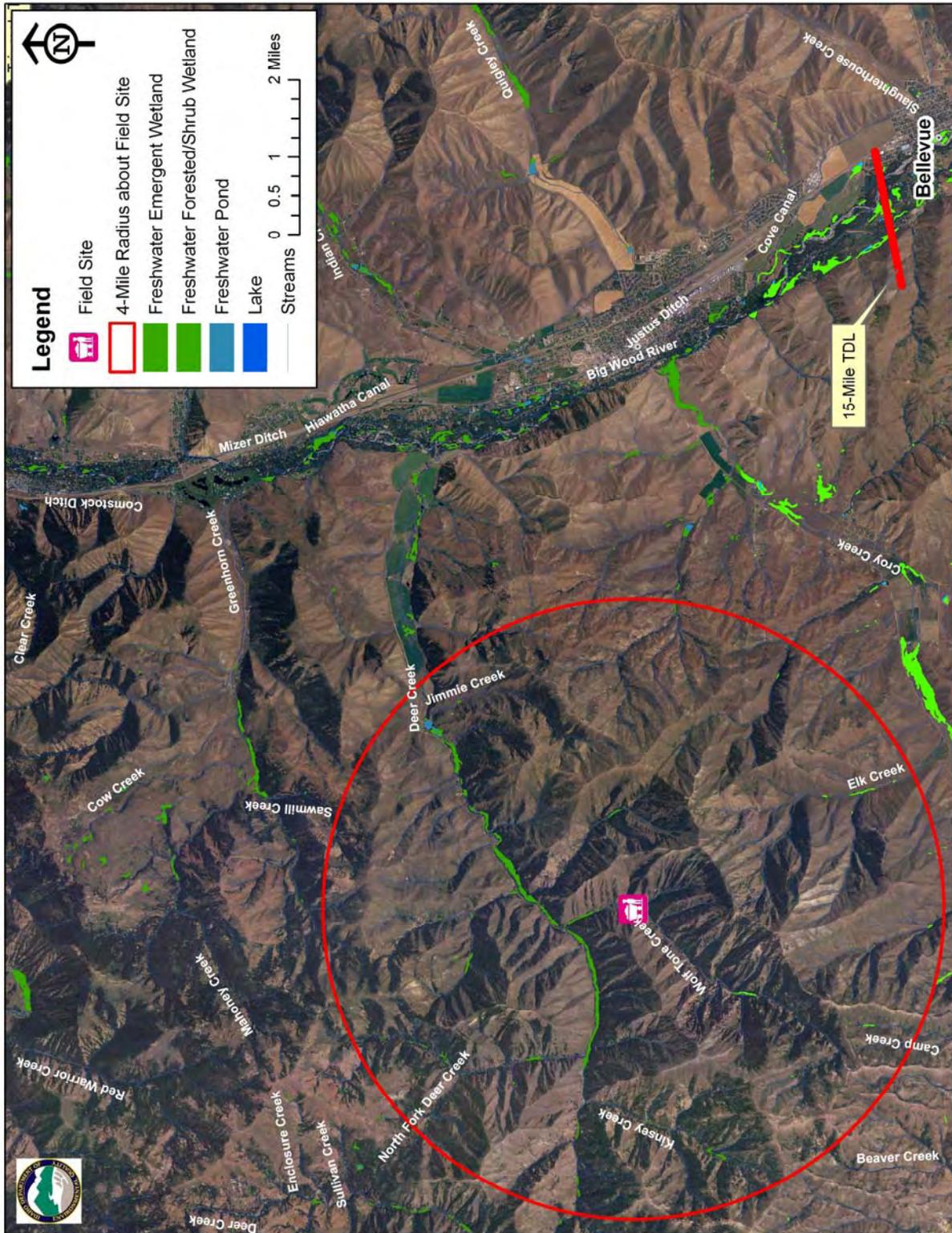
Future Land Use

Future land use could potentially include some year-round and/or seasonal homes on the private parcels of property in the sub-basin, owing to its close proximity to Hailey.

It is likely that recreational use of the site will increase as the local populations and recreation industry expands.

The site will also likely continue to provide grazing values to livestock and wildlife.

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Section 8 Waste Sampling and Characterization

Sample Collection

Waste

Ten soils/waste samples were collected around the Libby Jane Tunnel, Florence mines, and M. G. Smith Mill sites. Three of the samples (LJBGSS-1, LLJJTBG-1 and LJTBGSS-2) were collected for background analysis of soils. Five samples of mine waste and jig tailings (LJWDSS-1, LJWDSS-2, LJWDSS-3, LJJTSS-1 and LLJJTSS-2) were collected from the Libby Jane Tunnel Waste Dump and M.G. Smith Mill site. No samples were collected from the Florence Mine workings as adits, dumps and underground workings are insignificant in size. Two soil samples (LJPPESS-1 and LLJJTPPESS-1) were collected in Red Cloud Gulch and Wolfstone Gulch, respectively, below the location where mine waste or mill tailings enter perennial streams and wetlands.

Each soil sample collected was, initially approximately ten (10) pounds in size. Each sample location (except stream sediment samples) was excavated several inches with the material discarded. Then the sample hole was excavated approximately 6" more to extract a sample. Waste dumps and tailings had at least three locations within a few square yards sampled and composited. Samples were placed in a large sterile plastic bowl from which coarse (+1") rock and woody debris were hand picked. The samples were then screened over a 10 mesh sieve and placed in a sterile plastic zip lock bag. The bag was appropriately marked with the sample identification, location description, date and samplers. It was then placed in a cloth sample bag which was marked exactly the same way. Sample descriptions were entered into field log books for this analysis. The samples were logged on a standard chain-of custody lab submittal form and placed on ice in a cooler. Once samples were taken to IDEQ's field office at the end of the day they were placed in secure storage to await shipping.

