

Belshazzar Mine

(aka Ternan-Belshazzar Group and Idawa Development Co.)

Preliminary Assessment Report

Boise County
State of Idaho



Idaho Department of Environmental Quality

June 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

June 19, 2008

Maggie Manderbach
U.S Department of Agriculture
Forest Service – Region 4
324 25th Street
Ogden, Utah 84401

RE: Site Assessment of the Belshazzar Mine (aka Ternan-Belshazzar & Idawa Development Co.), Located on Public Lands, Administered by the U.S. Department of Agriculture, Boise National Forest (aka Forest Service).

Dear Ms. Manderbach:

The Idaho Department of Environmental Quality (IDEQ) has completed a review of historical mining data and geological information of the above referenced mining facilities. Subsequent to that review, IDEQ conducted site visits of the Belshazzar Mine. During these site visits, 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)

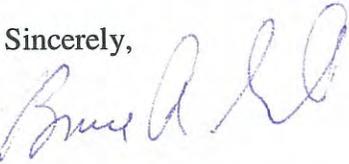
IDEQ also completed PAs under contract with the U.S. Environmental Protection Agency in order to identify risks to human health and the environment, and make recommendations to land managers regarding how risks might be managed, if necessary.

Based on current site conditions or on-site activities, the concentrations of heavy metals in the various mine and mill waste dumps, the disconnection between these sources and receptors and the very low potential for prolonged exposures to heavy metals concentrations, IDEQ has concluded that No Remedial Action is Planned for this site (NRAP). However, the USDA Forest Service should discourage recreational use of the site, and ensure that operating plans for mining of the site include site health and safety plans to abate fugitive dust and worker exposure. In addition, the determination that No Remedial Action is Necessary does not provide for future disturbance or excavation of the mill site, tailings piles or mine waste dumps. Disturbance of these mill and mine facilities may change the relative risks for release of contaminants to the environment.

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 openings and waste dumps, remnant structures and miscellaneous equipment as well as a brief checklist.

IDEQ very much appreciates your cooperation with our Site assessment program and projects, and looks forward to addressing any questions you may have regarding our findings. Please call me at (208) 373-0554 if you have any comments, questions, or if 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

BAS:tg belshazzar final.doc

Attachments

cc: Ken Marcie, U.S. Environmental Protection Agency
Russell Hicks – USDA Boise National Forest
Jim Curtis - USDA. Boise National Forest
file

LIST OF ACRONYMS

<u>Acronym</u>	<u>Definition</u>
amsl	above mean sea level
BLM	United States Department of the Interior, Bureau of Land Management
DEQ	Department of Environmental Quality
EPA	United States Environmental Protection Agency
gpm	gallons per minute
IDTL	Initial Default Target Levels
IGS	Idaho Geological Survey
MCL	Maximum Concentration Limit
PPE	Probable Point of Entry
HHSL	Human Health Medium-Specific Screening Levels
TCLP	Toxicity Characteristic Leaching Procedure
TDL	Target Distance Limit
TMDL	Total Maximum Daily Load
USFS	United States Department of Agriculture, Forest Service

Section 1: Introduction

This document presents the results of the Preliminary Assessment (PA) of the Belshazzar Mine, also known as the Ternan-Belshazzar Group, which was operated by the Idawa Development Co. 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 PAs at various mines.

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. Priority was also given to mining districts where groups or clusters of sites could be assessed on a watershed basis.

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

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

Assessment of the Belshazzar Mine was requested by the USDA Forest Service Region 4.

Although historical information was scant for the limited effort put into IDEQ's researching the Belshazzar Mine and Mill the information, particularly photos, and effort, received by individuals of the Idaho Historic Society is greatly appreciated.

Ownership

United States of America
U.S. Department of Agriculture
U.S. Forest Service
Boise National Forest

Claims

Unpatented lode and placer claims

SECTION 2: OVERVIEW

Location

The Belshazzar Mine is located in the upper reaches of Fall Creek, a tributary to the Granite Creek sub-drainage, approximately 1.75 miles southwest of the old Quartzburg mining area and 4.3 miles west of Placerville, Idaho, in Section 17 of Township 7 North, Range 4 East of the Boise Meridian, at Latitude 43° 56' 28"N, and Longitude 116° 00' 56"W (see Figure 1).

The Belshazzar can be accessed from Placerville, Idaho by heading west on Granite Street which becomes Granite Creek Road (FS Road 343) for a distance of approximately 2.6 miles, then turning southwest (left) onto FS Road 343B and continuing to the west-southwest for

approximately 1.1 miles to where the road forks. The left-hand fork leads to the Belshazzar Mine after approximately 1.6 miles (USFS, 2008).

Climate

There is no precipitation data available specifically for the Belshazzar Mine. The information provided in this section is based on a climate summary for the Centerville Arbaugh Ran site (station # 101636), which was obtained from the Western Regional Climate Center (WRCC, 2007).

The Centerville station is located approximately 8 miles northeast from the mine at an elevation of 4,440 feet amsl. Records from 1949 to 2007 indicate the mean annual precipitation is 27.75 inches; the mean annual snowfall is 119 inches; and the 100-year, 24-hour event is 2.28 inches. Based upon records from 1998 to 2007, the lowest temperature recorded for this period was -23° F in 2002 while the highest was 101° F in 2001.

Each site for which this data is used is subject to more localized meteorological conditions that result from difference in elevation, orientation of slopes in watershed, vegetation and other factors. The area around the Belshazzar Mine is characterized by cool dry summers and cold winters. The majority of precipitation occurs as snow, occurring mostly in December and January. The driest months are July, August and September.

Section 3 Assessment Activities and Site Description

Assessment Activities

Previous site assessment work was conducted at the Belshazzar Mine by geologists from the Idaho Geological Survey (IGS). Under a cooperative agreement with the U.S. Forest Service (Abandoned and Inactive Mine Program), the IGS inventoried mine site workings, assessed physical hazards and evaluated some potential ecological impacts. A site discovery visit was conducted by IGS on July 1, 1994 which concluded that additional investigation of the Belshazzar was warranted. On May 31, 2002 and briefly again on July 26, 2002, the IGS conducted site inspection visits at the mine (IGS, 2007).

On August 15, 2007, the IDEQ and USFS representatives conducted a site visit to assess current site conditions and potential contaminant concerns. IDEQ conducted a subsequent site visit on September 7, 2007, broadening the scope of investigation.

Current and Potential Future Uses

The Belshazzar Mine is accessed via a narrow 4-WD road, deeply rutted in places. The road enters the former mine's camp area (offices and living quarters) from the northeast. The bridge crossing at Fall Creek is unstable, but passable for bikes or ATV's.

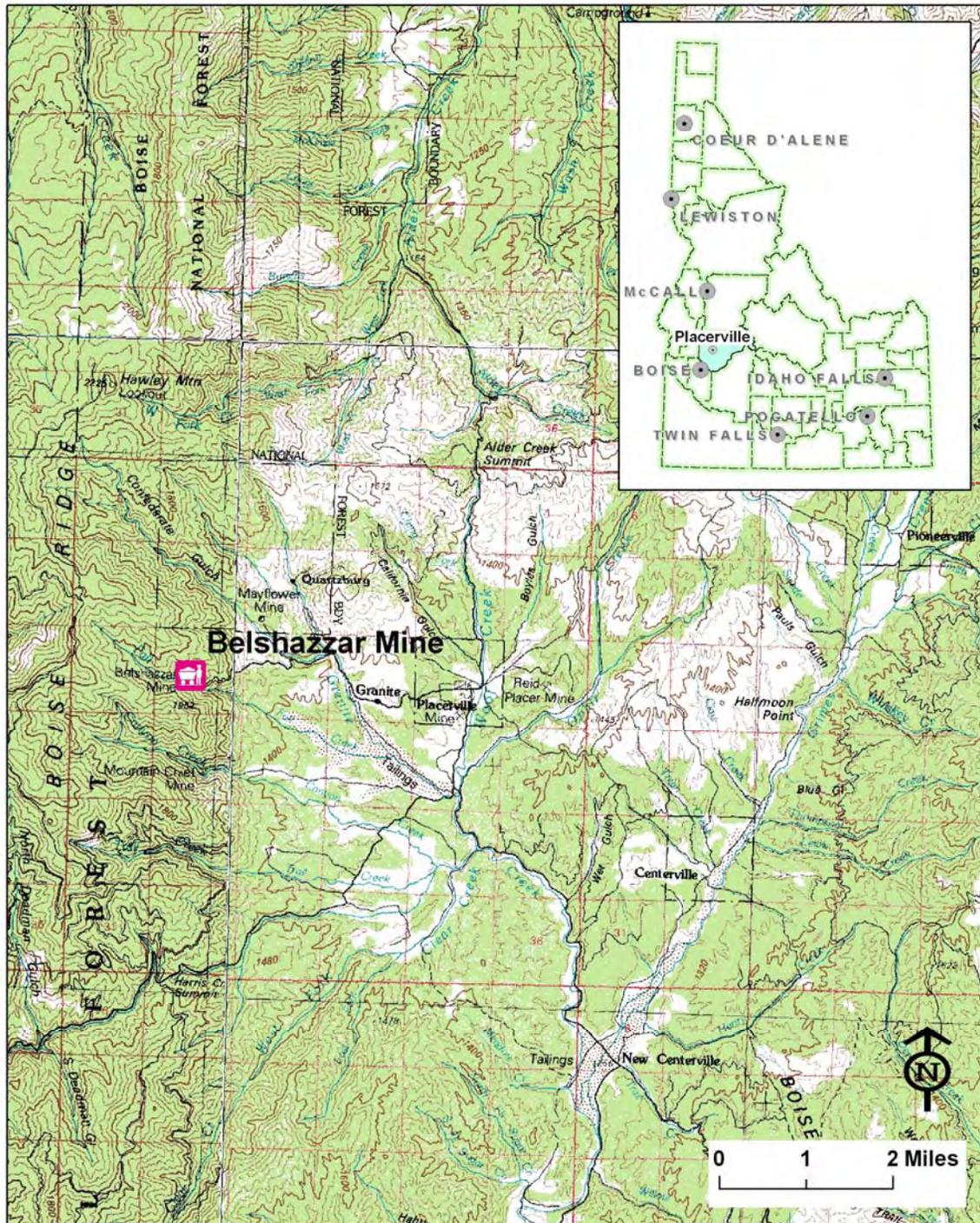


Figure 1

The site is comprised of several unpatented lode and placer claims that are administered by the USFS. In addition to ongoing mining activities, the site is used for recreation (bike and ATV riding and hunting) and grazing. Private development of the site may be limited, as it is dependent upon administration by Boise National Forest.

