IMPERIAL LODE MINE & MILL SITE

(A.K.A: Imperial Group, BLM Lot No. 38A, Parcels RP1M000000155B and RP03N170230000)

PRELIMINARY ASSESSMENT REPORT

Blaine County
State of Idaho

Department of

Environmental Quality

November 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 30, 2008

Mr. Brian Saksa and Dr. Stephen Kuslich
P.O. Box 5283
Ketchum, Idaho 83310-8134

Mike Brown – Geologist
U.S. Department of Interior – Bureau of Land Management (ID-931)
1387 S. Vinnell Way
Boise, Idaho 83709

RE: Site Assessment of the Imperial Lode and Millsite (aka Imperial Group).

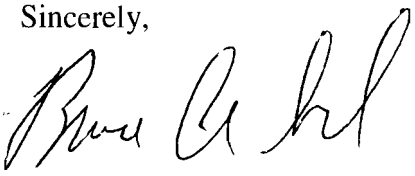
Gentlemen:

The Idaho Department of Environmental Quality (IDEQ) has completed a review of historical mining data and geological information at the above referenced claims. Subsequent to that research DEQ conducted a site visit of the Imperial lode and mill sites. DEQ used the existing information and observations made at the site to complete a final Preliminary Assessment (PA) report (attached). DEQ has found that the Imperial Mine and Millsite (aka Imperial group) contains few if any concerns for human health and the environment. IDEQ is recommending to EPA that these claims be designated as **NRAP, or "No Remedial Action Planned".**

However, IDEQ is recommending that you consider implementation of best management practices to control erosion and stabilize the mine waste dumps. DEQ suggests that the mine openings on the patented lode claim are closed or otherwise managed to restrict access as these are very dangerous physical openings.

IDEQ very much appreciates your past cooperation and your approval for our access on various properties. I look forward to addressing any questions you may have regarding our findings. You may contact me at (208) 373-0554.

Sincerely,



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

BAS:TE:tg G:\Waste & Remediation\Bruce Schuld\Banner\Imperial Lode and Millsite Mine

Attachment

cc: Ken Marcie, Environmental Protection Agency
file

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List of Acronyms

Acronym	Definition
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
USFWS	United States Fish and Wildlife Service

Section 1. Introduction

This document presents the results of the preliminary assessment (PA) for the Imperial Lode Mine (also known as the Imperial Group Mine) and mill site. 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 Imperial Lode Mine claim is accessible by vehicle through Imperial Gulch by way of a dirt road that intersects Greenhorn Road, approximately 2 miles west of Highway 75, and five miles north of Hailey, Idaho (Figure 1).

As these sites are on a patented claim and public lands, DEQ staff formally requested, and was granted, legal access to the patented claim to conduct a site visit.

Section 2. Ownership

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

Based on a limited search, Brian Saksa and Stephen Kuslich are the current owners of the patented Imperial Lode mine site (Blaine County 2008, BLM 2008). The mine is currently listed for sale with Sotheby's International Realty, Sun Valley Brokerage (http://www.sothebyshomes.com, MLS ID 08-305699). The mill site is owned and managed by the US Department of Interior's Bureau of Land Management (IDWR 1997).

Within the following ownership descriptions the **"Partial Determination"** is meant to convey a very brief summary of IDEQ's assessment of individual claims and parcels relative to human health and ecological risk factors associated with toxicological responses to mine wastes. A determination of No Remedial Action Planned or "NRAP" means that based on current conditions at the site IDEQ did not find any significant evidence that would indicate the potential of adverse effects to human or ecological receptors. This determination does not say anything about risks that may be posed to residential receptors if this property is developed for residential use. Furthermore, this determination says nothing about risks associated with physical hazards such as open adits, open shafts, high walls, or unstable ground. However, IDEQ has made some conclusions about risks associated with potential future uses, physical hazards, or their absence, and will present those observations in the following report.

Owners/Administrators:	**Parcel:**	**Partial Determination**
Mr. Brian Saksa and Dr. Stephen D. Kuslich PO Box 5283 Ketchum, Idaho 83310-8134	RP1M000000155B	NRAP
Mike Brown, Geologist, PG Abandoned Mine Lands/HazMat Program Lead BLM- Idaho State Office (ID-931) (208) 373-3864	RP03N170230000	NRAP

