

ARIZONA MINE

(Aka ARIZONA, AND IRIS PATENTED MINE CLAIMS)

PRELIMINARY ASSESSMENT REPORT

Blaine County
State of Idaho



**Department of
Environmental Quality**

December 2009

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

December 22, 2009

Atlas Mine & Mill Supply
North 1115 Havana St.
Spokane, WA 99202

RE: Site Assessment of the Arizona Mine

Dear Mr. Sir/Madam:

The Idaho Department of Environmental Quality (IDEQ) has completed a review of historical mining data and geological information of the above referenced mine. Subsequent to that review, IDEQ conducted a site visit of the Arizona mine. During the site visit, mining facilities were observed and mapped in order to complete the analysis necessary to complete an Abbreviated Preliminary Assessment.

PAs are conducted according to the Federal Comprehensive Environmental Response, Compensation and Liabilities Act. The reasons to complete a Preliminary Assessment 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 of hazardous substances through the Hazard Ranking System (HRS).

IDEQ has 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.

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There was no evidence of acid mine drainage or impacted surface waters. Based on a number of factors discussed in the following report, IDEQ has determined that No Remedial Action is Planned (NRAP) for this property.

Attached is a Preliminary Assessment report. IDEQ is recommending to EPA that the status of the mine is considered NRAP.

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 (208-373-0554) if you have any comments, questions, or if I may be of any other assistance.

Sincerely,



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

Attachments

cc: Ken Marcy – U.S. Environmental Protection Agency
Arizona Mine

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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
WRP	Waste rock pile

Section 1. Introduction

This document presents the results of the preliminary assessment (PA) for the Arizona Mine. The Idaho Department of Environmental Quality (DEQ) is 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.

DEQ often receives complaints or information about sites that may be contaminated with hazardous waste. These sites 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, DEQ 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

The Arizona Mine is located in the Croy Creek drainage basin in Section 23 of Township 2 north Range 17 east, Blaine County Idaho. The mine is accessible by vehicle through Bullion Gulch by way of an unimproved road that intersects Croy Creek Road, approximately 4.5 miles west of Highway 75 in Hailey, Idaho (Figure 1).

In 2006 DEQ participated in a site visit at the Arizona Mine, and sampling conducted by Ecology and Environment Inc. (E&E, 2007). DEQ is assimilating the information collected during that site visit and sampling with available historic and geological data collected during desk top research.

Section 2. Ownership and Status

Based on the limitations of the Blaine County Tax Rolls, it appears that Daniel Henry and Atlas Mine and Mill are the current owners of the patented Arizona Mine (Blaine County, 2009).

Owner	Mine/Claim Name	Parcel Number	Partial Determination
Daniel Henry 308 North 2nd Avenue Hailey ID 83333	Arizona Mine	RP1M0000001510	NRAP
Atlas Mine & Mill Supply North 1115 Havana Street Spokane, WA 99202	Iris patented claim (1/16)	RP1M000000700A	NRAP
	Iris patented claim (15/16)	RP1M0000001290	NRAP