History

There are very poor records of the individuals or companies involved in the original location and maintenance of the unpatented claims around the Belshazzar.

The mine was located in 1875 and has been worked intermittently to the present day...Little could be learned about the early history of the mine, except that the lodes were discovered by placer miners when they sluiced off the disintegrated rock on the divide between Fall and Canyon Creeks. By 1880 the disintegrated lode matter had been sluiced, and the works on the lodes had started, but it was continued thereafter intermittently...Active production started about 1926, but by late 1931 all the known ore reserves has been exhausted, and the mine suspended operations. The mine was idle in 1932 and 1933, but work resumed for a short time in 1931, when about 300 feet of development was done on the 401 level and on the intermediate level 60 feet below. A small amount of ore was run through the mill. In 1938 the mine was idle (Anderson, 1947, pp. 277-78).

In 1933 Ross reported that “The surface was worked by placer methods in the seventies, and \$60,000 was recovered. In 1905 to 1909 the upper three tunnels were opened and \$25,000 was recovered by amalgamation, concentrates being stored for future treatment. Since 1917 the present company has operated the mine. In 1921 tunnel 5, at the level of the mill, was driven at a reported cost of \$250,000. This tunnel, with its crosscuts, has a length of over 3,000 feet. A vein, presumably the lower extension of the Belshazzar, was found, but although good assays were obtained in places, the quantity of ore was small. The 401 tunnel, the present operating level, was next driven, and most of the recent production has come from stopes between the 401 and no. 3 levels, although connection has been made with tunnel 5, 400 feet below, and a little ore has been mined from two intermediate levels, of which the lower is 140 feet below the 401 level...In 1930 the mill heads averaged about \$10 a ton, but at times pockets of extremely high-grade ore have been found. From 1926 to 1930, inclusive, 27,116.32 ounces of crude bullion, valued at \$402,270.29, was shipped to the United States assay office at Boise, and concentrates yielded a total of \$63,253.87, of which \$48,605.60 was in gold and \$14,648.25 in silver. From January 1 to April 5, 1931, there was shipped 1,564.27 ounces of bullion, valued at \$24,193.74, and concentrates containing \$4,430.03 in gold and \$370.85 in silver”

In 1947 Anderson reported that “The (un)patented claims are currently owned by the Idawa Gold Mining Co. The claims group consists of 26 unpatented claims, a complete mine plant, and a 25-ton amalgamator and table concentrator. The mine has been developed by 5 tunnels, approximately 12,000 feet of workings (see pl. 50). The upper tunnels are each 500 and 600 feet long, the No. 401, from which most of the recent work

has been done, is about 1,700 feet long, and the No. 5, about 400 feet vertically below the No. 401, is 3,000 feet long. A long crosscut has also been driven from near the far end of the 401 drift to the Centennial vein, 680 feet to the south, and a drift extended along the Centennial for nearly 400 feet. An intermediate level has been made between the No. 401 and the No. 3, and two others below the No. 401, one 60 feet below and the other 140 feet below. All levels are joined by raises, and ore has been stoped above the 401 and partly above the intermediate 60 feet below. All but the upper two tunnels were open when the property was examined in 1932 and 1933. The No. 5 tunnel is at the level of the mill and camp on Fall Creek, but the others are more than 400 feet vertically up the slope southwest of the camp and are connected with the mill by tramway.”

Anderson also reported that “*Exact production figures are not available. The disintegrated lode matter is said to have yielded \$65,000 in gold, and \$25,000 is reported to have been recovered by amalgamation between 1905 and 1909, some 4,000 tons of ore valued at \$10.48 per ton having been treated with little more than 50 percent gold recovery. The main production, however, started in 1926, and from that year until April 5, 1931, 28,680.59 ounces of crude bullion valued at \$426,464.03 were shipped to the United States assay office at Boise, and concentrates yielded an additional \$68,954.75, of which \$53,035.63 was in gold and \$15,019.12 in silver”.*

IGS reported the “last known production was in 1941” (IGS, 2007, p. 55), but operational and production records for this period and subsequent years are not known. Currently, exploration or prospecting activities are being conducted at the Adit 2 (aka, 401 Tunnel) site. At the time of the site visit, several shallow excavations were noted along the access road to Adit 2, across the crest of the waste dump and landing area. Recent footprints were observed at the portal, as well.

Geology

Figure 2 illustrates the lithology and structural geology at the Belshazzar and surrounding area. During the past 100 plus years numerous authors including Ballard (1924), Ross (1933) and Anderson (1947) have described the geology and/or ore deposits within the Quartzburg Mining District and specifically, of the Belshazzar Mine. Later investigations of the property were conducted by IGS staff members (Mitchell & Bennett, 1995; Leppert and others, 2007). Anderson toured the mine workings and he noted:

The Belshazzar mine is about centrally located within the “porphyry belt”, and dikes of quartz monzonite porphyry, rhyolite porphyry, and lamprophyre are exposed in the underground workings as well as on the surface, and, except for the lamprophyres, are cut by the Belshazzar and Centennial lodes (pl. 50). The quartz monzonite porphyry dikes are long and have, barring slight offsets, had been traced for more than a mile. One passes beneath the camp along the bottom of the canyon, but the most prominent extends from the summit of Boise Ridge east-southeast through the mine. Another body of quartz monzonite porphyry is also exposed in the crosscuts and drifts in the No. 3 and No. 401 workings and two others in the No. 5 crosscut. The two bodies in the upper levels are somewhat irregular in thickness and are separated by reefs of quartz monzonite. Both cross diagonally through the workings. The rhyolite porphyry dikes are smaller and not so conspicuous on the surface as the quartz monzonite porphyry dike. At least three

irregular rhyolite porphyry dikes have cut in the western part of the workings and still another in the Centennial drift. These dikes are of variable size and locally appear to branch. They also pass diagonally through the workings and curve somewhat south of east and dip steeply north to vertical. Where the rhyolite and quartz monzonite porphyry dikes have been cut by the lodes their rock is completely altered, and one variety is difficult to distinguish from another. The lamprophyric dikes may be recognized from fragments in the soil debris but cannot be mapped, except underground. Several of them are exposed in the workings, particularly in the west part of the mine and along the 401 and Centennial crosscuts. They have diverse trends, but most of them strike somewhat north of west, locally north. They range from a few inches to 8 feet in thickness. Their rock is bleached, though younger than the lodes which cut them, and identification as to type is difficult.

There is a third lode on the property in addition to the Belshazzar and the Centennial, but neither this lode, which lies parallel to and 600 feet north of the Belshazzar, nor the Centennial, which also lays parallel to and 680 feet south of the Belshazzar, has been stoped. These lodes occupy fissure zones that trend approximately N. 70°-75° E., but the Belshazzar lode is curved at a considerable angle. It is supposed to be an easterly extension of the Mountain Chief lode on the opposite side of the Fall Creek-Canyon Creek divide, but the strike of the Mountain Chief lode is about N. 45° E. until it nears the common end line of the two mines, and then it curves in a broad arc as its strike changes to N. 60° E. and then to N. 70°-75° E. as it continues across the Belshazzar ground. The dip of the Belshazzar also shows a marked change with depth. Near the surface its dip is relatively flat, but between the No. 3 and 401 levels it increases from 30° SE. to nearly 70° SE. and remains unchanged to the lowest level. The dip of the Centennial is steeply southeast on the 401 level. There are also numerous fractures and slips of parallel and diverse trend, which are independent of the main fissuring. Some of these are shown on the maps of the underground workings (pl. 50). The No. 3 crosscut is partly along the minor fissure zone of west-northwest strike and steep southwest dip. Some of the fractures along the Belshazzar fissure zone strike N. 35°-55° E. and extend for some distance into the walls. Near the end of the No. 3 drift one of the mineralized fractures strikes N. 20° W. and dips 70° NE. Similar cross fractures observed along the 401 level, some of them were mineralized and others barren. Most of the dike contacts show evidence of movement, and some of the fractures alongside contain thin seams or ore. Movement has also taken place subsequent to ore deposition, but the displacements are of minor magnitude, commonly no more than a few inches, and are mostly along the planes of the older faults. One fault in the east workings on the 401 level has, however, offset the Belshazzar lode for several feet. This particular fault strikes N. 10° E. and dips 55° SE.