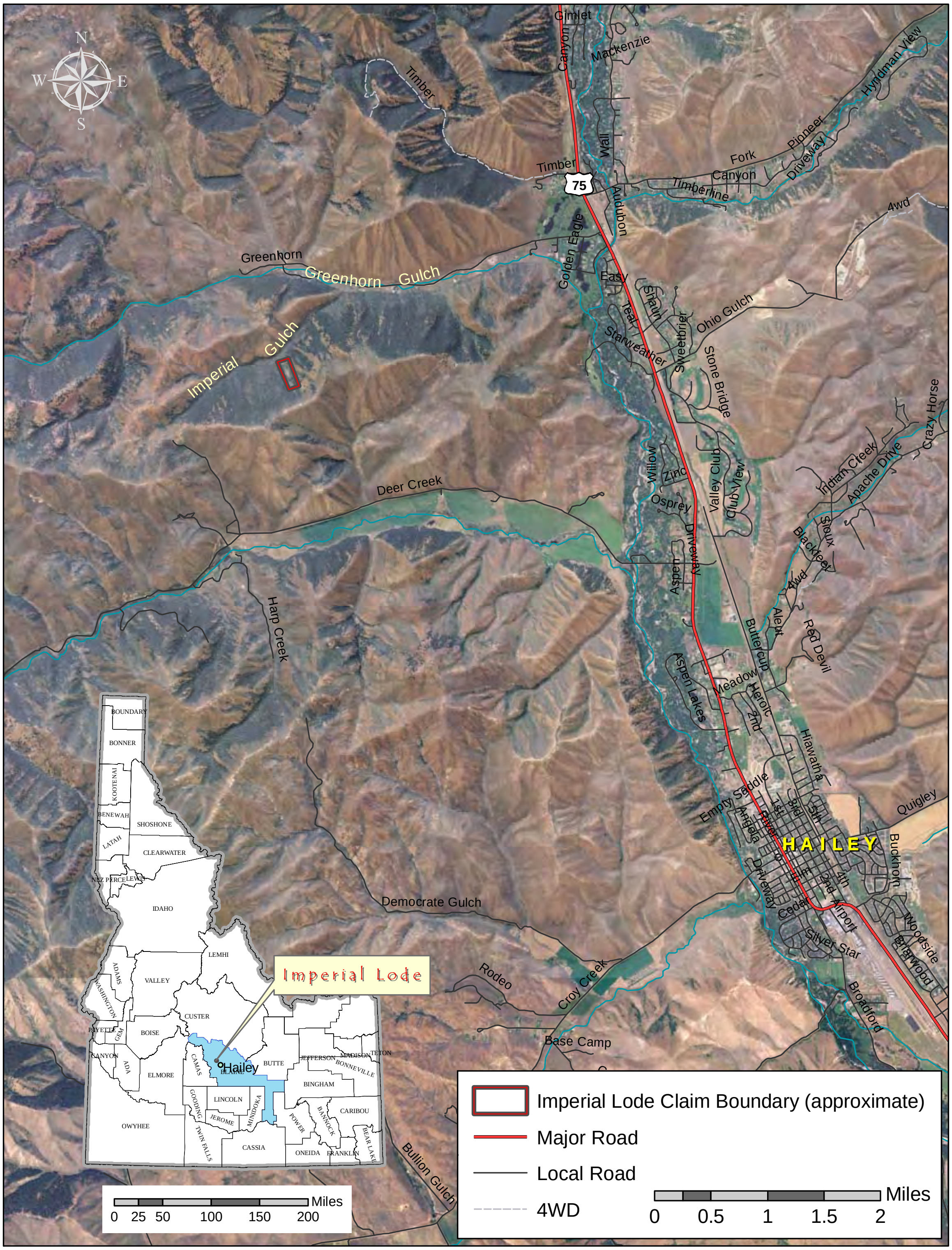

Figure 1. Location of the Imperial Lode mine with USFS parcel data overlay (Photo source: Blaine County NAIP 2004).

Section 3. Mine Site History

The amount of history DEQ found addressing the site is limited to two documents; Edward B. True, 1882 and Umpleby and others, 1930. Edward B. True conducted the original survey of the Imperial Lode Claim in November 1882. At that time Mr. True recorded the claimants as Samuel T. Hauser et al., later Mr. True states that this was in error and the claimant at the time of the survey was Isaac I. Lewis. Improvements made to the claim at that time consisted of "…a shaft 35 feet deep 4'x 6' with a drift 8 ft long from the bottom all in hard rock."

Umpleby and others (1930) report the Imperial group owned by the Hailey Bonanza Mining Co. then sold to an unnamed company in 1924 which "…did considerable development work, and started to build a mill, and since then this company has mined and milled some ore." The longest tunnel was 200 feet long and the entire underground workings were as great as 1000 feet.

> *Most of the ore mined evidently came from a stope above the longest tunnel, which is in a branch gulch on the east side of the stream above the camp. The principal development work done in 1924 consisted in extending the long tunnel and putting up raises from it in search of the continuation of the ore mined above.*
>
> Umpleby and others, 1930

Several short tunnels were located on the northwest side of the main gulch, following lodes that dip steeply to the west. Lodes consisted of sheared and brecciated country rock containing layers of white quartz stringers (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 (WRCC, 2006). Each site for which this data is used is subject to more localized meteorological conditions that result from difference in elevation, orientation of slopes, 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 performed. 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; IDEQ, 2002 & 2006; IDEQ & USEPA, 2006 & 2007).

Generally speaking the Imperial Lode area is hosted by sheared and altered quart 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 Imperial Lode 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 et al. 1950, p. 2

Anderson et al. (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 Imperial Lode 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-overturned 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

Anderson and Fryklund et al (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.*

Umpleby, et al (1930, p. 217) noted the Wood River formation at the Imperial Lode, strikes about north 25˚ west and dips steeply to the west. Quartz strings are noted to strike east and dip steeply north, running sub parallel to the lodes.