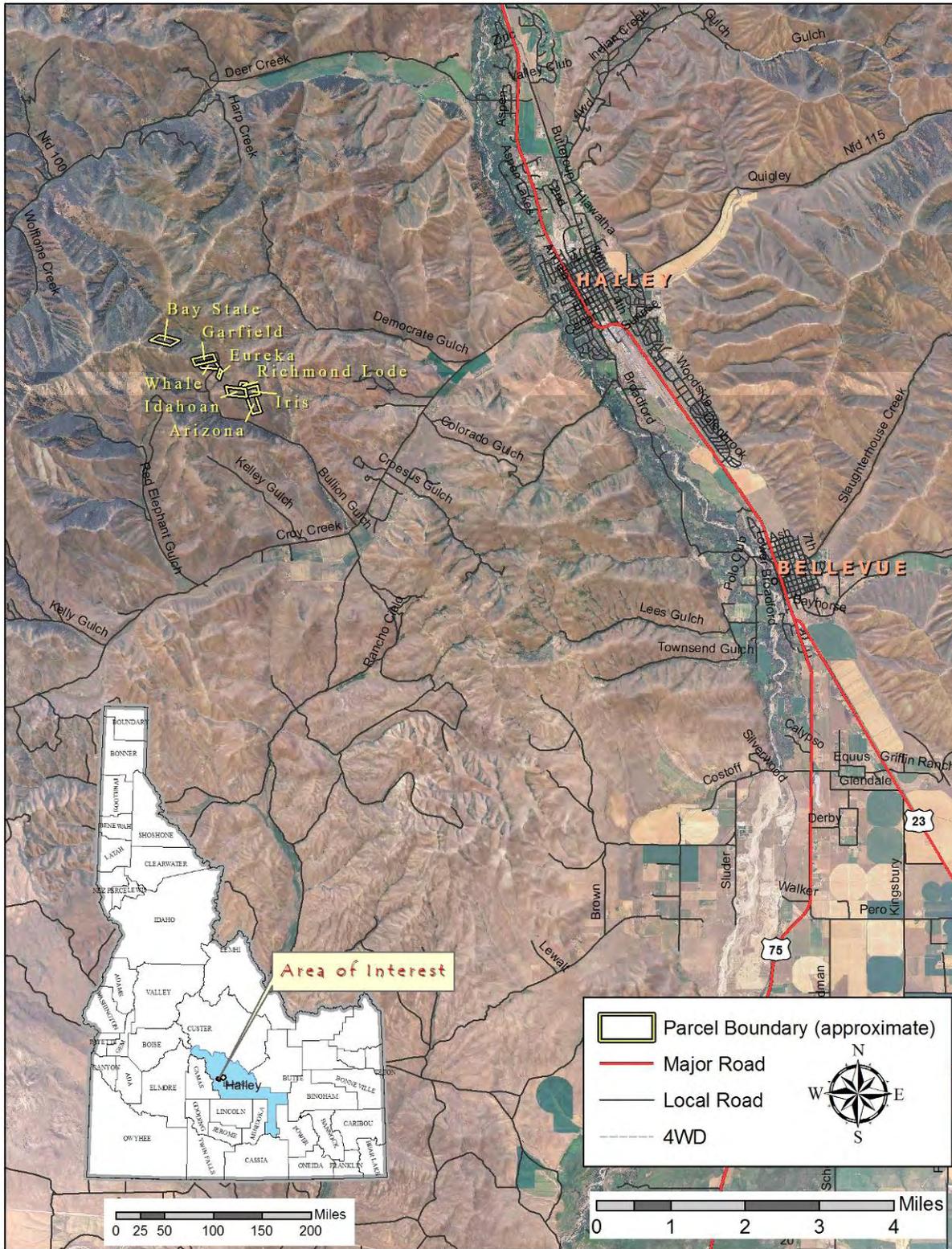


Figure 1. Location of the Arizona mine with USFS parcel data overlay. (Photo source: Blaine County NAIP 2004)

Section 3. Mine Site History

The amount of history DEQ found addressing the Arizona Mine's (Arizona) history is limited primarily to Umpleby and others, 1930 with other documents referencing Umpleby and others. The Arizona is the first of a number of mines (Eureka, Whale, Bay State, Garfield, and Idahoan among others) on the same northwest trending lode system. The majority of these mines were owned and operated by the New York-Idaho Exploration Co. in the 1880s, with the exception of the Arizona mine which was owned by Charles Cuneo. The Arizona Mine (Group) consisted of the Arizona, Iris, and nine other patented claims, largely in Section 23, T. 2 N, R. 17 E (Umpleby and others, 1930).

Umpleby and others (1930) reported the Arizona produced \$20,000 of ore according to Mark King, one of the owners. "In 1915 to 1918 Charles Cuneo worked on the Arizona and the adjoining Iris claim and made some shipments of ore from an open cut in the Arizona and a tunnel and shaft, now caved, on the Iris." In 1888 and 1890 the Iris claim produced 2.4 tons of ore, 177.3 ounces of silver, and 2,902 pounds of lead. The Arizona claim produced 4.8 tons of ore, 315.83 ounces of silver, and 4,879 pounds of lead between 1900 and 1901.

...The only recent shipments of which record is available are one in 1917 of 22 tons containing 1,345 ounces of silver and 20,292 pounds of lead, and another in 1918 of 43 tons containing 2,292 ounces of silver 39,911 pounds of lead, and 58 pounds of copper. A tunnel with its portal on the Iris claim exposed the vein under the Arizona open cut, and there are several other small tunnels on the two claims. The Plata Mining Co. has confined its efforts so far to driving a crosscut tunnel which is intended to cut the Arizona vein at depth. The portal of this tunnel is some distance down the gulch to the southeast of the old workings. On July 27, 1923, the tunnel has been driven some-what more than 380 feet with a trend of N. 28° E. and two short drifts to the northwest has been opened from it. Soon after this date operations were suspended.

Umpleby and others, 1930

The Arizona is on a lode system that probably extends north through the Whale mine. The lode has several off-shoots and is cut by a number of faults with minor displacement. The lode, as with most lodes in the district, is shear zones with little evidence of mineralization at some locations and excellent lead-silver ore at others. The ore is principally low-grade material averaging about 8 per cent lead and 9 ounces of silver per ton with about a quarter 50 to 60 per cent lead and 60 to 65 ounces of silver per ton (Umpleby and others, 1930).

Section 4. Climate

Climate information provided in this section is based on a climatological summary for Hailey, Idaho which was obtained from the National Oceanic and Atmospheric Administration (NOAA), National Climatic Data Center. The climatological data collected at the Hailey Airport (elevation 5,328 amsl), is for the period of 1951 through 1980. 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 region is characterized by short cool dry summers and very cold winters. The total annual precipitation measured at the Hailey Airport averages 16.2 inches. The majority of precipitation occurs as snow. Total annual snowfall averages 78.2 inches with most snowfall occurring in December and January. The driest months are July, August and September.

Based on records from 1951 to 1980, the average annual temperature measured at the Hailey Airport is 43 degrees Fahrenheit (F). The lowest temperature recorded for this period was – 28 degrees F in 1962. The highest temperature for this period of record was 100 degrees F in 1953. January is the coldest month with an average temperature of 19.5 degrees F. July is the hottest month with an average temperature of 67 degrees F.

Section 5. General Geology

Numerous geology and mineral resource studies of the Wood River and adjacent areas have been accomplished. 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; Kiislgaard 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; DEQ, 2002 & 2008; E&E, 2007).

Generally speaking the Croy Creek basin is hosted by sheared and altered quartz monzonite intrusives, with a basal chert-pebble conglomerate; of the Wood River formation. The lower portions of ephemeral drainages contain thick layers of colluvial fill, which are predominantly sandy remnants of the decomposed quartz monzonite. The colluvium is extremely erodible, and generally deeply incised. Figure 2 shows the generalized geology of the Arizona area.

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 that host many of the ore deposits in the Wood River region. They also host rather large intrusive bodies of diorite and quartz monzonitic rock which are regarded as outliers of the Idaho batholith. There is 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 (1950, p. 7) went on to note that, “The folding within the area is comparatively simple and consequently faulting constitutes the outstanding feature.”

To the south of the mine, a thrust fault separates the overlying sediments with the underlying intrusives. In discussion of the Red Elephant and Bullion areas, which are very similar in nature to the Arizona area, Link and Worl (2001) described geologic and historic information relating to stratigraphy and mineralization relationships within Dollarhide sedimentary sequences in the Mineral Hill district.