The fissure zone occupied by the Belshazzar lode ranges from a few inches to 4 feet in width but lacks continuous mineralization and contains stretches in which the lode is marked only by shearing and a little gouge. Much of the ore along the fissure zone is confined to relatively small shoots where the fissuring is most pronounced. These shoots are irregular and characteristically swell and pinch on strike and dip. The richest ore has apparently been in the widest swells, and the principal swells were found between the 401 and No. 3 levels where the dip is notably flat. The distribution of the ore has apparently been controlled by pre-mineral fracturing, and the most extensive ore

deposition has been in zones where the rock was most fractured and rendered most permeable to the ore solutions, especially in openings produced by movement along a curved or irregular fault plane. The most favorable site for mineral deposition has been in the granitic rock of the batholith and not in the porphyry dikes or at lode and dike intersections. As elsewhere, the rhyolite porphyry tended to splinter rather than fissure, and, although wider zones of fractures were produced, the ore in them is more widely dissipated and the value, therefore, is not so high. On the No. 3 and 401 levels the ore in the larger bodies of porphyry was left unmined, and the stoping was confined to the more compact and better-defined fissure veins in the granitic rock and across some of the smaller rhyolite porphyry dikes. Stopping has been carried along the strike at intervals for a distance of more than 200 feet. Much of the ore occurred in more or less compact veinlike bodies, few of them more than 12 inches thick, but commonly surrounded by a fringe of smaller seams and stringers. In some places the ore occurred only as stringers and seams in the fractured rock. In and along the lode, and particularly along the ore shoots, the country rock has been intensely sericitized, locally permeated by carbonates, and widely impregnated with crystals of pyrite (pp. 278-80).

Ore Mineralization

In 1924 Ballard reported “The Belshazzar vein is a typical gouge-filled fault fissure, with abundant pyrite and occasional sphalerite mineralization...Two shoots of quartz-pyrite ore occur as small kidneys and lenses extending along the fissure in the vicinity of several dikes. The quartz ore is as a rule considerably fractured and frequently shows mineralization by sphalerite subsequent to the pyrite. Only very small amounts of galena are present. One specimen collected in the raise, showing some galena and considerable sphalerite, contained a small amount of bismuth” (Ballard, 1924, p. 60).

The wall rocks in the Belshazzar have been sericitized and locally carbonatized in a manner similar to the alteration in the Gold Hill mine, but less intensely...Quartz seams follow the shearing planes, and most of the valuable minerals lie in the quartz. Pyrite is the most abundant metallic mineral and, according to assays quoted by Ballard, has gold associated with it. Many of the irregular pyrite stringers contain little quartz. In some places, as near the east end of the Belshazzar vein on the 401 level, pyrite cubes over half an inch wide are distributed through sheared quartz monzonite. Arsenopyrite is locally abundant, especially in some of the high-grade pockets containing native gold. There is a little pyrrhotite in the arsenopyrite ore. Locally sphalerite, with minor amounts of galena, fills the interstices in shattered pyrite. Bismuth has been found in several places but it is far less abundant than in the Gold Hill mine (Ross, 1933, p 268).

The lode filling varies considerably in its composition from place to place, but most of it is a composite admixture of sulfide seams and nests cut and penetrated and in part included in younger seams and lenses of quartz, which also contains an essentially contemporaneous assemblage of pyrite, arsenopyrite, scattered small grains and tufts of bismuth and antimony minerals, dolomitic carbonate, and free gold... The older sulfide filling is dominated by pyrite, and many seams and stringers containing pyrite alone. In places the pyrite is cut by small nests and granules of sphalerite and galena and locally

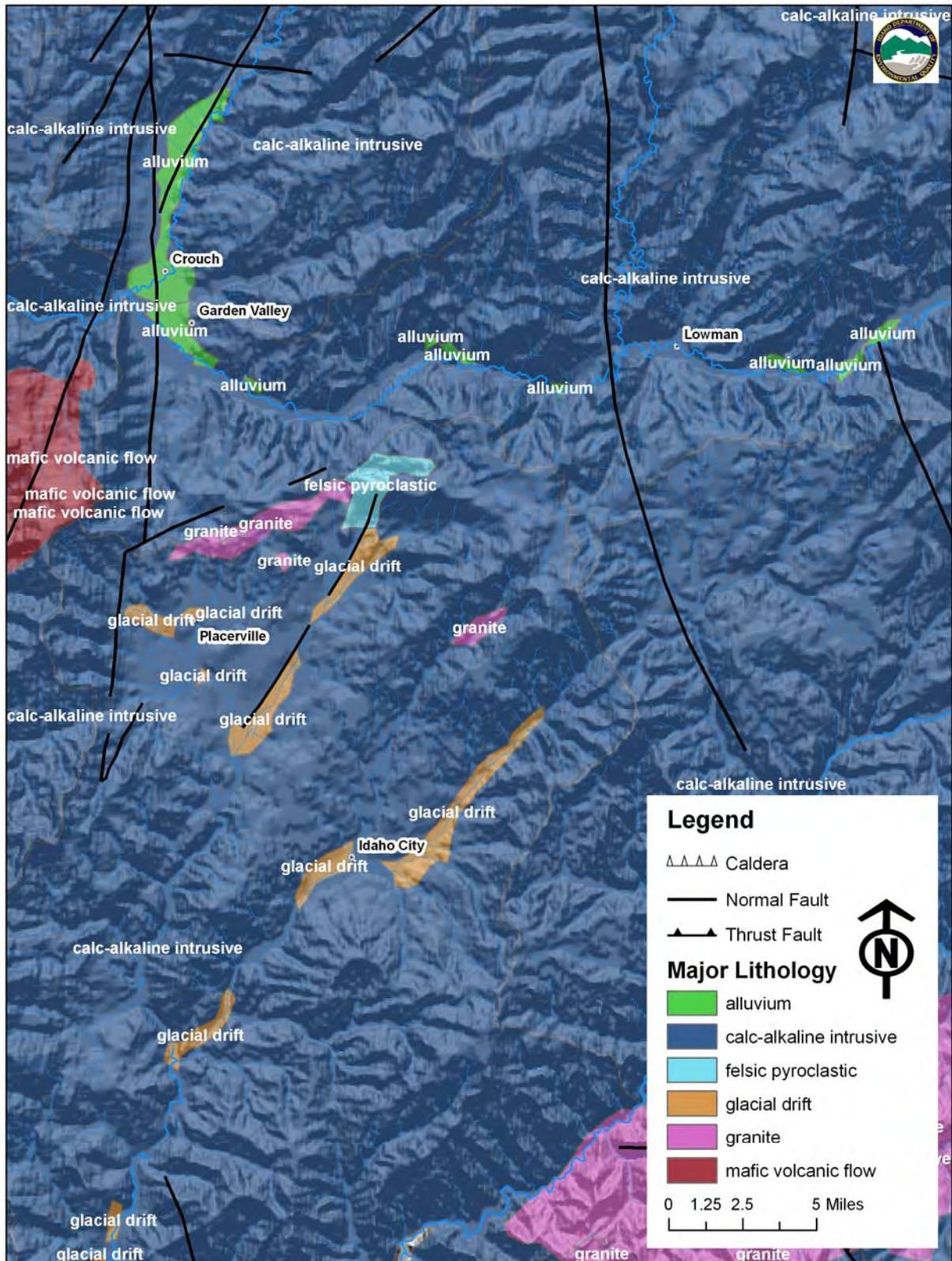
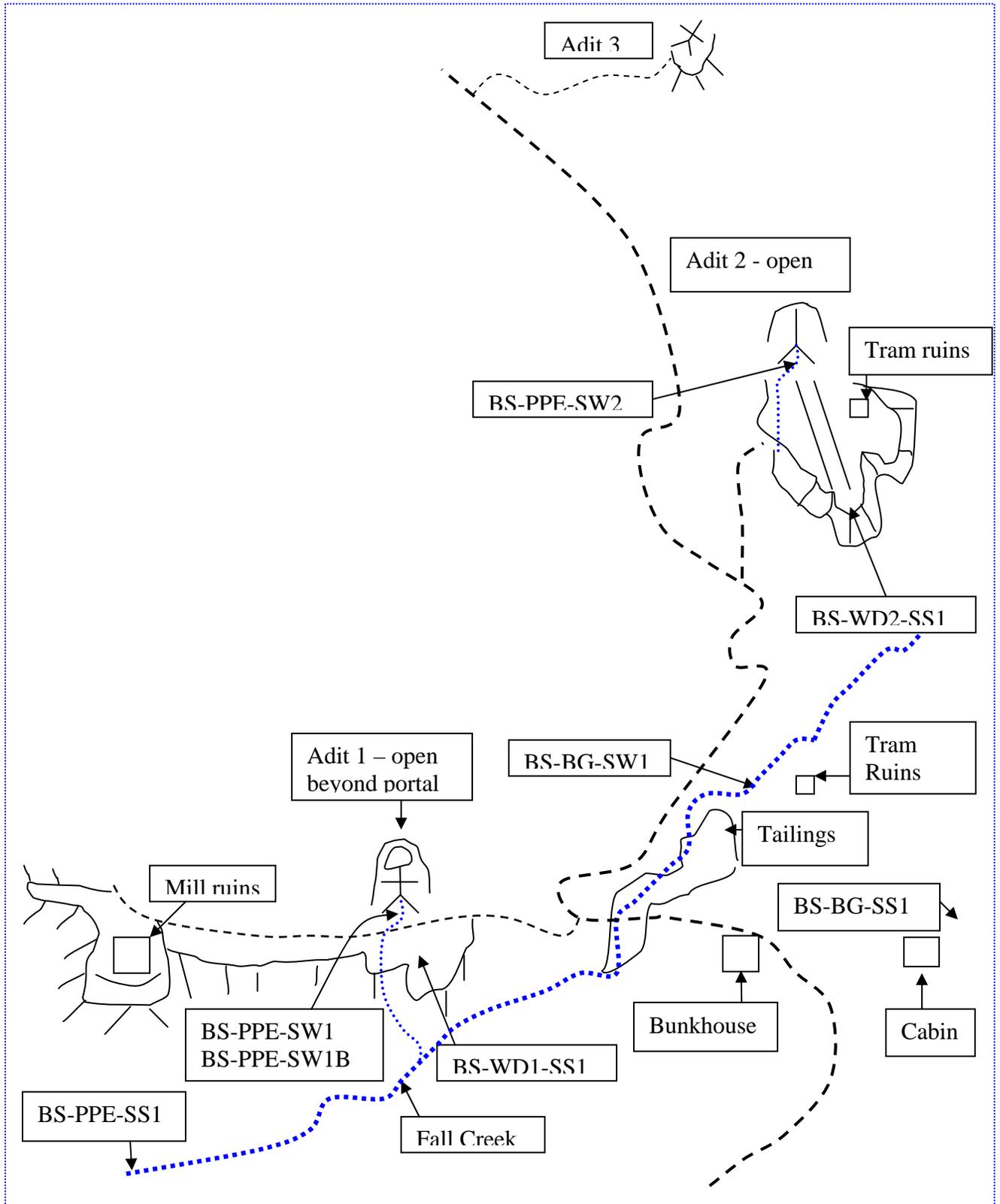