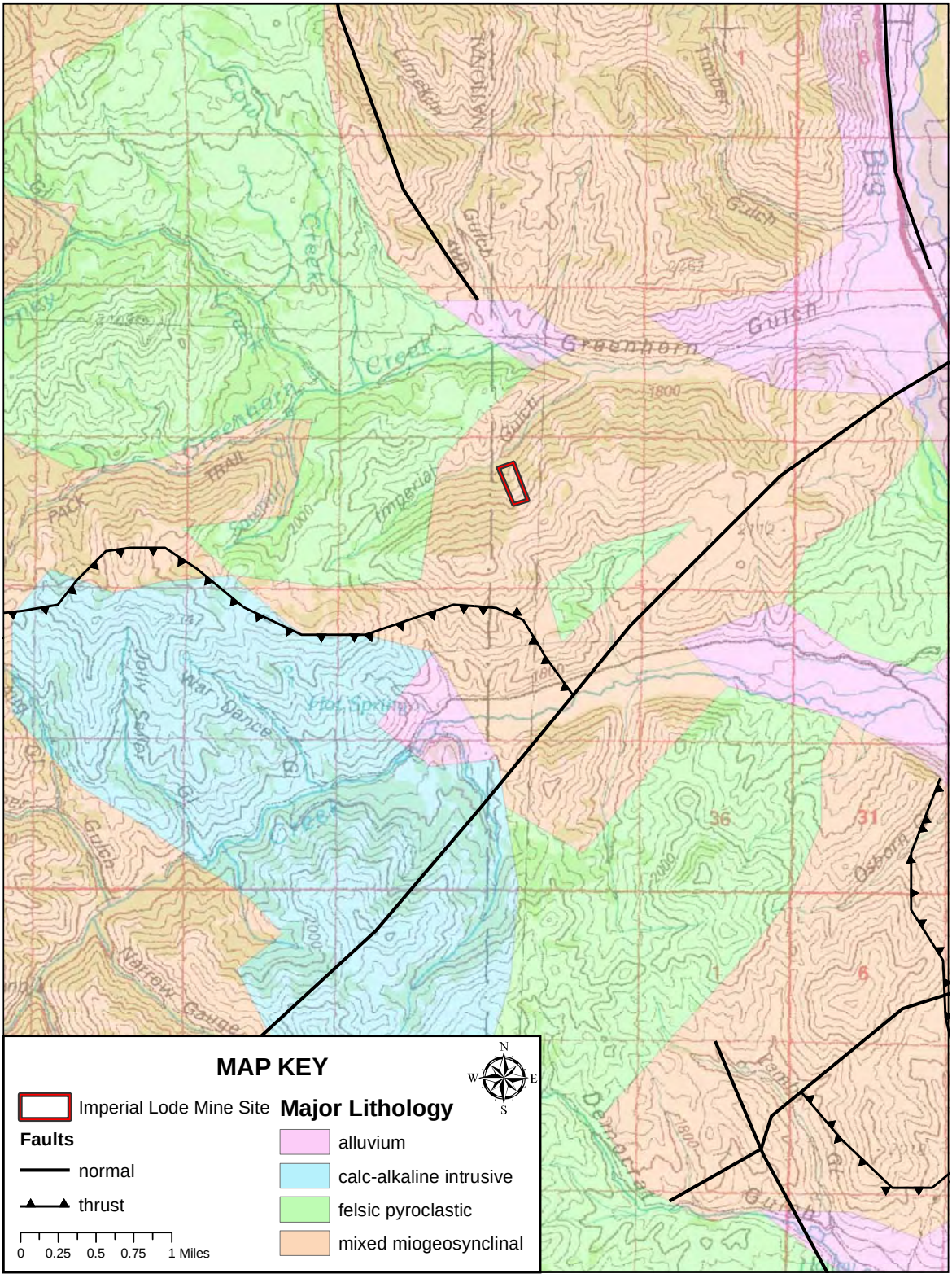

Figure 2. Geology of the Imperial Lode Mine area (Map source: USGS 24k).

Section 6. Current and Potential Future Land Uses

At the time of the site visit the Imperial Lode mine site was well maintained with very little recent refuse present. The dirt road leading from the floor of Imperial Gulch to a two-tiered leveled parking/camping area located on the northwest corner of the claim, showed signs of frequent use, possibly for camping by the current owners. The well and generator found on the lower tier appear to be in good repair (Photo 7). No recent vehicle activity was noted on the overgrown road leading from the camping area/well to the main mine workings, 600 feet to the south. A flat spot outside of the claim boundaries, just north of Adit 3 (see Figure 3), east of the access road has been used for camping as evidenced by the fire ring and tent stake found at the site. A spent shotgun shell was found just north of Adit 3, indicating that hunting for small game or game birds occurs in the vicinity.

Abundant deer sign and well worn game trails throughout the clam were noted by the investigation team. Moose scat was present within the aspen trees. Approximately half-dozen Forest Grouse were seen or heard from the primary mine workings.

The mill site is seen with some difficulty from the road on the floor of Imperial Gulch. The site is overgrown with dense shrubs and a large stand of aspens. The mill shows few signs of recent human activity despite its easy access from Greenhorn Road, Hailey and Ketchum.

As noted in Section 2 the patented mine claim is currently listed for sale. According to their advertisement, the property includes a home site with a well and generator; offers good hiking, hunting and other recreation opportunities; retention of full mineral rights; and is surrounded by public lands.