Water

Four surface waters samples were collected at the site. Because no surface water flows could be found on Red Cloud Gulch above the PPE, only one background water sample (LLJTSWBG-1) was collected, and that was collected on Wolfstone Creek above the M.G. Smith Mill site. There was only one discreet discharge that was sampled (LJ AD SW-1) on the site at the Libby Tunnel Adit. Two additional samples (LJ PPE SW-1 and LLJJTPPE SW-1) were collected where flows from the Libby Tunnel and M.G. Mill tailings entered the creek and wetlands in the bottom of Red Cloud Gulch and Wolfstone Creek.

While dry, sample bottles were appropriately marked with location, location description, samplers, date and time, preservatives and desired lab analysis. Sample bottles were rinsed three times using water from the creek, effluent or in-stream flows below the PPEs. The sample bottles were filled by submerging the bottles back into the source. Once filled, the samples were preserved using pre-measured ampules of nitric acid that accompanied sample bottles from SVL Laboratories. The full sample bottles were then placed in sterile plastic zip lock bags, logged on a standard chain-of custody lab submittal form and placed on ice. Once samples were taken to IDEQ's field office at the end of the day they were placed in a freezer to await shipping.

Sample Description

Soils

Sample **LJBGSS-1** was collected just up hill from the Libby Jane Tunnel Adit and road to the Red Cloud Mine. The sample was brown or buff colored and appeared to be very weathered fine grain shale. Approximately 75% of the sample passed the 10 mesh sieve, and less than 10% was plus 1" rock and large woody debris.

Sample **LLJJTBG-1** was collected on the southwestern slope of Red Cloud Gulch approximately 50 feet in elevation above the tailings area. The location for the sample was in heavy forest with a thick blanket of organic matter. This matter was clear away from the sample location until very little organics were observed. The sample location was then excavated approximately 6 more inches in very coarse rock and soil. The sample was brown or buff colored and appeared to be very weathered fine grain shale. Approximately 50% of the sample passed the 10 mesh sieve, and more than 50% was plus 1" rock with very little woody debris.

Sample **LJJTBGSS-2** was collected below the high water mark in the Wolfstone Creek stream channel approximately 1,000 feet upstream of the mouth of Red Cloud Gulch and the western edge of the M.G. Smith Jig Tails. The sample was taken in a poorly sorted colluvium that contained all sizes and shapes of sediment from sand and silt fractions to gravel, cobbles and boulders. The colluvium contained all types of detritus from silty limestones and shales to quartz diorite. The location of the sample contained very little organic detritus. Because the colluvium was well mixed by fluvial actions the sample location was not excavated to depth.

Sample **LJWDSS-1** a composited sample taken in the center of the Libby Jane Tunnel Waste Dump near the small wetlands. The sample was brown or buff colored and appeared to be very weathered fine grain shale. Approximately 90% of the sample passed the 10 mesh sieve, and less than 5% was plus 1" rock and large woody debris. Although there was some evidence of weathered sulfides on the dump, most of the dump contains approximately 3,500 cubic yards of country rock (estimated).

Sample **LJWDSS-2** was collected from fines immediately beneath the jig mill on the northwestern edge of the Libby Jane Tunnel Waste Dump. Although the sample is representative of a very small volume of material (<20 cubic yards) it was thought that the sulfide content of these wastes were significant enough to warrant sampling. The jig tailings were coarse with <50% passing the 10 mesh screen and about 50% being between ¼" and 1" in size. The sample was generally brown or buff colored, but there was clear evidence of altered sulfides in the mix.

Sample **LJWDSS-3** was collected near the toe of the Libby Jane Tunnel Waste Dump where it is likely that a best representation of the wastes from both the tunnel and jig mill might be taken. The sample contained the coarsest fragments, some greater than 3", on the dump. After hand sorting to get rid of the plus 1" material the dump sample was still coarse with <50% passing the 10 mesh screen and about 50% being between ¼" and 1" in size. The sample was generally brown or buff colored, but there was clear evidence of altered sulfides in the mix.

Sample **LLJJTSS-1** was collected in the lower debris area of the M.G. Smith Mill site approximately 900 feet above Wolfstone Creek. The sample was from a bench in the jig tailings

that contained coarse fragments, some greater than 3", that may be debris from either the Libby Tunnel or natural outcrops in Red Cloud Gulch. However, there was obvious stratification of the deposits in Red Cloud Gulch at this location. This stratification was made very obvious by the alternating brilliant colors of the altered sulfides in a cut bank. It was anticipated that this sample would run very high in heavy metals. After hand sorting to get rid of the plus 1" material the dump sample was still coarse with <50% passing the 10 mesh screen and about 50% being between ¼" and 1" in size. The sample was generally brown or buff colored, but there was clear evidence of altered sulfides in the mix.

Sample **LLJJTSS-2** was collected adjacent to the jig mill on the southwest side of the M.G. Smith Mill site, just above the Wolfstone Creek Road. The sample came from an area that did not contain any coarse fragments greater than 3". After hand sorting to get rid of the plus 1" material the dump sample was still coarse with <50% passing the 10 mesh screen and about 50% being between ¼" and 1" in size. The sample was generally brown or buff colored, but there was clear evidence of altered sulfides in the mix.