Figure 2



Sketch (Not to Scale)

by a little pyrrhotite, marcasite, tetrahedrite or tennantite, enargite, and chalcopyrite (Anderson, 1947, pp. 280-281).

Mine Facilities Description

Man-Camp and Office Area

The former man-camp, located on the north side of Fall Creek, is accessed from the east via FS Road 343B. A small cabin lies above the road to the north approximately 0.25 miles before entering the man-camp and office area. Remnant structures include a two-story office/bunkhouse and another cabin, possibly the residence of the former mine's superintendant (see Photos 1-6). A 1950's era truck, an older truck chassis and an old boiler lie abandoned in the camp clearing. Jig milling is present as are the remains of mill foundations, pipes, and a decant basin (see Photos 14-18). The tailings appear moderately pyritic, and the pile is estimated to contain <100 cubic yards of material. The pile is being eroded by Fall Creek (see Photos 19-21). Eroded tailings are obviously transported and are deposited along the perennial stream below the man-camp. A representative sample [BSMT-SS1] was collected from the tailings.



Figure 3.2.1: Historical photograph of Camp on January 15, 1928. Courtesy of the Idaho Historical Society (Photo # 63-160.110)

Adit # 1 (aka Tunnel 5)

The old mine road crosses Fall Creek heading southwest for an approximate distance of 150 meters to Adit # 1. This area is shown in Photos 13 & 22 through 30. The portal has partially collapsed, but the tunnel is open. Discharges from the adit, estimated at 25-30 gpm, flow across the road and beneath a small collapsed shed before disappearing into the waste rock dump toward Fall Creek. Surface water samples [BS-PPE-SW-1, BS-PPE-SW-1B] were collected at the portal during site visits.

Waste rock provides a foundation for a bench on which there were a number of mine buildings, including the upper mill site. The waste rock is dominated by quartz monzonite porphyry, which is coarsely grained and contains minor fines. The eastern limb extends beyond the mill site to the east, though some of the waste rock may have partially supported the structure. Waste rock is evident on the north bank of the creek and may be a continuation of the dump, which at one time probably dammed up the creek. The western limb fronts the adit and trends toward the creek. The two limbs are separated by 80 meters over which a trestle ran from the portal to the mill. Scattered remains of timber supports and track along the dump slope are present. Assorted metal debris and an empty storage tank were observed near the portal. Small trees and brush are established on the landing and to a lesser extent across the dump slope. The vegetation did not appear stressed. A representative soil sample was collected from the western limb [BS-WD1-SS1].

The volume of waste rock is calculated from the historical accounts of the length of the workings at Tunnel 5, rather than by direct measurement. The volume of the waste rock material is estimated at approximately 8,000 cubic yards. Owing to the steepness of the slope, however, the dump material may appear to be considerably larger than it actually is, and a large portion of the waste may have been transported downstream.

Mill Site

The mill ruins lie adjacent to and partially on top of the eastern limb of the waste dump. All that remains of the mill are its foundations and some of the abandoned milling and ancillary equipment including a ball mill, jaw crusher, electric generator and pumps were identified on the slope. The mill building apparently burned to the ground a number of years ago. Various solid wastes including scrap metal is scattered among the foundations, across the dump slope to the creek, and in the trees and brush. Figure 3.2.3 illustrates the relative location of the foundations and associated equipment. At the time of the September 15, 2007 site visit, a strong sulfide odor was detected, apparently emanating from the dump material beneath the mill.

Adit # 2 (aka 401 level)

Adit # 2 lies approximately 0.25 miles southwest of Adit # 1. Both Adit # 2 and Adit # 3 are accessed via the mine road. This road is narrow, rocky and extremely steep. Switchback turns and detours have been cut through the brush, probably by ATVs, to mitigate the short but steep grade. Erosion along these off-road routes is evident, increasing sediment loading of Fall Creek.



Figure 3.2.3: Historical photograph of the Belshazzar Mill, circa 1930's. Courtesy of the Idaho Historical Society (Photo # 78-191.1)

The site is shown in Photos 31 through 38, 41 and 42. Claim posts and monument marker were identified adjacent to Adit # 2. "Jim Rice" from Boise was listed on the marker for the Ore Gage claim.

IDEQ's designated Adit # 2 correlates with Anderson's (1947) description of the 401 level which contained 1700 feet of workings. Adit # 2 opened to a moderately sized waste dump, estimated to contain approximately 2500 cubic yards of material; the burned and scattered debris of the aerial tramway loading shed; a small landing; and various abandoned equipment, including an air recirculation pump, air piping, track, tram winch and other solid waste. Waste rock was also used as support for the tramway structure and landing. Therefore, the total estimate of waste rock at this site is estimated to be about 4,000 cubic yards. A soil sample was collected from the dump [BS-WD2-SS1).

The timbered portal is in fair condition, a few boards partially bar entrance to the tunnel. When viewed from the portal, some of the cribbing in the tunnel had fallen from the back and ribs. Pyrite was observed in the muck at the portal. Approximately 10 gpm of water was discharging onto the landing. Iron-stained precipitate borders the water's course across the landing and road into the south side of the dump, where it apparently infiltrates. Thick vegetation is supported and does not appear stressed. A surface water sample was collected at the portal [BS-PPE-SW2]. The adit water was not observed to resurface, either along the toe of the dump or from the adjacent ground.

Adit # 3 (aka No. 3 level)

Adit # 3 lies approximately 100 meters southwest of Adit # 2 and is accessed from the mine road by trail. The site is shown in Photos 39 and 40. Anderson (1947) mentioned two upper workings that were driven at least 500 feet, but IDEQ only located one of these workings. Most likely, the No. 3 level corresponds to Adit # 3.

The adit is caved, and waste rock was dumped immediately outside of the portal. The waste dump is small, estimated to contain <150 cubic yards of material. The dump is dominated by quartz monzonite porphyry with disseminated pyrite. Remnant tracks protrude from the collapsed adit onto the dump, minor solid waste was noted. A red wheelbarrow seemingly in perfect condition was observed near the toe of the dump. Because there was no surface water or direct connection between this dump and the perennial stream, and because the dump was so small Waste Dump #3 was not sampled.

Section 4 Sample Collection and Analysis

Sample Collection

As stated earlier, both IGS and IDEQ collected samples during site visits in 2002 and 2007 respectively. Sample locations are presented in Figure 5, and laboratory results are presented in Table 3 and Table 4, respectively.

Each of the IDEQ soil samples collected were initially approximately ten (10) pounds in size. Each sample location (except stream sediment samples) was excavated several inches with the material discarded. The excavation was deepened approximately six (6) inches further 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 bag while coarse (+1 inch) rock and woody debris were hand picked and removed. The samples were then screened over a 10 mesh sieve and placed in a second 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. Samples were transported to IDEQ's office and placed in secure storage to await shipping.

Sample Analysis

IGS Sample Analysis indicates that the mine and mill waste concentrations for total arsenic, total chromium, total lead, total mercury and total silver exceed Idaho's *Initial Default Target Levels* (IDTLs). These IDTLs are risk-based target levels for certain chemicals that have been developed by IDEQ using conservative input parameters, a target acceptable risk of 10^{-6} , and a *Hazard Quotient* of 1. An exceedance of the IDTLs indicates that if pathways are complete, and receptors can get a prolonged exposure to contaminants from the site, then additional site assessment work may be necessary to qualify true risk under current site conditions.