Section 7. Site Conditions and Waste Characterization

DEQ performed the site assessment for the Imperial Lode mine and mill site on September 18, 2009. The claim itself is 16.5 acres located on a north-facing slope in Imperial Gulch. The main workings are located approximately 600 feet south of the northern claim boundary. The investigation team noted three adits, one vertical shaft, four waste rock piles, a collapsed feature, a road fill that crosses a small drainage, a road, and a flat camping/parking area on the claim (Photo 1).

Adit 1 is located at the top of waste rock pile 1 (Photo 2). Based on its location in relation to waste rock pile 2 and the northern claim boundary this adit is probably the "shaft" noted by True (1882). The adit is partially buried by waste material from waste rock pile 2; however the adit remains partially open and accessible.

Adit 2 is a large opening in the rock face uphill and about 65 feet south of adit 1 (Photo 1 and Photo 3). The first 15 to 20 feet of the adit appears to have collapsed, possibly due to stope mining described by Umpleby and others (1930), requiring a 10 foot descent down unstable steep slopes to enter the adit. Horizontal wood bracing and two tunnel levels are visible when viewed from the north. Evidence of recent human activity (foot prints near the adit entrance) was noted by the investigation team.

Adit 3 is located near the claim's northern boundary east of the access road. The adit entrance appears to be closed off and is well vegetated (Photo 4), likely a result of snow accumulation at this location.

The vertical shaft is located approximately 200 feet south of Adit 2 along the ore strike at the edge of the trees (Photo 5). The shaft is fairly nondescript with only a small waste rock pile marking its location. This shaft is open and poses a significant danger for those hiking or hunting in the area not aware of its presence.

There are no indications of water discharge at any of the site's adits.

Each of the four waste rock piles is associated with one of the adits or shaft. All of the waste rock piles are nearly void of vegetation, while vegetation is abundant at the toes, with the exception of waste rock pile 2 which ends at the top of waste rock pile 1. The total volume of waste rock piles 1 and 2 is estimated at less than 1,000 cubic yards. The volumes of the other two are considerably smaller. A strong sulfide odor was noted at waste rock piles 1 and 2; however, no obvious minerals were noted.

Uphill and south of adit 2 is a long trench-like feature that is oriented in a line between adit 2 and the shaft. It is unclear if this feature is a result of open stoping up from the main tunnel or a result of surface mining.

Photo 1. View looking east-southeast towards the main Imperial Lode mine workings.

Photo 2. View looking southeast at Adit 1. Opening is accessible to humans. This mine opening is a dangerous physical hazard that should be closed or otherwise restricted.

Photo 3. View looking south at Adit 2 (Open Stope) from the top of the waste rock pile 2. Width of opening is approximately 2.5-3 feet, and extends to an unknown depth. This mine opening is a dangerous physical hazard that should be closed or otherwise restricted.

Photo 4. View looking east at Adit 3. Opening is collapsed and inaccessible. Camping and hunting occurred on the waste pile just to the left of this photo.

Photo 5. View looking down into shaft. Opening measures approximately 2.5 feet in diameter, and the ground surface nearby does not indicate its presence. This mine opening is a dangerous physical hazard that should be closed or otherwise restricted.

Near the western claim boundary about midway up the hillside, a small drainage was filled with what appears to be an unknown volume of waste rock in order to provide road access to the mine workings (Photo 1 and Photo 6). The road forms a small catchment basin on the upward side when moisture is present in the drainage. Rills are present on the downgradient side of the road fill, with little vegetation being present. A small overgrown road intersects the road fill and goes uphill and north along the claim boundary, then west onto public lands. The road is impassable to most motorized vehicles and is not visible in aerial photos.

Photo 6. View looking west along the road fill (see Photo 1). Lush vegetation on the upper half of the photo is an indication the old road forms a small dam causing water to pond from the drainage above.

The flat cut into the hillside at the top of the access road (northwest corner of the claim) is well maintained and may have been developed for use to park several camp trailers and trucks or as a home site (Photo 7). A domestic well and generator are located here. The well casing looks to be in good condition. Based on information available on the driller's report (IDWR, 1992) the well was constructed in May 1992. It is 600 feet in depth, with 8 inch steel casing installed from 1.5 feet above land surface to 330.5 feet below land surface. The remainder of the borehole is uncased. Ground water was first encountered at 460 feet below land surface in a limestone and quartz formation.

Photo 7. View looking southeast along the cut (parking area) located on the northwest corner of the Imperial Lode claim. A larger view of the well and generator has been inserted in the right corner of the photo. The main workings are visible through the trees, near the photo's center.

Umpleby and others (1930) stated a mill was constructed at the Imperial Lode claim in 1924. Although the parcel boundaries from the county ArcGIS database may be somewhat inaccurate, it appears that the mill site is located on lands administered by BLM. The site contains a large concrete foundation and timbers located approximately 340 feet north of the Imperial Lode claim and just above the floor of Imperial Gulch. The foundation is largely obscured from view, from the Imperial Gulch road, by a stand of aspens and dense undergrowth (Photos 8 – 11). Upon investigation a large three-level concrete foundation was constructed into the hillside measuring approximately 150 feet long, 50 feet wide, and 30 feet tall. Framing sized timber debris and other

discarded/fallen timbers are located to the west of the foundation and several smaller wooden debris piles are located south and east of the foundation. East of the foundation approximately 150 feet a 15 foot diameter, non-descript deposit of fine-grained yellowish soil is found framed by cut lumber, fallen trees, and dense vegetation (Photo 12). The soil has a strong sulfur smell. A surface soil sample was collected from near the center of the soil pile. Sampling results are presented in the following section.