The Bullion mineralized area...is underlain by the lower and middle members of the Pennsylvanian and Permian Dollarhide Formation, which is folded into upright and west-overtuned map scale folds....The lower member of the Dollarhide Formation,

hosts most of the mineralized rock (Skipp and others, 1994). Fryklund (1950), following Umpleby and others (1930), labeled these rocks as Wood River Formation, though he notes, "it is possible that Milligen formation is also present" (p. 64). An unpublished map (circa 1970) of W.E. Hall labels the dark-colored rocks in the Bullion area as Milligen Formation. Hall (1985) showed the rocks as Dollarhide Formation, and Wavra and Hall (1989) showed them as upper member, Dollarhide Formation.

The lower member of the Dollarhide Formation in the Bullion area contains fine- to medium-grained sandstone, black siltite and black limestone or marble. A distinctive lithology in the lower member is channelized disorganized conglomerate that contains mainly intrabasinal soft-sediment clasts of siltstone and sandstone. The lower member occupies both sides of Bullion Gulch and the central part of Red Elephant Gulch. The rocks east of Bullion Gulch are mapped as being stratigraphically high in lower member Dollarhide Formation, because the middle member quartzite is not present. They are intruded on the east by the Deer Creek stock.

In the Bullion area the middle member of the Dollarhide Formation (regionally about 300 m [984 ft] thick) contains silicified sandstone that crops out as light-gray to brown quartzite that forms the high ridge between Red Elephant and Bullion Gulches. These rocks were shown as Wood River Formation on the map of Hall (1985). The mineralized veins of the Bullion area do not extend southward into the middle member Dollarhide Formation. The middle member, much less silicified, is also present in west-dipping beds on the ridge of Kelly Mountains (Link and Worl, 2001, pp. 12 & 14).

5.1 Structure

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.

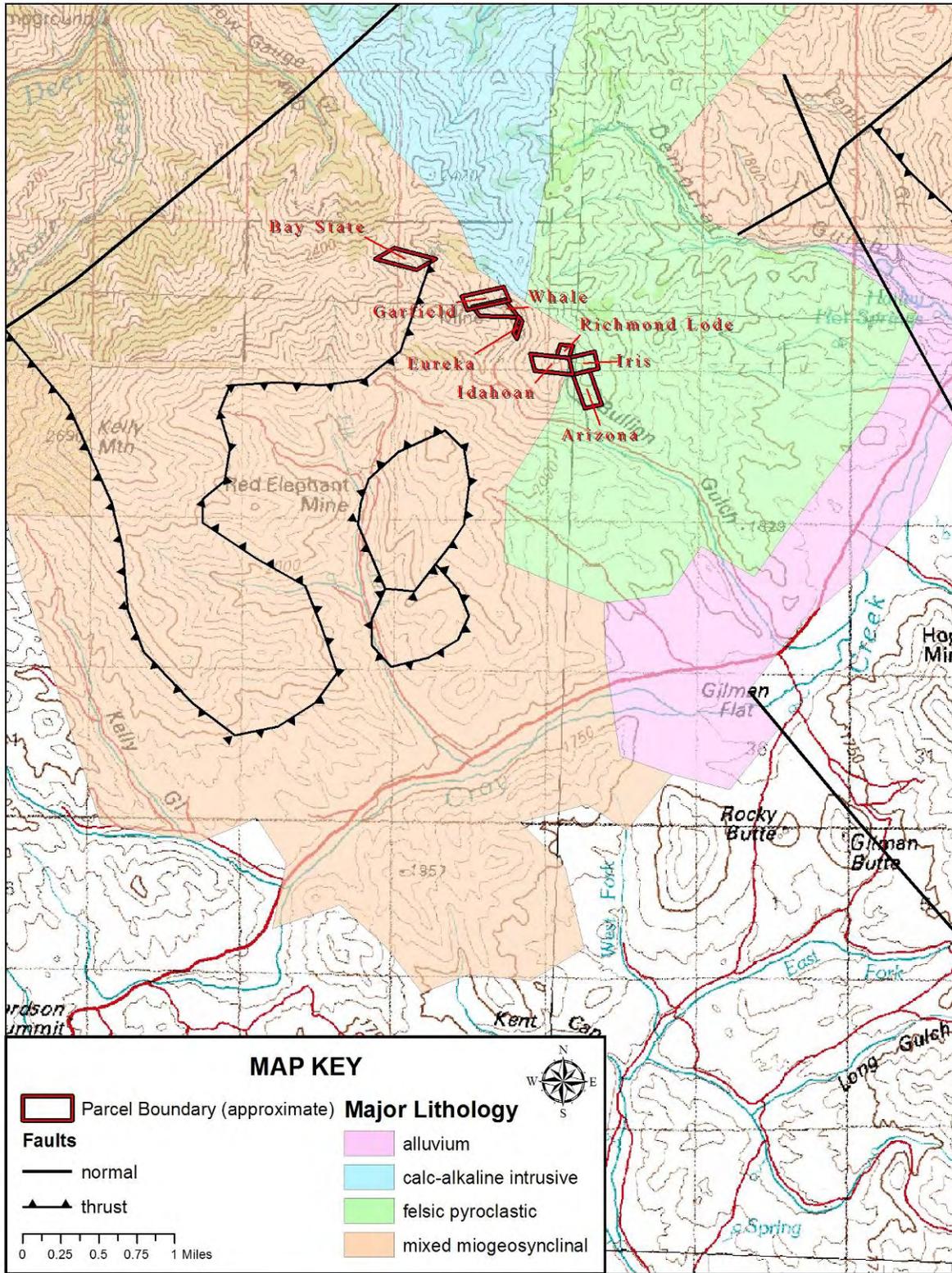


Figure 2. Geology of the Arizona Mine area. (Map source: USGS 24k)

Section 6. Current and Potential Future Land Uses

6.1 Current Land Uses

Current land uses in the Bullion Creek sub-drainage includes biking, hiking, hunting, horseback riding and off-road vehicle (ORV) touring. The Arizona and surrounding mines lie within the Bureau of Land Management's Bullion grazing allotment (BLM, 2009), so some grazing is likely occurring at the mine.