Toxicity Characteristic Leaching Procedure (TCLP) analysis was used to determine the leaching potential of the metals from the waste rock and tailings. The IGS data indicates the likelihood of arsenic to leach from soil/waste rock at a level that exceeds the IDTLs.

IDEQ Sample Analysis of stream sediment, mill tailings and waste dumps sample analysis is presented in Table 4. Samples were analyzed for Total Recoverable Metals (Totals), but subsequent TCLP analyses were not performed. In addition to IDTLs, the sample results were compared with the EPA Region 6 Human Health Medium-Specific Screening Levels (HHSL). Although HHSL values are not regulatory, they are derived from EPA guidance equations and commonly used defaults (EPA², 2007).

Sample **BS-PPE-SS1** was a discrete sample of sediment from Fall Creek taken below the Mill site and the eastern limb of Waste Dump # 1. Total arsenic concentration exceeds the IDTLs and the background soils concentration, marginally.

Sample **BS-MT-SS1** was a composite sample collected from the jig tailings pile in the Camp Area, just above Fall Creek. Concentrations of heavy metals included total arsenic, total cadmium, total lead, total mercury and total silver which exceeded IDTLs. Concentration of total arsenic exceeds HHSLs. Total concentrations of arsenic, cadmium, lead, mercury and silver significantly exceed background soils concentrations.

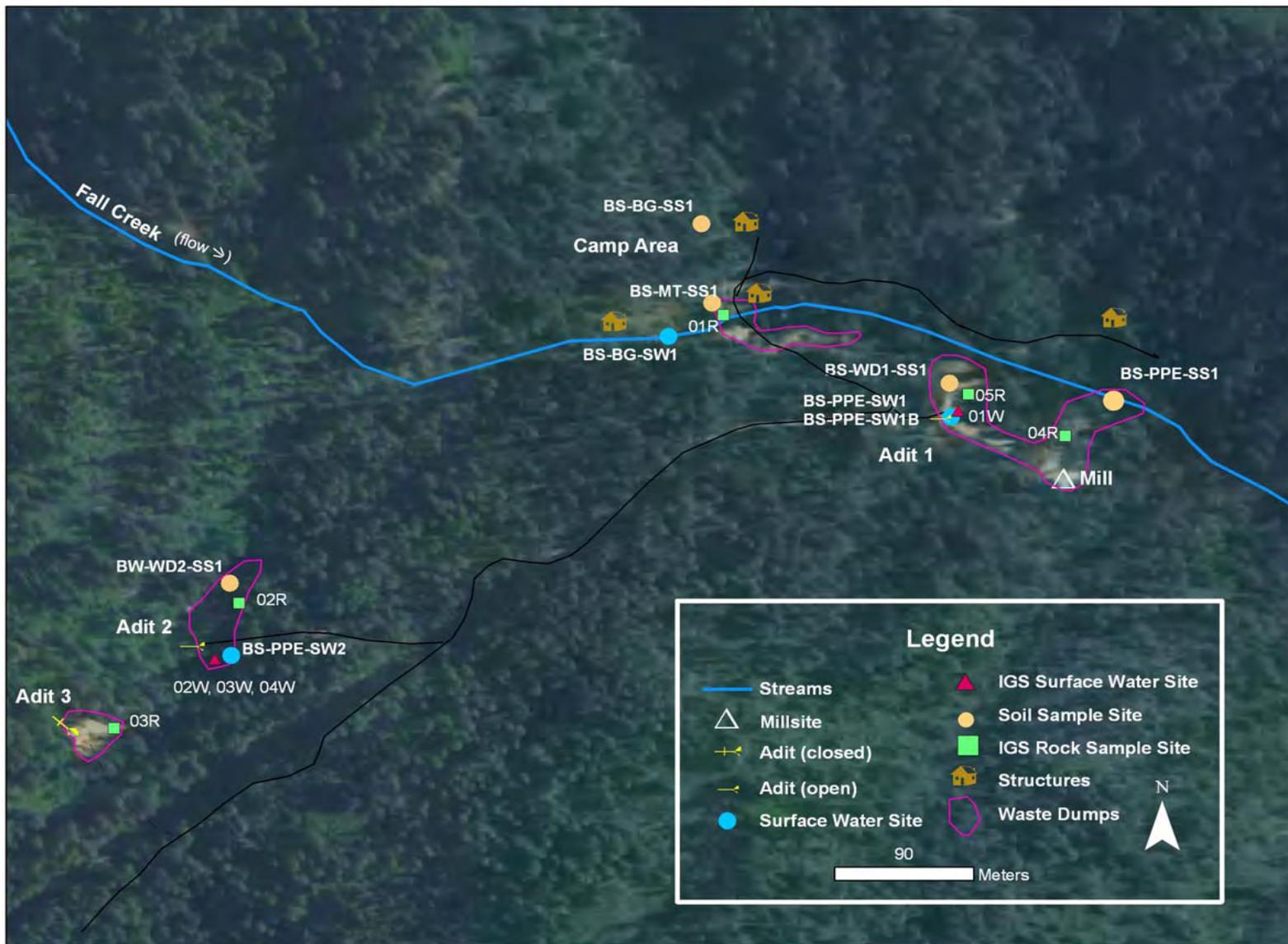


Figure 3

Table 3 Idaho Geological Survey Rock Sample and TCLP Analyses

Belshazzar Mine					
Description	IDTLs mg/kg	Camp Tails BO263-53102- 01R (ppm)	Camp Tails BO263-53102- 01R TCLP (ppm)	Above Mill BO263-53102- 04R (ppm)	Above Mill BO263-53102- 04R TCLP (ppm)
		Arsenic	0.391	872	0.29
Barium	896	<10	0.2	60.0	<0.1
Cadmium	1.35	2	<0.002	<0.5	<0.002
Chromium	7.9	170	2.5	103	<0.25
Copper	921	57		15	
Lead	49.6	472	0.87	88	1.3
Mercury	0.00509	25.6	0.00043	0.16	0.00025
Selenium	2.03		<0.5		<0.5
Silver	0.189	67.6	<0.2 *	3.6	<0.2 *
Zinc	886	166		46	

*Method Detection Limit (MDL) exceeds IDTLs.

Note: The data included in Table 3 as compiled from Figures A-5 and A-6 contained in the Boise NF report (IGS, 2007).

Table 4: Total Recoverable Metals Analysis (mg/kg)

Belshazzar Mine

Description	EPA Region 6 IDTLs HHSLs		Sample No.	Sample No.	Sample No.	Sample No.	Sample No.
	Units: Mg/Kg		BSPPE-SS1	BSMT-SS1	BSBG-SS1	BSWD1-SS1	BSWD2-SS1
Arsenic	0.391	23	5.7	763	4.1	645	374
Barium	896	1600	40.2	64.9	155	105	87.6
Cadmium	1.35	39	0.32	7.63	1.04	0.99	1.63
Chromium	7.9	210	2.64	<0.60	7.24	1.20	3.95
Copper	921	2900	1.06	12.6	7.61	21.1	15.3
Lead	49.6	400	2.89	315	12.3	110	489
Manganese	223	3600					
Mercury	0.00509	23	<0.033*	19.7	0.043	0.553	1.08
Nickel	59.1	1600					
Selenium	2.03	390	<4.0*	<4.0*	<4.0*	<4.0*	<4.0*
Silver	0.189	390	<0.50*	59.2	<0.50*	9.69	6.18
Zinc	886	23,000	39.7	45.7	59.2	24.2	80.1

* Method Detection Limit (MDL)

Sample **BS-BG-SS1** was a composite sample collected from the hillside above the “superintendent’s cabin” in the Camp Area. Concentrations of heavy metals included total arsenic and total mercury. The total arsenic exceeded IDTLs.

Sample **BS-WD1-SS1** was a composite sample collected from the crown and side slopes of Waste Dump # 1, on the western limb. Concentrations of heavy metals included total arsenic, total cadmium, total lead, total mercury and total silver which exceeded IDTLs. Concentration of total arsenic exceeds HHSLs. Total concentrations of arsenic, lead, mercury and silver significantly exceed background soils concentrations.

Sample **BS-WD2-SS1** was a composite sample collected from the crown and side slopes of Waste Dump # 2. Concentrations of heavy metals included total arsenic, total lead, total mercury and total silver which exceeded IDTLs. Concentrations of total arsenic and total lead exceed HHSLs. Total concentrations of arsenic, lead, mercury and silver significantly exceed background soils concentrations, while total cadmium is slightly higher.

Section 5 Pathways

Air

Concentrations of metals in wind borne fugitive dust have been the driving force behind cleanups in the former mining properties of the Wood River area, particularly at the Triumph Mine Site and the Minnie Moore tailings impoundment. However, the mill tailings pile at the Belshazzar appears competent and not readily amenable for aerial dispersion. Episodic release of airborne particulates by incursions from off-road vehicles is expected to be minimal. The waste dumps are primarily composed of coarse rock and are moderately consolidated. Consequently, the likelihood of aerial dispersion of particulates is expected to be minor.

Ground Water

The ground water flow system in the Belshazzar area exists in the biotite granodiorite (granite) of the Idaho Batholith (IDEQ, 2002). Ground water flow is generally from the steep stream margins towards the stream centers, then down-stream towards lower elevations. Regional and localized faulting may form preferential flow paths or boundaries to ground water flow within the bedrock system.