Sample **LJPPESS-1** was collected at the probably point of entry (PPE) which IDEQ staff identified as where the mine and mill waste from the Libby Tunnel Site enter the perennial flow in Red Cloud Gulch just above the road as it leaves the bottom of the gulch to traverse westward into the forest. The sample was taken in a typical of stream channel sediments in that it was poorly sorted colluvium that contained all sizes and shapes of sediment from sand and silt fractions to gravel, cobbles and boulders. The colluvium contained all types of detritus from silty limestones and shales. The location of the sample contained very little organic detritus. Because the colluvium was well mixed by fluvial actions the sample location was not excavated to depth.

Sample **LLJJTPPESS-1** was collected from the lower end of the M.G. Smith Mill site where the alluvial fan was pushing downstream into lower Wolfstone Creek at its wetlands. At this point Wolfstone Creek was undercutting saturated jig tailings and debris and materials were observed to be discharged to wetlands in lower Wolfstone Creek. The sample was from a bench in the jig tailings that contained coarse fragments, some greater than 3", that may be debris from either the Libby Tunnel or natural outcrops in Red Cloud Gulch. However, there was obvious stratification of the deposits in Red Cloud Gulch at this location. This stratification was made very obvious by the alternating brilliant colors of the altered sulfides in a cut bank. It was anticipated that this sample would run very high in heavy metals. After hand sorting to get rid of the plus 1" material the dump sample was still coarse with <50% passing the 10 mesh screen and about 50% being between ¼" and 1" in size. The sample was generally brown or buff colored, but there was clear evidence of altered sulfides in the mix.

Water

Sample **LLJTSWBG-1** was collected on Deer Creek above the M. G. Smith Mill site ditch that was dug from a diversion approximately 1,000 feet above the mill site, to the first jig system at the mouth of Red Cloud Gulch. Originally the debris at the mouth of Red Cloud Creek was called the "Lower Libby Jane Jig Tailings" and hence the name of some of the samples. The sample was typical of perennial flows in the area in late June, being clear cool and fairly voluminous. Field parameters were collected for the sample, which included pH = 7.9, Conductivity = 0.26, Turbidity = <Detection Limits, Dissolved Oxygen = 10.5 mg/l, temperature = 10.0 Degrees C. None of the field parameters were remarkable.

Sample **LJADSW-1** was collected from the Libby Jane Tunnel Adit. Flows were extremely unusual (> 50 gpm) for an adit based on previous observations at other mines in the Warm Spring Mining District. However, the observable characteristics were typical of perennial flows during spring runoff in that they are clear and cold. Field parameters were collected at the adit which included pH = 8.2, Conductivity = 0.28, Turbidity = <Detection Limits, Dissolved Oxygen = 8.5 mg/l, temperature = 7.5 Degrees C. None of the field parameters were remarkable.

Sample **LJ PPESW-1** was collected at the probably point of entry (PPE) which IDEQ staff identified as where the mine and mill waste from the Libby Tunnel Site enter the perennial flow in Red Cloud Gulch just above the road as it leaves the bottom of the gulch to traverse westward into the forest. The sample was taken in a typical of perennial flows in the area in late June, being clear cool and fairly voluminous. Field parameters were collected for the sample, which included pH = 7.9, Conductivity = 0.26, Turbidity = <Detection Limits, Dissolved Oxygen = 11.5 mg/l, temperature = 9.5 Degrees C. None of the field parameters were remarkable.

Sample **LLJJTPESW-1** was collected from springs that were coming out of the alluvial fan on its northwest edge. At this point Wolfstone Creek was undercutting saturated jig tailings and debris and materials were observed to be discharged to wetlands in lower Wolfstone Creek. The springs emanated from the alluvial fan several feet above the Wolfstone Creek waterline. Field parameters for the springs were measured and included pH = 8.1, Conductivity = 0.27, Turbidity = <Detection Limits, Dissolved Oxygen = 8.0 mg/l, Temperature = 8.0 Degrees C. None of the field parameters were remarkable.

Sample Analysis

Generally speaking soils and water analysis indicates that the heavy metals of concern for the site are Arsenic, Cadmium, Lead and Zinc. These metals are elevated, even in background soils samples, above Idaho's Initial Default Target Limits (IDTLs) and EPA Region 6's Human Health Screening Levels (HHSLS). However, only the discharge water samples had concentrations of copper and zinc that have possible acute toxicological affects for ecological receptors, specifically cold water biota.

Soils

Background sample **LJBGSS-1**, which was collected above the Libby Jane Tunnel site, had heavy metals concentrations of total arsenic, total cadmium, total chromium, total mercury and total silver which exceeded IDTLs. However, only total arsenic in the sample exceeded HHSLS.

Background sample **LLJJTBG-1**, which was collected above the valley floor on the western slopes of Red Cloud Gulch, had heavy metals concentrations of total arsenic, total cadmium, total chromium, total mercury and total silver which exceeded IDTLs. None of the concentrations exceeded HHSLS.

Background sample **LJJTBGSS-2**, which was collected in the Wolfstone stream channel above the M.G. Smith Mill site, had heavy metals concentrations that were far below the other two

back ground sample concentrations, but total arsenic, total cadmium, total chromium, total mercury and total silver which exceeded IDTLs. None of the concentrations exceeded HHSLs.