The most direct route approaches the gulch from Croy Creek. Public access to the mine is not restricted. Ready access to the old mine road is afforded from Bullion Gulch Road. During a DEQ's site visit to near by mines in the fall of 2009, staff noted abundant forest grouse and several deer in the area.

6.2 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 and homes presently constructed at the mouth of Bullion Gulch. It appears likely that unauthorized access to the property may increase as the local populations and the recreation industry expands.

Section 7. Site Conditions and Waste Characterization

DEQ with E&E (2007) conducted a site inspection in July 2006 that was reported in E&E's Croy Creek Site Inspection Report (2007). The inspection team conducted the inspection of the mine site from the roads as they did not have permission to access the property. During DEQ and E&E's visit, they collected one waste rock pile, and one probable point of entry soil/sediment samples from outside the claim boundaries.

Since access to this mine had not been obtained, the START [Superfund Technical Assessment and Response Team] mapped the mine from the road and collected samples from locations on public land. The volume of the sampled source; and its associated sample number and analytical results are presented below:

Waste Rock Pile 1 – *This waste rock pile could not be measured by the field team since access to the property had not been obtained. However, from their vantage point, the field team estimated the pile had a volume of 2,000 cubic yards. One waste rock sample, AMWRO1SS, was collected from this source at a location where it extended out into the waterway on public land. Analytical results from this sample indicate the presence of nine TAL metals at significant concentrations with respect to background concentrations...*

E&E, 2007

Section 8. Soil/Sediment Sample Collection

One soil and one sediment sample was collected from public land adjacent to the Arizona in 2006 during the E&E site inspection (Figure 3). Background samples were collected north of the Idahoan.

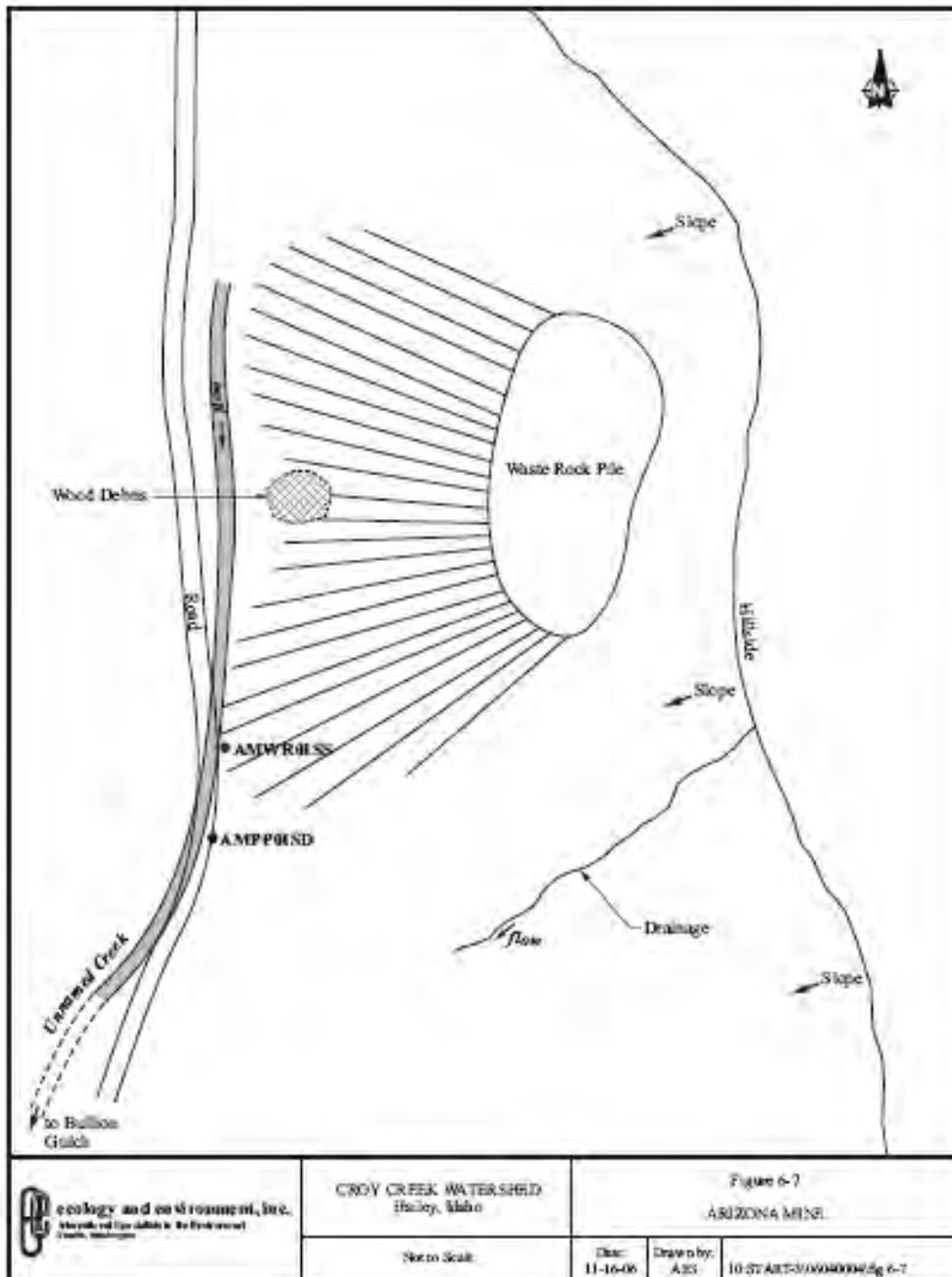


Figure 3. Map of sampling locations, adits, and waste rock piles (from E&E, 2007).