Shallow ground water and surface water are closely related as both are bounded by densely crystalline bedrock and both flow through or on top of the valley fill colluvium. The amount of surface and shallow ground water recharge to the regional aquifer system is unknown.

There are no public drinking water supplies and 65 private wells within a 4-mile radius of the Belshazzar site (Figure 3). There are no known persistent water quality problems in the area water supply wells.

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. 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**).

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. One source water assessments for drinking water supplies has been used in this Preliminary Assessment Process to evaluate the potential impacts to both public and private drinking water supplies near the site.

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 Mores Creek Hydrologic Province 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).

The Wilderness Ranch Owners Association Inc. operates and maintains a public drinking water system consisting of three wells and a surface water intake, located beyond the TDL, approximately 20 miles from the Belshazzar Mine site (IDEQ 2002). Generally speaking, the Wilderness Ranch public drinking water system rated as high (IDEQ 2002). Multiple factors affect the likelihood of movement of contaminants from the sources to the aquifer, which lead to this moderate to high score. Soils in the area moderately to well drained and no aquitard is present. The vadose zone is predominantly decomposed granite, which increases the score. On the valley floors the average depth to ground water zero (0) to 70 feet below ground surface.

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. Arsenic, copper, fluoride, mercury and nitrate have been detected in the Wilderness Ranch wells, and all were well below MCLs except for arsenic which was detected at 70 ppb in 1998 (IDEQ 2002). There are no long term or recurring water chemistry problems in the Wilderness Ranch system.

Surface Water

The Belshazzar is near the headwaters of a perennial drain, Fall Creek. The creek flows southeast where it enjoins Granite Creek at approximately 3.2 miles, entering through “Mud Flat”, a historic placer. Clear Creek merges with Granite Creek at 4.4 miles and Meadow Creek merges at 8.1 miles as well as other unnamed tributaries, before Granite Creek enjoins Grimes Creek at 8.75 miles near the southern portion of another historic placer. Grimes Creek continues to the south for the remainder of the Target Distance Limit (TDL) to a point in the area known as “Rye Flat”.

Surface water pathways to ecological receptors appear to be complete as evidenced by significant erosional features in tailings and waste dumps that indicate material is eroding directly into Fall Creek. Mine discharge may also be traced directly from Adit 1 to Fall Creek. There are no significant wetlands or aquatic species of concern in this watershed. There are no

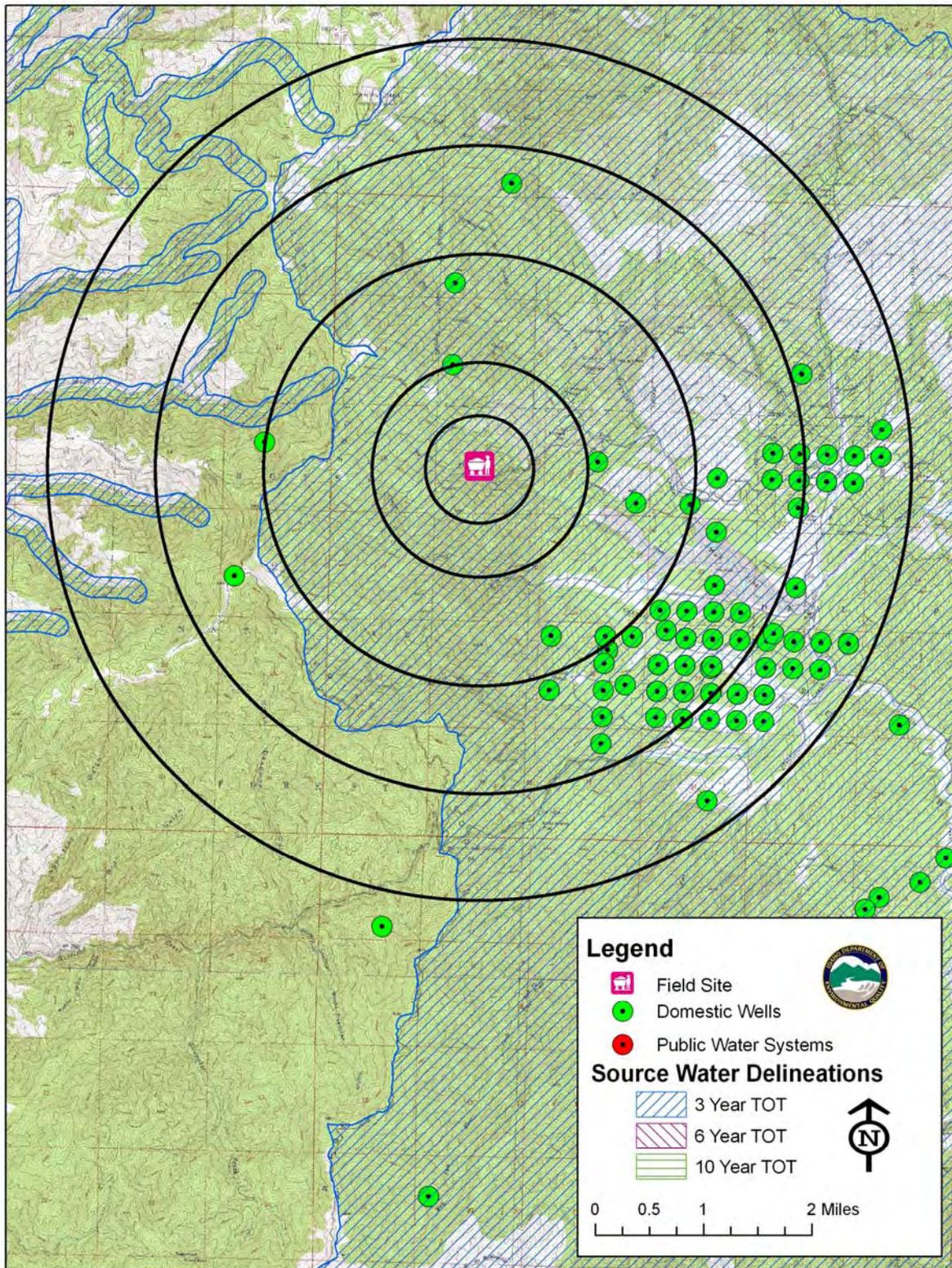


Figure 4

Table 2: Total Recoverable Metals Analysis (mg/L)
(Standards in “dissolved” unless stated)

Belshazzar Mine

Description	IDEQ Ground Water Standard	IDEQ Drinking Water Standard	IDEQ Cold Water Biota Standard	IDEQ Cold Water Biota Standard	Adit No. 1 Discharge (8-15-07)	Adit No. 1 Discharge (9-7-07)	Adit No. 2 Discharge	Fall Creek Background
	(T)	MCL	Acute	Chronic	BS PPE SW1	BS PPE SW1-B	BS PPE SW-2	BS BG SW-1
Arsenic	0.05	0.01	0.36	0.19	<0.025	<0.025	0.953	<0.025
Barium	2	2			0.0230	0.0361	0.154	0.0193
Cadmium	0.005	0.005	0.00082 (H)	0.00037 (H)	<0.0020	<0.0020	0.0410	<0.0020
Chromium (Total)	0.1	0.1			<0.0060	<0.0060	0.0070	<0.0060
Copper	1.3		0.0046 (H)	0.0035 (H)	<0.010	<0.010	0.163	<0.010
Lead	0.015	0.015	0.014 (H)	0.00054 (H)	<0.0075	<0.0075	<0.0075	<0.0075
Mercury	0.002	0.002	0.0021	0.000012 (T)				
Nickel		0.61	0.438 (H)	0.049 (H)				
Selenium	0.05	0.05	0.018 (T)	0.005 (T)	<0.040	<0.040	<0.040	<0.040
Silver	0.1*		0.00032 (H)		<0.0050	<0.0050	<0.0050	<0.0050
Zinc	5*		0.035 (H)	0.032 (H)	0.0282	0.0989	5.08	0.0156