Photo 8. View looking south from a few feet off the Imperial Gulch Road at the concrete walls/foundation of the assumed mill.

Photo 9. View of the mill foundation looking southeast from the lowest tier.

Photo 10. Pile of discarded/fallen timbers on the west side of the mill foundation.

Photo 11. Discarded building material located on the southeastern corner on the mill foundation. View looking to the north.

Photo 12. Surface soil sample ILWPSS1 location, east of the mill foundation. Sample collected from near the center of the photo. The small soil pile (< 3 cubic yards) is framed by cut timbers, fallen trees, and dense vegetation. A 9inch X 12inch field notebook is present for scale.

Section 8. Soil Sample Collection

One surface soil sample was collected from a deposit of < 3 cubic yards of wastes on the Imperial Lode mill site (ILWPSS1). The wastes were yellow and had a strong smell of sulfur was suspicious. No samples were collected from the waste rock piles on the claim as these materials appeared to be country rock with little to no mineralization. No background sample was collected for this site. The mill site soil sample was approximately five pounds in size and was sieved through a No. 10 screen. The material passing was mixed in a clean bucket prior to placing it in a one gallon zip lock bag, which was then placed in a cloth mineral sample bag. Both bags were appropriately marked, and then documented on a Chain of Custody Form for submittal to SVL laboratories.

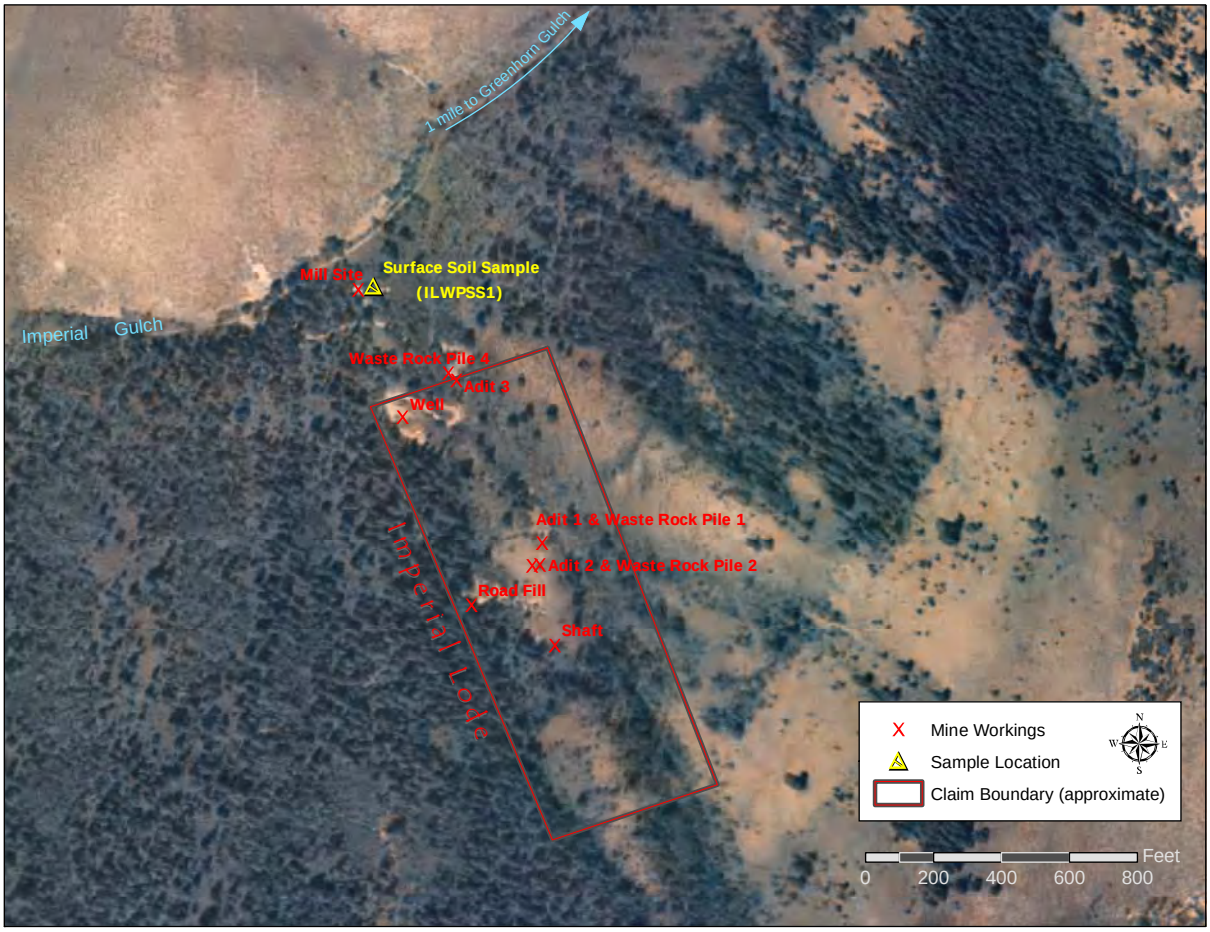

Figure 3. Map of sampling locations, adits, and waste rock dumps (Map source: NAIP 2004).