E&E's sample naming convention is as follows:

The first two letters represent the mine

IM – Arizona Mine

The next two letters are a description of the sample type

BG – background

WR – waste rock

PP – probable point of entry

The numbers are a sequential numbering system

And the final two letters represent the sampled media

SS – soil

SD – sediment

So sample AMWR01SS was the first soil sample collected at the Arizona from a waste rock pile.

8.1 Soil Analysis

A summary of laboratory results from E&E soil and sediment samples are presented in Table 1.

Laboratory analysis of the soil and sediment background samples (IMBG01SS and IMBG01SD) showed iron, lead, manganese, mercury, selenium, and silver concentrations in exceedance of Idaho's *Initial Default Target* (IDTLs). Arsenic exceeded both the IDTLs and EPA Region 6's Preliminary Human Health Screening Levels (HHSLs) in background sample IMBG01SD. IDTLs are very conservative risk based soil screening levels developed by the state of Idaho to provide preliminary screening levels for contaminants. HHSLs used in this report are health based screening levels developed by EPA for a residential scenario.

The laboratory analytical result's of soil sample AMWR01SS collected from the toe waste rock pile, showed concentrations of arsenic, lead, manganese, and thallium above the background sample concentrations (IMBG01SS), IDTLs, and HHSLs. Antimony, cadmium, lead, mercury, silver, and zinc concentrations were above background and IDTLs in both soil samples. Aluminum, beryllium, calcium, chromium, cobalt, copper, nickel, and sodium were above background concentrations. Magnesium exceeded the IDTLs.

8.2 Sediment Analysis

Sediment sample AMPP01SD analytes aluminum, barium, beryllium, calcium, nickel, potassium, and zinc were above background levels. Arsenic, lead, magnesium, and silver were above both IDTLs and background. Iron, manganese, mercury, and thallium were above IDTLs. Cadmium concentrations were above all three comparative values for both sediment samples.

Table 1: Total Recoverable Metals Analysis

Arizona Soil/Sediment Samples						
Description	Background				Sample No.	
	EPA Region 6		IMBG01SS	IMBG01SD	AMWR01SS	AMPP01SD
	IDTLs	HHSLs				
Units: mg/Kg						
Aluminum	NSC	76,000	9,440	8,250	9,680	9,860
Antimony	4.77	314	1.7 JQ	2.0 JQ	6.9 JL	1.6 JQ
Arsenic	0.391	21.65	19.8	22.6	77.5	12.9
Barium	896	15642	119	74.9	97.1	101
Beryllium	1.63	150	0.49 JQ	0.47 JQ	0.56	0.52
Cadmium	1.35	39	3.3	3.9	50.1	4.6
Calcium	NSC	NSC	2,770	7,630	952,000	8,760
Chromium	NSC	NSC	13.1	16.3	85.9	28.2
Cobalt	NSC	900	5.6 JK	4.1 JQ	6.0	3.6 JQ
Copper	921	2,900	27.6	34.4	214	27.1
Iron	5.76	55,000	13,100	12,600	38,800	11,600
Lead	49.6	400	50.9 JL	72.9 JL	3,590	252 JL
Magnesium	223	NSC	2,600	2,060	6,480	3,930 JL
Manganese	223	3,239	531	618	6,110	506
Mercury	0.00509	23	0.049JQ	0.088 JQ	1.4	0.068 JQ
Nickel	59.1	1,600	19.2	16.5	35.4	19.4
Potassium	NSC	NSC	1,970 JK	1,510 JH	748 JH	2,070 JH
Selenium	2.03	391	3.5 JK	0.44 JQ	3.5 J JL	0.29 JQ
Silver	0.189	391	0.28 JQ	0.51 JQ	20.1	1.7
Sodium	NSC	NSC	79.8 JQ	NA	225 JQ	NA
Thallium	1.55	5.5	1.1 JQ	2.6	5.6	2.5 U
Vanadium	NSC	390	65.0	86.6	50.9	42.3
Zinc	886	23,464	261	318	6,870	507

Notes: **Bold** – value above IDTLs - value above HHSLs **Blue** – values above background
 J – The associated value is an estimated quantity K - Unknown bias L - Low bias Q - The detected concentration is below the method reporting limit/contract required quantitation limit, but is above the method quantitation limit.
 NA – Not Analyzed, U - The material was analyzed for, but was not detected above the level of the associated value

Section 9. Surface Water Sample Collection

Surface water was not noted at the Arizona mine site during E&E's site visit. No surface water samples were collected during this investigation.

Section 10. Pathways and Environmental Hazards

10.1 Ground Water Pathways

During the cleanup activities of the nearby mines, specifically the Minnie Moore and Triumph mines, some of 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 piles) and along three pathways, as illustrated by the following three scenarios. First, heavy metals are leached from tailings piles and waste rock piles, 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 DEQ'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 (DEQ 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**).

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 (DEQ, 1999). 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, Idaho.

The information extrapolated from these source water assessment reports is based on data that existed at the time of their writing, and the professional judgment of DEQ 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 (DEQ, 1999). 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.

DEQ 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. This information is illustrated in Figure 4 near the right edge.

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 (DEQ, 1999). 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 (DEQ, 1999).

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 (DEQ, 2008).

Generally speaking, public drinking water systems in the Big Wood River Valley are rated as moderate to high susceptibility. 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 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 (DEQ, 2008). 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 (DEQ 2008). Currently, there are no data that indicate that any metal concentrations have exceeded MCLs in the Bellevue drinking water systems.