* Secondary MCL (T) – Standard in Total (H) – Hardness dependent @25 mg/L

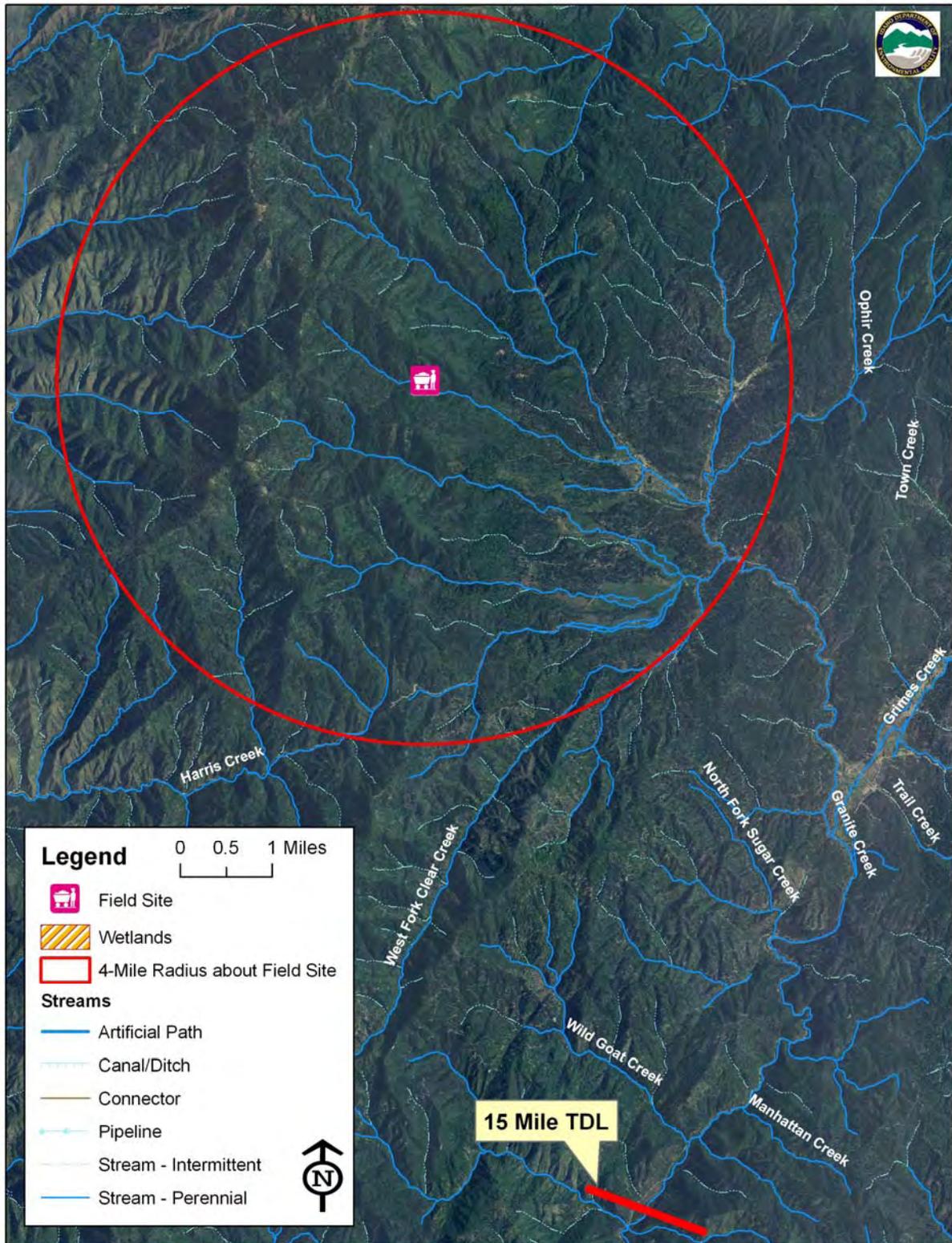


Figure 5

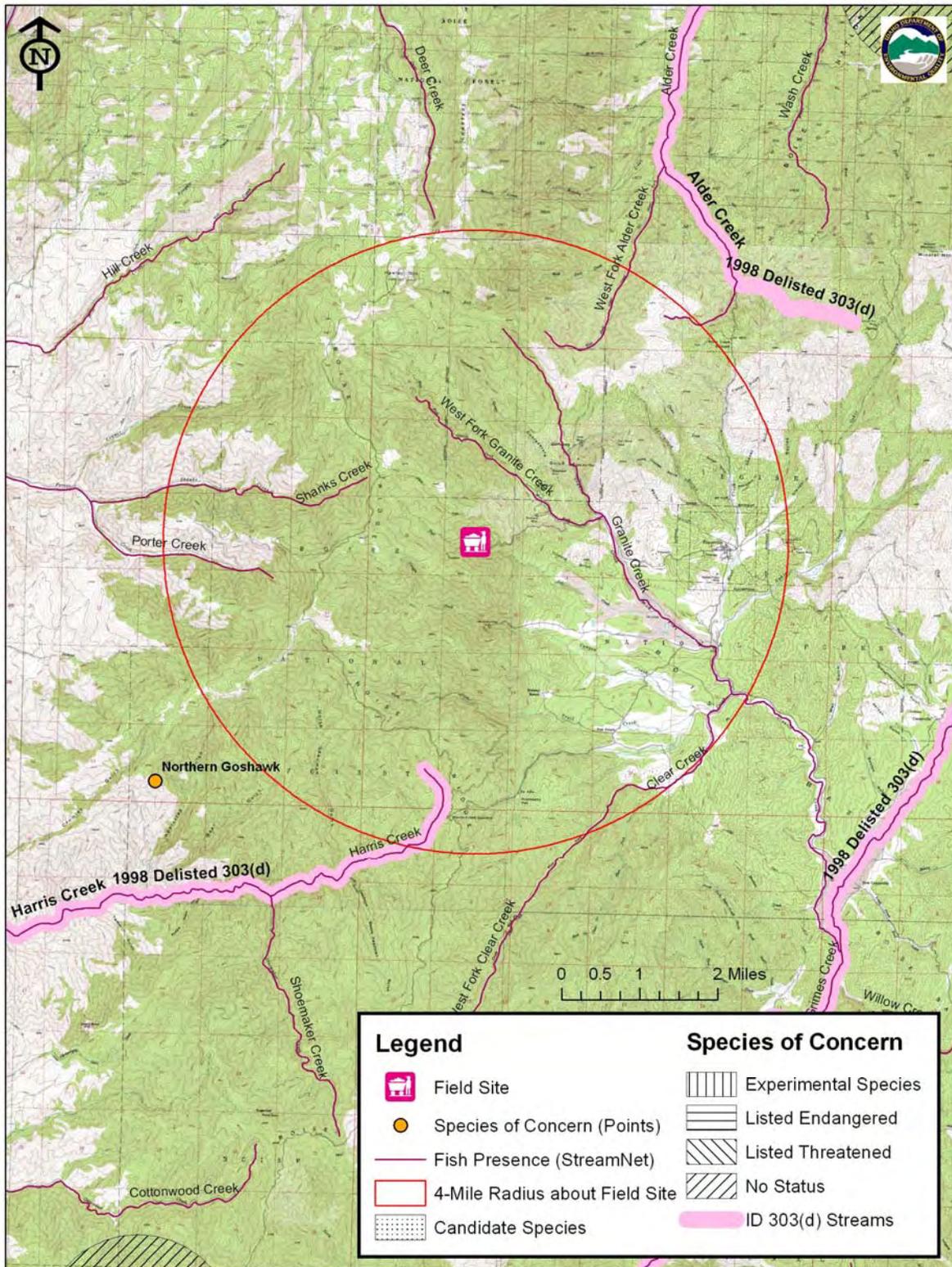


Figure 6

surface water intakes for public drinking water supplies within a four mile radius; however, the site lies within the 3-year time-of-travel for the surface intake at the Wilderness Ranch public water system.

Mill tailings and waste dumps through which Fall Creek is incising are major sources for metals laden sediment production. Two predominant mechanisms for sediment production were noted. First the waste and tailings are subject to rapid spring runoff from both the mill site and the mine adit locations. Second, sediment is mobilized as Fall Creek incises the dumps located on its banks.

However, based on the sediment and water quality samples collected at the PPE, it does not appear that there is significant surface water transportation of heavy metals to downstream receptors. In sum, this pathway is incomplete.

Soil

There are not any residences, schools or day care facilities within 200 feet of any of the Belshazzar workings. Mining claims have been established on sections of the site and occasional workers can be expected.

The primary population within a 4-mile radius of the mine is the town of Placerville. The community of Placerville reported to have 60 full time residents among whom 12 were listed as being below the age of 19, while the median age is 55. The 2000 census report indicated a marked increase in Placerville's population as compared to the 1990 census when only 14 full time residents were recorded (USCB, 2008).

Although real estate sale and development has slowed in recent months, several land tracts are available in the surrounding areas, including one property located at the headwaters of Fall Creek. Summer cabin construction is expanding into the area, along Harris Creek and Grimes Creek roads. The nearby patented Mayflower Mine property houses several summer cabins. Residential development on or in proximity to inactive and abandoned mines has resulted in inquiries by local realtors and potential buyers regarding the risks associated with mine properties.

Section 6 Risk Analysis

The heavy metal concentrations exhibited in the tailings pile and waste rock dumps may present an unacceptable health risk for receptors visiting and/or working at the site. To identify risks to human health from the Belshazzar soils, DEQ performed the following risk evaluation using the DEQ 2004 Risk Evaluation Manual (REM). This analysis is based on exposure to surface soils, and it utilized the following sample data from the tailings, waste dump # 1 and waste dump # 2.

It is assumed that recreational visitors have the potential to contact contaminants at the site while hiking, hunting, and riding mountain bikes or ATVs. However, it is also assumed that most visitors may access the site specifically to explore for minerals. Therefore, the exposure routes, in decreasing order of significance, are incidental soil ingestion, inhalation of particulates, and dermal contact.

Exposure Duration and Frequency

Both excess cancer risk and non-cancer risk (hazard index) are shown in Table 5. The age-adjusted receptor represents an individual who visits the site over 30 years, six times as a child, nine times as an adolescent, and fifteen times as an adult. For non-residential receptor the exposure duration is 6.6 years. The exposure duration of a construction worker is 30 days; this is assumed to be a conservative estimate owing to the duration of most construction projects.

For exposure routes involving direct contact with soil, including soil ingestion and dermal exposure, it is assumed that receptors have contact with soil primarily in warmer months, when the ground is not frozen or snow covered. For this reason, an exposure frequency of 270 days per year is used for these exposure routes for both residential and nonresidential scenarios. The direct contact exposure frequency for construction workers is 30 days per year (REM, Appendix E, p. E-2).