Sample **LJWDSS-1**, which was a composite sample of the Libby Jane Tunnel Waste Dump, had heavy metals concentrations of total arsenic, total cadmium, total chromium, total mercury and total silver which exceeded IDTLs. Concentrations of total arsenic, total cadmium and total lead exceed HHSLs. **Total concentrations of arsenic, cadmium, copper, iron, lead, mercury, silver and zinc significantly exceed background soils concentrations.**

Sample **LJWDSS-2** was a composite sample of the lower Libby Jane Tunnel Waste Dump where it is expected that both tunnel waste rock and jig tails would be mixed before being release from the dump to the perennial stream below. Concentrations of total arsenic, total cadmium and total lead exceed HHSLs. **Total concentrations of arsenic, cadmium, copper, iron, lead, mercury, silver and zinc significantly exceed background soils concentrations.**

Sample **LJWDSS-3** which is a sample of jig tailings on the Libby Jane Tunnel Waste Dump, had heavy metals concentrations of total arsenic, total cadmium, total chromium, total mercury and total silver which exceeded IDTLs. Concentrations of heavy metals included total arsenic, total cadmium, total chromium, total mercury and total silver which exceeded IDTLs. Concentrations of total arsenic, total cadmium and total lead exceed HHSLs. **Total concentrations of arsenic, cadmium, copper, iron, lead, mercury, silver and zinc significantly exceed background soils concentrations.**

Sample **LLJJTSS-1** was a composite sample of the upper portion of the M.G. Smith Mill site jig tails where it was observed that stratifications occurred in the wastes and were highlighted by alterations of sulfides in various strata. Concentrations of heavy metals included total arsenic, total cadmium, total chromium, total mercury and total silver which exceeded IDTLs. Concentrations of total arsenic, total cadmium and total lead exceed HHSLs. **Total concentrations of arsenic, cadmium, copper, iron, lead, mercury, silver and zinc significantly exceed background soils concentrations.**

Sample **LLJJTSS-2** was a composite sample of M.G. Smith Mill site jig tails on the southwestern side of the Millsite just above Wolfstone Creek. Concentrations of heavy metals included total arsenic, total cadmium, total chromium, total mercury and total silver which exceeded IDTLs. Concentrations of total arsenic, total cadmium and total lead exceed HHSLs. **Total concentrations of arsenic, cadmium, copper, iron, lead, mercury, silver and zinc significantly exceed background soils concentrations.**

Sample **LJPPESS-1** was collected in the perennial stream at the bottom of Red Cloud Gulch below the Libby Jane Tunnel Waste Dump. Concentrations of heavy metals included total arsenic, total cadmium, total chromium, total mercury and total silver which exceeded IDTLs. Concentrations of total arsenic, total cadmium and total lead exceed HHSLs. **Total concentrations of arsenic, cadmium, copper, iron, lead, mercury, silver and zinc significantly exceed background soils concentrations.**

Sample **LLJJTPPESS-1** was collected at the terminus of the northeastern terminus of the M.G. Smith Mill site jig tailings in Wolfstone Creek where the tailings are being delivered to wetlands there. Concentrations of heavy metals included total arsenic, total cadmium, total chromium,

total mercury and total silver which exceeded IDTLs. Concentrations of total arsenic, total cadmium and total lead exceed HHSLs. **Total concentrations of arsenic, cadmium, copper, iron, lead, mercury, silver and zinc significantly exceed background soils concentrations.**

Water

Background sample **LLJTSWBG-1** was the only background water sample collected, and it came from Wolfstone Creek above the M.G. Smith Mill site. Concentrations of metals in this background sample were below method detection limits (MDLs), drinking water standards and ground water standards.

Sample **LJADSW-1** was collected from the Libby Jane Tunnel discharge. Total arsenic concentrations in the sample exceeded the drinking water standards, and total copper concentrations barely exceeded the chronic cold water biota standards.

Sample **LJ PPESW-1** was collected in the perennial stream below the Libby Jane Tunnel Waste Dump. Concentrations of metals in this background sample were below method detection limits (MDLs), drinking water standards and ground water standards.

Sample **LLJJTPESW-1** was collected from the springs emanating from the debris flow at the northeastern bottom of the M.G. Smith Mill site. Total arsenic concentrations in the sample exceeded drinking water standards. Total copper and total zinc concentrations exceeded the acute and chronic cold water biota criteria for copper and zinc which are “dissolve concentration criteria”. Since there is evidence throughout the Warm Springs Mining District that metals are not often mobile in a dissolved state, it is likely that these totals concentrations are reflections of suspended sediment

Section 9 Pathway and Environmental Hazard Assessment

Pathway and environmental hazards were assessed for groundwater, surface water, and soil/air exposure. The findings from these assessments are presented in the following.

Ground Water

Ground water flow is expected to be controlled structurally within faults and brecciated zones in the country rock and be expressed at the surface as springs. However, the high flows from the Libby Jane Tunnel indicate that the extensive underground workings of the Red Cloud Mine provide anthropogenic influences on ground water flows. Other than the adit discharge no other springs were noted or mapped in Red Cloud Gulch.

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Libby Jane Tunnel and Mill Site Soil Samples