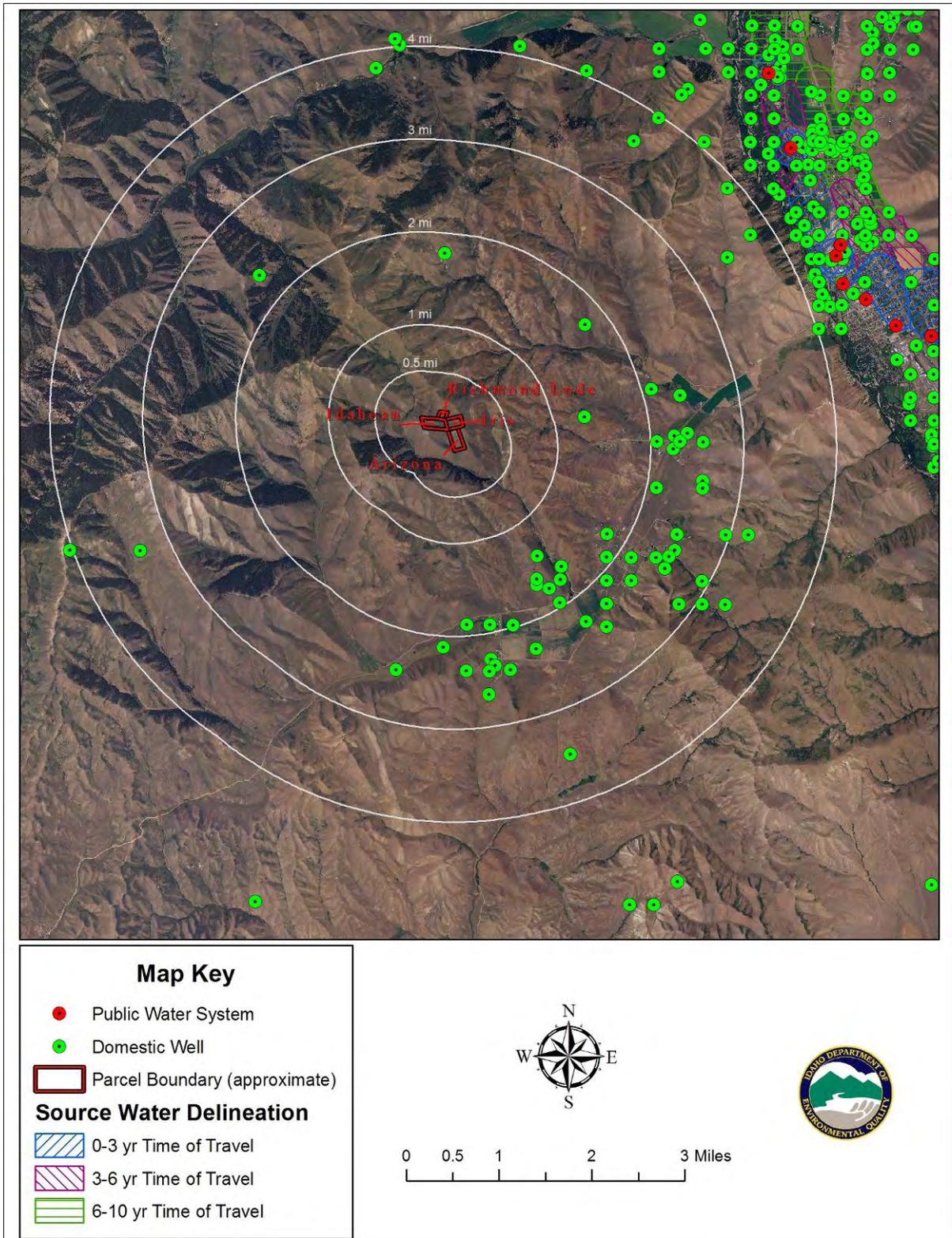


Figure 4. Drinking Water Well locations and source water delineations (Map source: NIAP 2004).

10.2 Surface Water Pathways

There was no evidence of flowing water at the Arizona beyond the short seasonal runoff due to snow melt. The vegetation surrounding the mine is well-established and there is no evidence of substantial waste rock eroding into a body of water. However, a small portion of the toe of the waste rock pile appears to be creeping into the ephemeral creek (Figure 3).

Ephemeral streams that drains the Arizona and surrounding area flows into Bullion Gulch then into Croy Creek which is a tributary to the Big Wood River.

The probable point of entry of mine materials into Croy Creek is approximately 1.5 miles to the south where Bullion Gulch enters Croy Creek. The 15-mile target distance limit (TDL) is approximately 7.5 miles south of Hailey on the Big Wood River. The city of Hailey sites at about mile 6 of the TDL. There are no surface water intakes for public drinking water systems within the 15-mile TDL.

10.3 Air Quality Pathways

The mine road gives easy access to the Arizona and surrounding mines. Access is unrestricted to off-road vehicles which travel to the waste rock piles at which time the most likely pathway would be relative to fugitive dust emissions. The delivery of significant dust from the mine site to local residents is not likely because of the distance (~2 miles) to those residents.

10.4 Soil Exposure

According to DEQ's Risk Evaluation Manual if pathways are determined to be complete, or if pathways are anticipated to become complete as a result of future uses, and the IDTLs are exceeded for any constituents, two options should be considered:

1. Adopt the IDTLs as the cleanup levels and develop a *Risk Management Plan* (RMP).
2. Perform a more detailed, site-specific evaluation, which includes developing site-specific background concentrations for comparative purposes.

The soil exposure pathways are not complete for residential or construction worker receptors at the Arizona. However, the non-residential receptor pathway is potentially complete for recreational users. The residential pathway for hypothetical future residential receptors on the mine site is also potentially complete if the claim is developed for residential housing.