8.1 Soils Analysis

Levels of total antimony, arsenic, iron, lead, silver, and zinc exceeded both Idaho's *Initial Default Target Levels* (IDTLs) and EPA Region 6's Preliminary Human Health Screening Levels (HHSL) (EPA 2002) at the mill site. Selenium levels exceeded Idaho's IDTLs. Table 1 summarizes laboratory analytical results for surface soil sample ILWPSS1.

The IDTLs are risk-based target levels for certain chemicals that have been developed by DEQ using conservative input parameters, a target acceptable risk of 10^{-6}, and a *Hazard Quotient* of 1. These numbers, although used for comparison even at remote locations, are more applicable to sites where it is expected to see "unrestricted uses" such as residential development. Similarly, the Region 6 HHSLs are human health based risk derived for screening where residents are at risk for exposure. As observed during the development of other Preliminary Assessments in the Big Wood River Basin by DEQ, these concentrations are not unusual for a location or facility in this historic mining district.

Table 1: Total Recoverable Metals Analysis (mg/Kg)

Imperial Lode Mill Soil Sample			
	IDTLs	EPA Region 6 HHSLs	Sample No. ILWPSS1 mg/Kg
Description	Units: mg/Kg		
Antimony	4.77	314	**9,350** D2
Arsenic	0.391	21.65	**7,860** D2
Barium	896	15642	34.5
Cadmium	1.35	39	316
Chromium	NSC	NSC	0.6
Copper	921	2,900	283
Iron	5.76	55,000	**78,600**
Lead	49.6	400	**94,000** D2
Manganese	223	3,239	93.9
Mercury	0.00509	23	9.75 D2
Selenium	2.03	391	**17.9**
Silver	0.189	391	**1,190**
Zinc	886	23,464	**29,100** D2

D2 – sample diluted by a factor of 10 for analysis.
NSC – no soil criteria

Section 9. Surface Water Sample Collection

Surface water was not noted at the Imperial Lode mine site or at the mill site during the site visit. All surface water in the area appears to be intermittent flow. 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 dumps) and along three pathways, as illustrated by the following three scenarios. First, heavy metals are leached from tailings piles and waste rock dumps, enter ephemeral or perennial drains and then contaminate the area's shallow ground water system. Second, heavy metals leach from the local ore bodies and are transported through the geologic structure to the shallow ground water. Third, heavy metals could leach out of the ore bodies, and be discharged from the underground workings as adit water, that is then conveyed through ephemeral and perennial drains to the shallow ground water systems.

For the purposes of completing Preliminary Assessments, Source Water Assessments (completed for local public drinking water supplies) were used to identify any known affects to those systems. Although 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 2000). Source water assessments for new public drinking water systems are being developed as those systems come online. Each public water system is provided with two copies of its final assessment report. Four source water assessments for drinking water supplies have been used in this Preliminary Assessment process to evaluate the potential impacts to both

public and private drinking water supplies in and around Sun Valley, Ketchum, Hailey, and Bellevue, 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 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.

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 (DEQ 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 (DEQ 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 (DEQ 2000).

There are numerous public and private drinking water supplies in the Big Wood River Basin. The Sun Valley Water and Sewer District operates and maintains nine wells in two groupings (DEQ 2000). The City of Ketchum drinking water system consists of seven wells in two groupings. The City of Hailey’s drinking water system consists of six wells and a spring (DEQ 2000).The City of Bellevue drinking water system consists of two wells and three springs (DEQ 2000).

Generally speaking, public drinking water systems in the Big Wood River Valley are rated as moderate to high (DEQ 2000). 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 2001). Currently, there are no data that indicate that any metal concentrations have exceeded MCLs in the Bellevue drinking water systems (DEQ 2008).

10.2 Surface Water Pathways

There was no evidence of flowing water at the Imperial Lode claim or mill site beyond the short seasonal runoff due to snow melt and some potential ponding of water behind the road fill after a precipitation event. Small springs may be present within the vicinity based upon the presence of nearby grouse, yet none of this water reaches the valley floor. The vegetation surrounding the mine is lush and well-established and there is no evidence of waste rock eroding into a body of water. Additionally, the drainages are densely vegetated with no defined stream channels.

An ephemeral stream on the floor of Imperial Gulch feeds Greenhorn Creek which is a tributary to the Big Wood River. The ephemeral stream is approximately 430 feet north of the Imperial Lode claim.

The probable point of entry (PPE) of mine and mill runoff into Greenhorn Creek is approximately 1 mile to the east of the claim where Imperial Gulch enters Greenhorn Gulch. The 15-mile target distance limit (TDL) is approximately 2 miles south of Hailey on the Big Wood River. There are no surface water intakes for public drinking water systems within the 15-mile TDL. Because the pathway for release did not appear complete, soils, sediment and water at the PPE were not sampled.