Description	IDEQ IDTL values	EPA Region 6 Human Health Screening Criteria	Libby Jane Background Soil Sample above Tunnel	Lower M. G. Smith Jig Tailings Background Soil Sample E side of Gulch	Lower M.G. Smith Jig Tailings Background Soil Sample in Wolfstone Gulch	Libby Jane Tunnel Waste Dump Southern Lobe	Libby Jane Tunnel Waste Dump Central Lobe	Libby Jane Tunnel Waste Dump Nothern Lobe (Jig Tailings)	Libby Jane Tunnel PPE Below Waste Dump	M. G. Smith Lower Jig Tailings PPE on Wolfstone Creek	M. G. Smith Jig Tailings Soil Sample 1 at head of lower tailings pile	M. G. Smith Lower Jig Tailings Soil Sample 2 near western jig set
			LJBGSS-1	LLJJTBG-1	LLJJTBGSS-2	LJWDSS-1	LJWDSS-2	LJWDSS-3	LJPPESS-1	LLJJTPPE-1	LLJJTSS-1	LLJJTSS-2
Arsenic	0.391	23	27.2	17.7	12.2	3680	6560	8080	516	46.8	9000	11900
Barium	896	1600	106	110	29.2	32.3	27.4	18.3	39.2	37.7	8.26	27.9
Cadmium	1.35	39	2.56	3	1.34	54.6	58.5	118.00	13.3	4.61	430	120
Chromium	7.9	210	37.6	54.2	10.4	33.7	25.4	12.1	33.7	13.1	10.8	22.4
Copper	921	2900	20.1	11.4	7.8	<u>242</u>	<u>160</u>	<u>650</u>	37.5	18.5	<u>1310</u>	<u>1030</u>
Iron		55000	16000	12700	10600	<u>36900</u>	<u>36100</u>	<u>46700</u>	11600	13800	76400	69200
Lead	49.6	400	30.8	39.4	30	5270	7500	17200	974	<u>159</u>	15700	40400
Mercury	0.00509	23	0.072	0.035	<0.033	2.73	1.43	4.3	0.463	0.122	14.2	8.07
Selenium	2.03	390	<4	<4	<4	< 4	5.0	5	< 4	<4	<4	12.0
Silver	0.189	390	0.91	<0.50	<0.50	<u>25.6</u>	<u>34.4</u>	<u>64</u>	<u>3.63</u>	<0.50	<u>136</u>	<u>126</u>
Zinc	886	23000	92.2	148	87.6	<u>6000</u>	<u>8130</u>	<u>20200.0</u>	<u>2050</u>	<u>742</u>	<u>72400</u>	<u>17400</u>

XXXXX Exceeds Both IDTLs and EPA Region 6 HHSLs

XXXXX Significantly exceeds background soils concentrations

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Libby Jane Tunnel and M. G. Smith Mill Site Surface Water Quality

Description	IDEQ Ground Water Standard	IDEQ Drinking Water Standard	IDEQ Cold Water Biota Standard	IDEQ Cold Water Biota Standard	Lower Libby Jane Background on Wolfstone Creek	Libby Jane Tunnel Adit Discharge	Libby Jane PPE in Red Cloud Gulch	Lower Libby Jane, MG Smith Millsite PPE
			Acute	Chronic	LLJJTSWBG-1	LJ AD SW -1	LJ PPE SW 1	LLJJT PPE SW1
Arsenic	0.05	0.00002(D)	0.36 (D)	0.19 (D)	<0.025	0.032	<0.025	0.0092
Barium					0.005	0.103	0.0036	0.005
Cadmium	0.01		0.0037 (D)	0.001 (D)	<0.002	<0.002	<0.002	<0.002
Chromium	0.05		0.157 (D)	0.18 (D)	<0.0060	<0.0060	<0.0060	<0.0060
Copper	1		0.017 (D)	0.0106 (D)	<0.010	0.011	<0.010	0.024
Iron	0.3				<0.060	0.174	<0.060	0.079
Lead	0.05		0.065 (D)	0.0025 (D)	<0.0075	0.0254	<0.0075	<0.0075
Mercury	0.002	0.00014(D)	0.00204 (D)	0.000012 (T)	<0.00020	<0.00020	<0.00020	<0.00020
Selenium	0.01		0.02 (T)	0.005 (T)	<0.040	<0.040	<0.040	<0.040
Silver	0.05		0.0034 (D)		<0.0050	<0.0050	<0.0050	<0.0050
Zinc	5		0.11 (D)	0.10 (D, H)	<0.010	0.084	0.085	0.127

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Shallow ground water and surface waters are inextricably related as both are bounded by densely crystalline bedrock and flow through or on top of the valley fill colluvium. The amount of recharge of regional aquifers by surface and ground water in the Red Cloud Gulch area is unknown.

According to Idaho Department of Water Resources July 2002 records, only 4 private drinking water wells are located within a 4-mile radius of the site. However two of the locations are on the other side of Kelly Mountain from Red Cloud Gulch, and these were identified by IDEQ staff as live stock watering tanks, not domestic wells. The domestic wells are located within the Deer Creek drainage almost six miles down gradient of the site. No wells were sampled.