Discussion

Although residential and non-residential scenarios have been included for reference, the most appropriate receptor for the site is the construction worker. Most of the receptors are expected to actively work the mineral claim or adjacent ground. Considering the climate, the elevation and slope aspect of the workings, late-May through September might represent the typical mining season. The frequency and duration of the construction worker seems to be appropriate to the type of mining activities likely to occur at the Belshazzar.

Excess cancer risk and non-cancer hazards at the Belshazzar Mine are driven by arsenic concentrations.

Waste Dump # 1: Excess cancer risk for all residential and non-residential receptors is greater than the acceptable level of $1E-05$, as defined by the REM. The construction worker receptor is slightly less than the acceptable level. The non-cancer hazard is greater than the acceptable level (Hazard Index = 1) for a receptors.

Waste Dump # 2: Excess cancer risk for all residential and non-residential receptors, particularly workers living or camping at the site, is greater than the acceptable level, while the construction worker receptor is slightly less than the acceptable level. The non-cancer hazard index is less than the acceptable level for the construction worker receptor.

Tailings: Excess cancer risk and non-cancer for all residential and non-residential receptors are greater than the acceptable level of $1E-5$ defined by the REM, but the construction worker receptor is slightly less than the acceptable level. The non-cancer hazard is greater than the acceptable level for the construction worker receptor.

Uncertainty

The risk estimates presented here are based on specific locations and may not be representative, as it is unlikely receptors would repeatedly spend so much time in these areas over an exposure duration of many years, or even 30 days.

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The analysis presented here assumed that all of the arsenic is 100% bioavailable. It is likely that bioavailability varies in soils throughout this site; 60% arsenic bioavailability has often been assumed for arsenic in soils contaminated with mine waste.

TABLE 5: SUMMARY OF CUMULATIVE RISK AND HAZARD INDEX

Routes of Exposure Surface Soil: Inhalation of Vapors and Particulates, Dermal Contact, and Accidental Ingestion	RECEPTOR											
	RESIDENTIAL								NON-RESIDENTIAL		CONSTRUCTION	WORKER
	CHILD		ADOLESCENT		ADULT		AGE-ADJUSTED		Risk	Hazard Index	Risk	Hazard Index
	Risk	Hazard Index	Risk	Hazard Index	Risk	Hazard Index	Risk	Hazard Index				
Waste Dump 1	1.12E-03	2.90E+01	2.04E-04	3.53E+00	3.31E-04	3.44E+00	1.65E-03	8.58E+00	7.10E-05	1.68E+00	8.64E-06	1.35E+00
Waste Dump 2	6.47E-04	1.69E+01	1.18E-04	2.06E+00	1.92E-04	2.00E+00	9.57E-04	4.99E+00	4.12E-05	9.76E-01	5.01E-06	7.84E-01
Tailings	1.32E-03	3.53E+01	2.41E-04	4.30E+00	3.91E-04	4.17E+00	1.95E-03	1.04E+01	8.40E-05	2.05E+00	1.02E-05	1.64E+00

* modified from REM Risk Sum sheet

Note: The preliminary risk estimates are based on exposure only to the tailings pile, waste dump # 1 and waste dump # 2. A full risk analysis of the Belshazzar Mine would require additional characterization of all tailings and waste rock areas, as well as estimates of background concentration in unexpected areas.

Section 7 Conclusions and Recommendations

Based on the concentrations of heavy metals in the various mine and mill waste dumps, the disconnection between these sources and receptors and the very low potential for prolonged exposures to heavy metals concentrations, IDEQ has concluded that No remedial Action is Planned for this site (NRAP). However, serious consideration should be taken by the USDA Forest Service to discourage recreational use of the site, and operating plans for mining of the site should include site safety plans with abate fugitive dust and worker exposure during operations.

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PHOTOGRAPHS

Mine Camp Structures



Photo 1

View to southwest, entrance to mine camp; bunkhouse (left), tailings (center beyond road)



Photo 2

View to southwest of truck chassis & boiler (right, in trees)



Photo 3

View to north-northeast; office/bunkhouse, abandoned truck (circa 1950's) at right



Photo 4

View to north; mine road (left), office/bunkhouse with cabin beyond



Photo 5
View to north; superintendent's cabin above bunkhouse



Photo 6
Close-up view of superintendent's cabin



Photo 7

View to north; cabin across Fall Creek from mill ruins (lower)

Mill sites, process areas & equipment



Photo 8

View to northeast (downhill); Primary Crusher – mill site



Photo 9

View to east; Mill debris, boiler (top center)



Photo 10

View to northeast (downhill); Ball Mill and Jaw Crusher amid Mill foundation



Photo 11

View to southwest (uphill); Ball Mill and Jaw Crusher amid Mill foundation



Photo 12

View to southeast; Electric Motor and Pump on Mill foundation



Photo 13

Close-up view, half-buried Trammer or Welder

Jig Mill



Photo 14

View to south; Jig Mill platform, on north side of Fall Creek above camp area



Photo 15

Close-up view; Jig Mill and tails



Photo 16

View to southeast; Decant Basin in upper portion of tailings pile, road (center) to millsite (not in picture)



Photo 17

View to west; Jig tailings pile, Fall Creek at lower left



Photo 18

View to east; Jig tailings pile



Photo 19

View to east; Fall Creek under-cutting Jig tailings pile, debris in stream



Photo 20

View to southeast, Fall Creek incising tailings and sediment



Photo 21

View to south; tailings or sediment below waste dump #1

Workings



Photo 22

View to south; Adit # 1 portal, discharging to left



Photo 23

View to southwest; Adit # 1 portal, rock & timbers in tunnel, mostly caved



Photo 24

View to southwest; Adit # 1, caved back of portal, tunnel open at outcrop face



Photo 25

View to west-southwest; Adit #1 (upper center), discharge through collapsed shed (?)



Photo 26
View to west; collapsed shed near Adit # 1



Photo 27
View to south, empty 500-gallon storage tank, near Adit # 1



Photo 28

View to southeast; Waste Dump # 1



Photo 29

View to west-northwest; trestle remains across Waste Dump # 1



Photo 30

View to north; Adit #1 discharge incising Waste Dump # 1, Fall Creek (upper)



Photo 31

View to north; Adit # 2 (far left center), collapsed tram shed (upper left), waste dump (right)



Photo 32

View to northwest; ruins of tram loading building, winch (center)



Photo 33
Close-up; tram winch



Photo 34
View to southwest; remnant track atop waste dump, air pump (left), Adit # 2 lies in shadow at top center



Photo 35
View to south; air circulation pump and pipe



Photo 36
View to west, Adit # 2 portal



Photo 37

Close-up into Adit # 2 portal, discharge (lower center), abundant pyrite in muck



Photo 38

Close-up, boot print (recent?) leading into Adit # 2 portal



Photo 39

View to northwest; caved Adit # 3, waste rock piled in front of adit

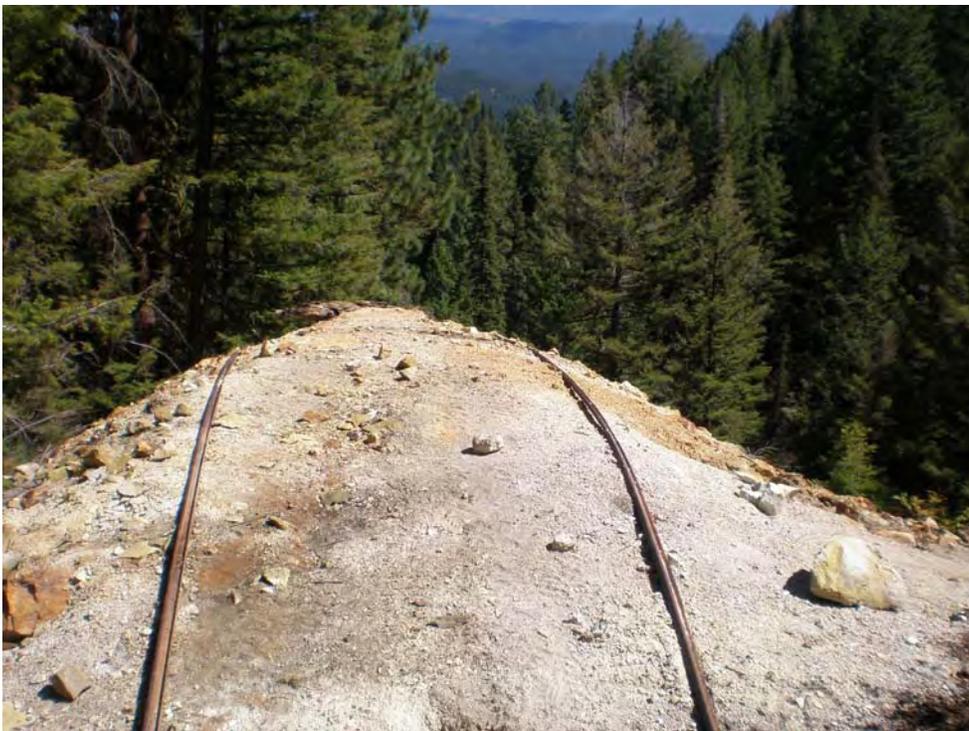


Photo 40

View to east; remnant track protruding from Adit # 3



Photo 41

Corner marker: the "Ore Gage" claim, along the old mine road near Adit # 2



Photo 42

Location monument nearby Adit # 2