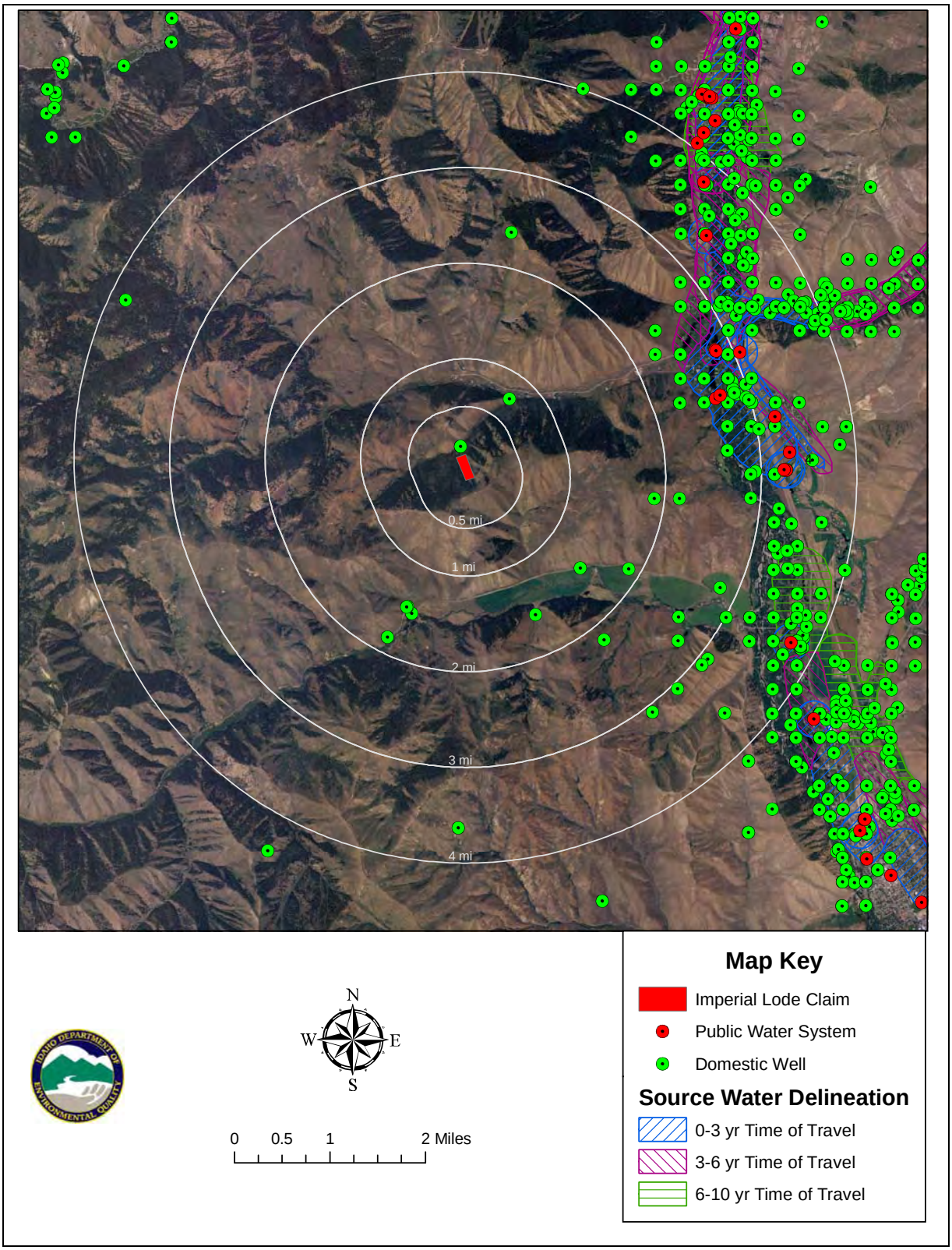

Figure 4. Drinking Water Well locations and source water delineations (Map source: NAIP 2004).

10.3 Air Quality Pathways

Steep slopes, dense vegetation, and the lack of direct road access to Imperial Lode mine workings prevent off road vehicles from accessing the waste rock piles where the most likely air quality pathway would be relative to fugitive dust emissions. The delivery of dust from the mine site to local residents is not likely because of the distance (0.8 mile) to those residents. Dust emissions from the mill site are not likely due to many of the same situations as at the mine site with the addition of dense vegetative cover providing a wind block to the small sediment pile.

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.

However, the soil exposure pathways are not currently complete for residential or construction worker receptors at the mine or mill site assessed in this report. 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. This pathway is not complete at the mill site as the mill is located on public land and not likely to be developed as residential.

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, copper, lead, mercury, selenium, silver, and zinc based on levels detected in the mill site soil sample. Results of the analysis showed a cumulative risk of $8.65 \text{ X } 10^{-4}$ at the mill site and a cumulative hazard index of 38.1 for non-residential receptors. The primary driver for both the risk and hazard index is arsenic with a risk of $8.65 \text{ X } 10^{-4}$ and a hazard quotient of 20.4.

10.5 Domestic Wells and Public Water Supplies

There are 430 domestic, commercial, and municipal water wells within a four mile radius of the mine, including the one domestic well located on the claim and 12 public drinking water supply wells (IDWR, 2008) (Figure 4). A domestic well, located approximately 1 mile down hydraulic gradient from the site within Greenhorn Gulch, is more likely affected by watershed wide sources of contaminants than by this mine site.

The domestic well located on the claim is 600 feet deep and the first encountered ground water was reported at 460 feet below land surface. The well is located on the opposite side of a small

drainage from the main mine workings. Well depth and location in relation to the mine and geologic features (such as fault planes) indicate that this well should have little impact from the Imperial Lode mine and the mill; however, it is recommended that the well be tested for metals prior to development.