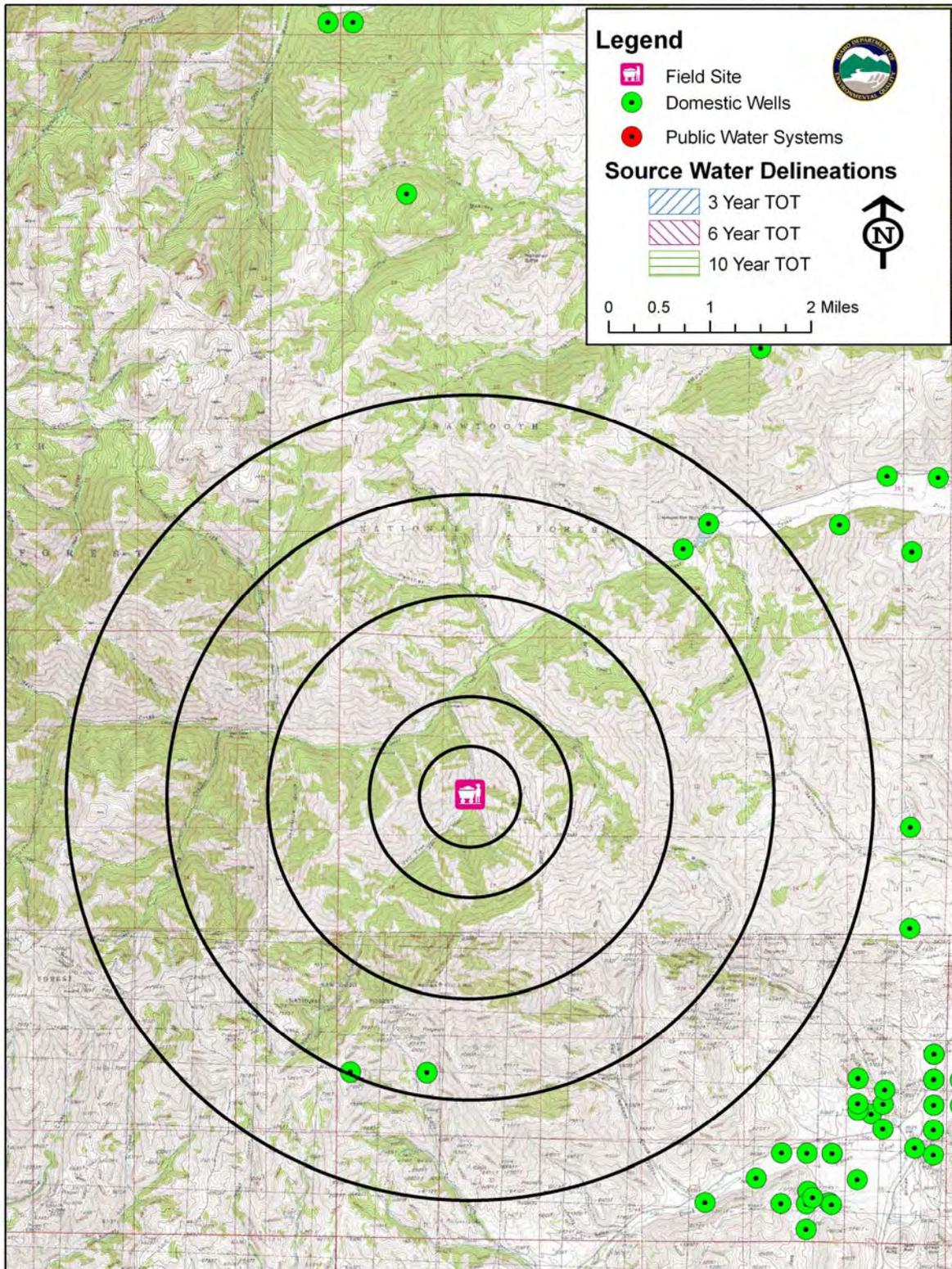
During the cleanup activities of the nearby mines, such as Triumph and the Minnie Moore Mill site, the first concerns were related to potential human health risks as a result of contamination of public and private drinking water supplies. Generally speaking, contamination of drinking water systems was thought likely to occur from two types of sources (ore bodies and waste dumps) and along three pathways, as illustrated by the following three scenarios. First, heavy metals are leached from mine waste dumps, enter ephemeral or perennial drains and then contaminate the area's shallow ground water system. Second, heavy metals leach from the local ore bodies and are transported through the geologic structure to the shallow ground water. Third, heavy metals could leach out of the ore bodies, and be discharged from the underground workings as adit water, that is then conveyed through ephemeral and perennial drains to the shallow ground water systems.

For the purposes of completing Preliminary Assessments, Source Water Assessments (completed for local public drinking water supplies) were used to identify any known affects to those systems. Although IDEQ's Source Water Assessments were used to evaluate potential affects of this mine on public drinking water supplies no inferences can be made about the affects that this and adjoining mines have on local private wells.

Source water assessments provide information on the potential contaminant threats to public drinking water sources. In the Big Wood River Valley Idaho, most of those sources (>95%) are ground water (IDEQ 2000). Each source water assessment:

- Defines the zone of contribution, which is that portion of the watershed or subsurface area contributing water to the well or surface water intake (source area delineation).
- Identifies the significant potential sources of drinking water contamination in those areas (contaminant source inventory).
- Determines the likelihood that the water supply will become contaminated (susceptibility analysis).

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Each assessment is summarized in a report that describes the above information and provides maps of the location of the public water system, the source area delineation, and the locations of potential contaminant sources. Idaho began developing source water assessments in 1999, and in May 2003 met its obligation under the amendments of the Safe Drinking Water Act by completing delineations for all 2100+ public water systems that were active in Idaho as of August 1999 (IDEQ 2000). Source water assessments for new public drinking water systems are being developed as those systems come online. Each public water system is provided with two copies of its final assessment report. Four source water assessments for drinking water supplies have been used in this Preliminary Assessment Process to evaluate the potential impacts to both public and private drinking water supplies in and around Sun Valley, Ketchum, Hailey and Bellevue.

The information extrapolated from these reports is based on data that existed at the time of their writing, and the professional judgment of IDEQ staff. Although reasonable efforts were made to present accurate information, no guarantees, including expressed or implied warranties of any kind are made with respect to these reports or this Preliminary Assessment by the State of Idaho or any of its agents who also assume no legal responsibility for accuracy of presentation, comments or other information in these publications or this Preliminary Assessment report. The results should not be used as an absolute measure of risk, and they should not be used to undermine public confidence in public drinking water systems.

The Source Area delineation process establishes the physical area around a well or surface water intake that becomes the focal point of the source water assessment. The process includes mapping the boundaries of the zone of contribution (the area contributing water to the well or to the surface water intake) into time of travel zones (TOT) indicating the number of years necessary for a particle of water to reach a well or surface water intake (IDEQ 2000). The size and shape of the source water assessment area depend on the delineation method used, local hydrogeology, and volume of water pumped from the well or surface water intake.

IDEQ used a refined computer model approved by EPA to determine the 3-year (Zone 1B), 6-year (Zone 2), and 10 year (Zone 3) time of travel associated with the Big Wood River Aquifer and its sources (IDEQ 2000). This information is illustrated in Figure 4.