A cumulative risk and hazard index analysis was completed by DEQ staff using Idaho's Risk Evaluation Manual. The analysis was performed for antimony, arsenic, cadmium, iron, lead, magnesium, mercury, selenium, silver, thallium, and zinc based on the detected levels in the waste rock pile soil sample (AMWR01SS). Analysis results showed a risk of 8.53×10^{-6} and a cumulative hazard index of 0.64 for non-residential receptors. The primary driver for both the

risk and hazard index is arsenic with a risk of 8.53×10^{-6} and a hazard quotient of 0.201. Remedial action levels are typically set between 1×10^{-4} and 1×10^{-6} for risk and/or a hazard index of 1. Based on this analysis there is minimal human health risk and hazard associated with frequent recreational use of the Arizona mine site through inhalation, dermal contact and ingestion of site soils.

10.5 Domestic Wells and Public Water Supplies

There are approximately 120 domestic, commercial and municipal water wells within a four mile radius of the mine. No public water system wells or their zones of capture are within 4-miles of the Arizona (Figure 4). The nearest domestic well is located approximately 1.5 miles down hydraulic gradient from the site near the mouth of Bullion Gulch. The six or so domestic wells locate at or near the mouth of Bullion Gulch are the most likely wells to be impacted by the Arizona and other Bullion Gulch mines. No analytical data was available for these wells. DEQ recommends that owners of the wells have their wells tested on a regular basic for metals.

10.6 Residences, Schools and Day Care Facilities

The nearest residence is approximately 1.5 miles south of the Arizona. The nearest Day Care or School Facility is over 6 road miles east of the mine site.

10.7 Wetlands

Significant wetlands exist along Croy Creek 2-3 miles down stream of the mill site to the 15-mile TDL on the Big Wood River. However, there are no wetlands in the immediate area of the Arizona (Figure 5). The closest wetland is a 0.64 acre freshwater forest/shrub wetland located approximately 0.5 mile south of the mine, too small to be readily seen in Figure 5 (USFWS, 2009).

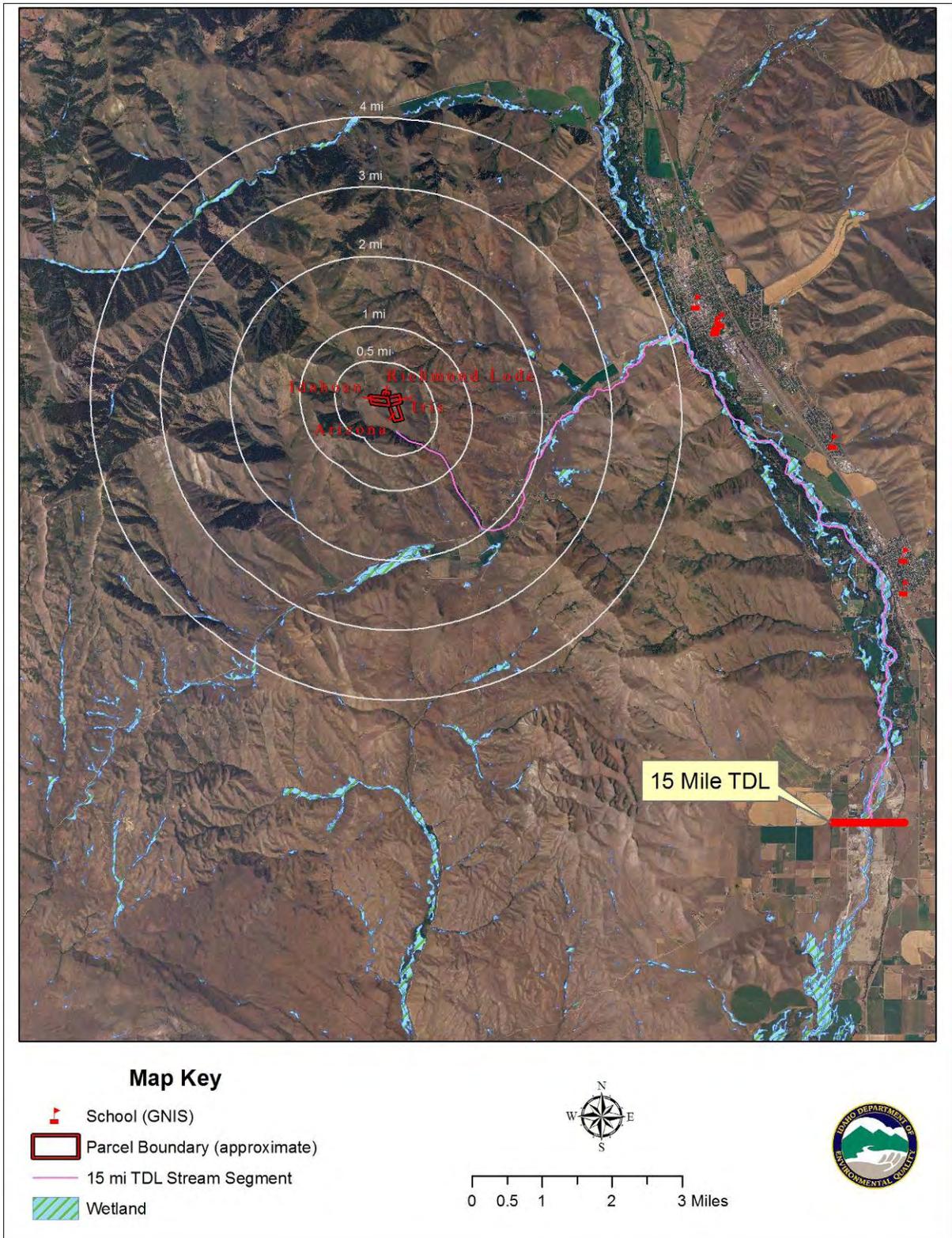


Figure 5. Wetlands and 15-Mile TDL map. (Source Fair 100k, Sunv 100k, NIAP 2004)

10.8 Sensitive Species (Plant and Animal)

Although the site is located within a defined range and habitat for wolves, the size of the piles relative to the total range is small and therefore unlikely to be a significant source for exposure. Camas Golden weed (*Haplopappus insecticruris*), North American Wolverine (*Gulo gulo luscus*), and Long-legged Myotis (*Myotis volans*) are listed as sensitive species located within 4 miles of the claim.