This process involves collecting, recording, and mapping existing data and geographical information system (GIS) coverage to determine potential contaminant sources (e.g., gas stations) within the delineated source water assessment area. The potential contaminant source inventory is one of three factors used in the susceptibility analysis to evaluate the overall potential risk to the drinking water supply (IDEQ 2000). The inventory process goal is to locate and describe those facilities, land uses, and environmental conditions that are potential sources of ground water or surface water contamination.

This susceptibility analytical process determines the susceptibility of each public water system well or surface water intake to potential contamination within the delineated source water assessment area. It considers hydrogeologic characteristics, land use characteristics, potentially significant contaminant sources, and the physical integrity of the well or surface water intake. The outcome of the process is a relative ranking into one of three susceptibility categories: high, moderate, and low. The rankings can be used to set priorities for drinking water protection efforts (IDEQ 2000).

There are numerous public and private drinking water supplies in the Big Wood River Basin. The Sun Valley Water and Sewer District operates and maintains nine wells in two groupings

(IDEQ 2000). The City of Ketchum drinking water system consists of seven wells in two groupings. The City of Hailey's drinking water system consists of six wells and a spring (IDEQ 2000). The City of Bellevue drinking water system consists of two wells and three springs (IDEQ 2000).

Generally speaking, public drinking water systems in the Big Wood River Valley are rated as moderate to high (IDEQ 2000). Multiple factors affect the likelihood of movement of contaminants from the sources to the aquifer, which led to this moderate to high score. Soils in the area are poorly to moderately drained. The vadose zone is predominantly gravel, which increases the score. On the valley floors the average depth to ground water is twenty to fifty feet.

To date, routine water quality monitoring of public drinking water indicates that there are no significant volumes of heavy metals migrating through the regional or localized ground water systems. There is no current, long term or recurring water chemistry problems in the City of Ketchum's drinking water sources. Arsenic, nickel, antimony, barium, selenium, chromium, cyanide and nitrate have been detected in Ketchum's wells, but all were well below MCLs (IDEQ 2000). There is no long term or recurring water chemistry problems in the City of Hailey's drinking water sources. Manganese, zinc, chromium, and mercury have been detected in Hailey's wells, but all were well below MCLs (IDEQ 2001). Currently, there are no data that indicate that any metal concentrations have exceeded MCLs in the Bellevue drinking water systems (IDEQ 2000).

Surface Water

Red Cloud Gulch drains northward towards the northeast flowing Wolftone Creek which then enters the large Deer Creek approximately 1 mile from the site. Overland flow across or in the vicinity of the waste piles delivers sediment to Red Cloud Gulch before disappearing into the porous colluvium and mill wastes. Red Cloud Gulch is not currently listed on the EPA CWA §303(d) list of impaired streams. The nearest EPA CWA §303(d) listed stream is the Big Wood River approximately 8 miles downstream from the site.

Commercial or subsistence fishing does not occur within the 15-mile downstream distance, but sport fishing does. Redband rainbow trout [*Oncorhynchus mykiss gairdneri*], mountain whitefish [*Prosopium williamsoni*], wood river sculpin [*Cottus leiopomus*], and brook trout [*Salvelinus foninalis*] are, however, present within the Big Wood River (IDFG, 2000).

There are no surface water intakes for drinking water or any type of industry within the 15-mile TDL. Two drinking water wells are located within the 4-mile radius of the site and are discussed further in the Groundwater Pathway section.

Soil Exposure and Air

Access to the mine site is unrestricted from the Wolftone Gulch Road (FS 111). Human and ecological receptors may be exposed to soils and mine waste by inhalation, dermal contact and ingestion. As with most of the mine sites in the Big Wood River area, strong winds on hot summer afternoons suspends fugitive dust in the air, which may be inhaled. Visitors may also have direct contact with heavy metals in wastes while exploring the site.

Potential Receptors

Potential receptors include hikers, hunters, anglers, cattlemen, and trail riders (motorized and non-motorized). Sheep graze the surrounding area, but their presence within the mine site is minimal. Outdoor enthusiasts remain the highest percentage of human receptors, as they frequent the area for a number of recreational activities. The land within a two (2) mile radius of the site is primarily public land administered by the USDA Forest Service.

Schools, Day-Care Facilities, Private Residences

There are no schools, day-care facilities, or private residences within 200 feet of the site, however, BLM or Forest Service workers, in addition to the outdoor recreation enthusiasts, may occasionally be within 200 feet of the site.

Plant and Animal Species of Concern

Camas Goldenweed and Long Legged Myotis were the only IDF&G listed species of concern (F&G, 2002) within a 4-mile radius of the mining site. Gray Wolves and North American Wolverines may also range in this area. Due to the much greater area of range for these animals compared to the size of the waste dumps, it is unlikely that individual animals would experience sufficient doses to be at risk.

Soil Sample Concentrations

Frequent exposure to heavy metals at the site for all receptors exists. Risks due to these exposures may be high particularly exposures to arsenic, cadmium and lead.

Section 10 Summary and Conclusions

Heavy metals concentrations in the mine and mill wastes warrant calculation of a Hazard ranking score for the Libby Tunnel Waste Dump and M.G. Smith Mill site. In addition, risk calculations and risk management plans may be warranted. Use by the public for camping and hunting may pose unacceptable risks to human health, particularly on USDA Forest Service administered lands since the highest concentrations of metals were found on public lands at the site.

Although there is over 3,000 cubic yards of waste on the Libby Jane Tunnel Waste Dump, the wastes that pose the greatest risks are associated with the jig tails on the northern lobe of the waste dump. There are approximately 50 cubic yards of these jig tails in one area. Collectively, the mine wastes and jig tailings should be considered for future remedial work. At a minimum, risk management should include posting the health hazards at the dump and its wastes as a health hazard and restricting access.

The volume of the material in the M.G. Smith Mill could not be estimated with any certainty. However, the surface area of the site, the presence of very high concentrations of arsenic, cadmium, lead, mercury, silver and zinc warrant in depth risk analysis and possibly remedial actions.

The Florence Mine workings do not appear to present any significant risks to human or ecological receptors. As with most old mine workings some physical hazards exist because of uneven ground, unstable dumps and over hanging rocks in the adits.

Presence of Wetlands

Official wetland surveys and aerial photographs of the area, wetlands exist on the site. Samples were collected at the PPE above the wetlands, but no samples were collected from any wetlands below this site. Based on observations and available wetlands data, existing wetlands are probably impacted by this site.

Impacts on Water Quality

Overland connections were observed between seasonal runoff and nearby surface or ground water systems. However, source water assessments indicate that there are no adverse impacts to public or private drinking water supplies from mining in the area. If future development encroaches on the site, new wells drilled at the site would not be likely impacted by heavy metals from the site.

Potential Exposure for Wildlife, Livestock, and Vegetation

Potential exposure from the tailings pile to wildlife and vegetation from the site is present. Native plant species may bio-accumulate high concentrations of metals that may be consumed by the local wildlife or livestock. Livestock and wildlife may be exposed at the site, particularly to elevated lead and silver concentrations, but relative to the extensive range of the livestock and wildlife, the area of the dumps and exposure is small, and therefore dosage of toxic metals would likely be insignificant.

Potential Exposure for Humans

Human activity around the site is high due to the recreational values of the area. This site is frequently visited by mountain bikers, hikers, hunters, snowmobile operators, off-road four wheeling, and various other outdoor recreation enthusiasts. Humans receive very small doses of heavy metals, especially arsenic, cadmium, chromium, lead, mercury, silver and zinc. Fugitive dust or direct contact with the waste piles appears to be the most significant route of exposure to humans for elevated constituents. Considering the site access is very easy, these exposure levels are likely and probably should be addressed.

Recommendations

Based on existing conditions and uses, IDEQ is recommending that EPA generate a Hazard Ranking Score for the site(s). Furthermore IDEQ is recommending that the land owner and the USDA Forest Service consider; either conducting additional sight investigations and data collection that is necessary to complete an accurate risk assessment and implementing a risk management plan; or that they consider taking conservative remedial actions that prevent additional discharges from the site, restrict exposures to the jig tailings, and they limit uses of the site for camping.

References

- Bureau of Land Management, 2006, *Land Patent Details* – BLM GLO Records.
<http://www.glorerecords.blm.gov/PatentSearch/Detail.asp?Accession=IDIDAA+046037&Index=1&QryID=41620.75&DetailTab=1>
- Idaho Department of Water Resources (IDWR), 2006.
<http://www.idwr.idaho.gov/water/well/search.htm>
- Anderson, A.L., Kiisgaard, T.H., and Fryklund, V.C., Jr., 1950, *Detailed geology of certain areas in the Mineral Hill and Warms Springs mining districts, Blaine County, Idaho*; Idaho Bureau of Mines and Geology, Pamphlet No. 90, 37 p.
- Blaine County, 2006, Blaine County Treasurer-Tax Collections, Hailey, Idaho
- Bureau of Land Management, 2006, *Land Patent Details* – BLM GLO Records.
<http://www.glorerecords.blm.gov/PatentSearch/Detail.asp?Accession=IDIDAA+046037&Index=1&QryID=41620.75&DetailTab=1>
- Environmental Protection Agency (EPA), 2002. Preliminary Remediation Goals.
<http://www.epa.gov/region9/waste/sfund/prg/index.htm>
- Idaho Department of Fish and Game (IDFG), 2002.
http://www2.state.id.us/fishgame/info/cdc/plants/vasc_plants&status_n-r.htm
- Idaho Department of Fish and Game (IDFG), 2000. Redband Trout Distribution.
- Idaho Department of Environmental Quality (DEQ), 2006. Safe Drinking Water Information System (SDWIS).
- Idaho Department of Environmental Quality (DEQ), 2000. 1998 303(d) list.
- Idaho Department of Water Resources (IDWR), 1997. COVERAGE IDOWN -- Idaho Surface Ownership.
- IDWR², 2002. GIS shapefile of well database.
- Kiisgaard, T.H., Lewis, R.S., and Bennett, E.H., 2001, *Plutonic and Hypabyssal Rocks of the Hailey 1°x2° Quadrangle, Idaho*, USGS Bulletin 2064-U, 18 p.
- Link, P.K. and Worl, R.G., 2001, *Geology and Mineral Deposits of the Minnie Moore and Bullion Mineralized Areas, Blaine County, Idaho*, USGS Bulletin 2064-Y, 22 p.
- Mitchell, V.E., and V.S. Gillerman, 2005, Site Inspection Report for the Abandoned and Inactive Mines in Idaho on U.S. Bureau of Land Management Property in the Hailey-Bellevue Area: Red Elephant Gulch, Blaine County, Idaho; Idaho Geological Survey, 66 p.
- Umpleby, J.B., Westgate, L.G., and Ross, C.P., 1930, Geology and ore deposits of the Wood River region, Idaho, with a description of the Minnie Moore and nearby mines by Hewett, USGS Bulletin 814, 250 p.
- United States Geological Survey (USGS), 1991. Digital map file of major land uses in the United States.
- Western Regional Climate Center (WRCC), 2006. <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?idhail>