10.9 Fisheries

Redband rainbow trout [*Oncorhynchus mykiss gairdneri*], mountain white fish [*Prosopium williamsoni*], wood river sculpin [*Cottus leiopomus*], and brook trout [*Salvelinus foninalis*] are present within the Big Wood River (IDFG, 2000).

10.10 Sensitive Waterways

Croy Creek and the Big Wood Rivers are both Clean Water Act 303(d) listed streams down gradient from the Arizona, which might be adversely affected by contaminant delivery from the site. However, the ephemeral stream draining Bullion Gulch likely only flows during spring runoff and runoff from the mine would provide only a small percentage to total stream flow.

10.11 Livestock Receptors

There was no indication that the area is used for livestock grazing. However, the Arizona falls within the BLM's Bullion grazing allotment, indicating the potential for grazing to occur on the property.

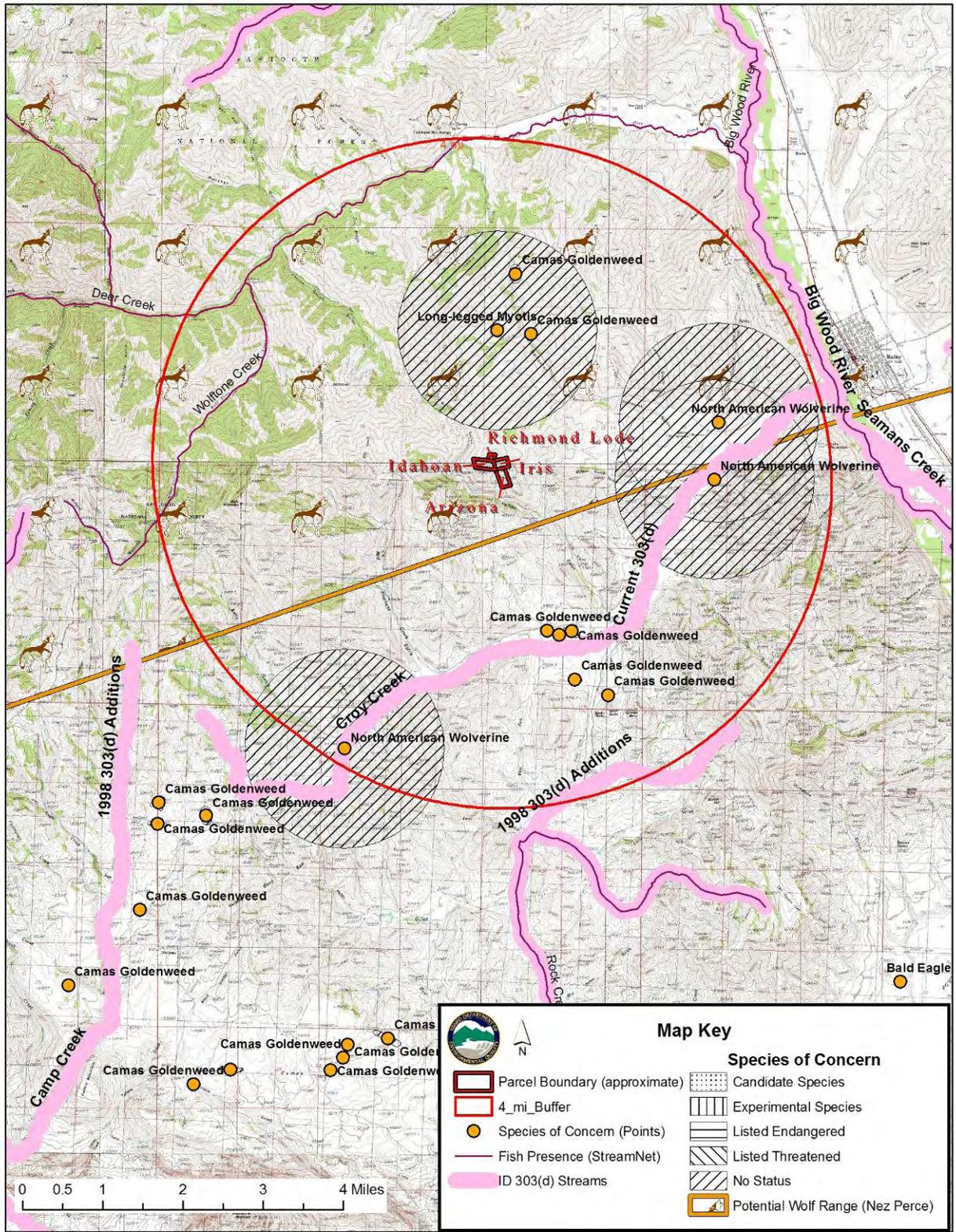


Figure 6. Sensitive species near the Arizona Mine. (Source: Fair 100k, Sunv 100k, USGS 24K Topo)

Section 11. Summary and Conclusions

Based on existing conditions and uses, historic information, data observations made during DEQ's and E&E's site visit, soil sample analysis, size of the mine, potential contaminant pathways, and potential exposures to ecological and human receptors, DEQ recommends that further investigation be conducted at the Arizona only if the site is to be developed for residences or if recreational activities increase. Otherwise, DEQ determines the Arizona mine as No Remedial Action is Planned (NRAP).

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