10.6 Residences, Schools, and Day Care Facilities

The nearest residence is approximately 0.8 mile northeast of the Imperial Lode mine site. The nearest day care or school facility is 6 miles southeast of the mine site.

10.7 Wetlands

Approximately 600 acres of wetlands are downstream from the mine/mill site, along Greenhorn Creek to the 15-mile TDL on the Big Wood River (USFWS, 2009). However, there are no wetlands in the immediate area of the Imperial Lode mine and mill. There is no evidence of erosion taking place from these sites into the streams below them (Figure 5). Drainages at the mine are well vegetated and do not have well defined stream channels.

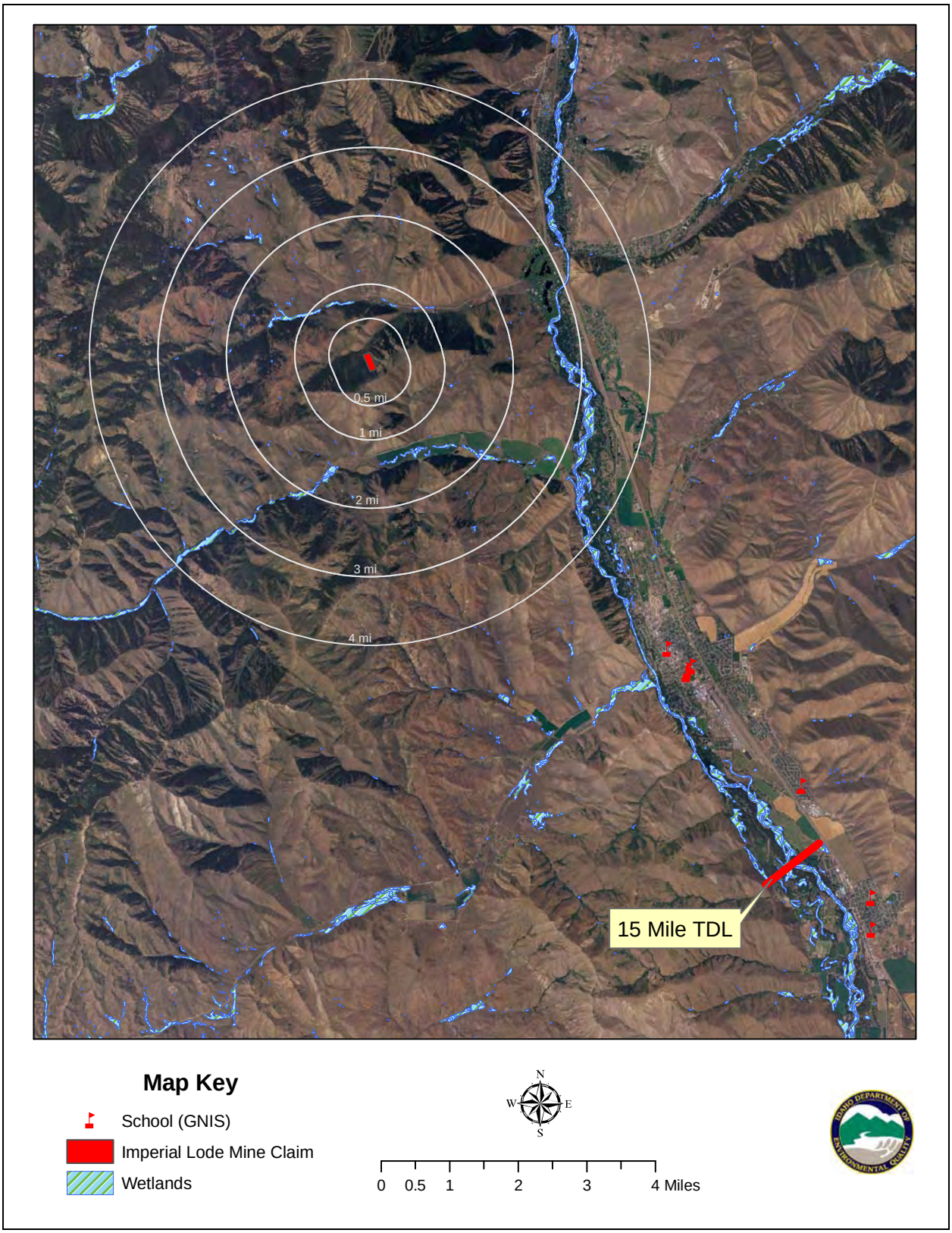

Figure 5. Wetlands and 15-Mile Target Distance Limit (TDL) map (Source: Fair 100k, Sunv 100k, NAIP 2004).

10.8 Sensitive Species (Plant and Animal)

Although the site is located within a defined range and habitat for wolves, the size of the dumps relative to the total range is very small and therefore unlikely to be a significant source for exposure. Camas Golden weed (*Haplopappus insecticruris*) and Long-legged Myotis (*Myotis volans*) are listed as sensitive species located within 4 miles of the claim (IDF&G 2002).

10.9 Fisheries

Redband rainbow trout [*Oncorhynchhus mykiss* gairdneri], wood river sculpin [Cottus leiopomus], and brook trout [Salvelinus foninalis] are present within Greenhorn Creek. Redband rainbow trout [*Oncorhynchhus 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

Greenhorn Creek and the Big Wood River are both Clean Water Act 303(d) listed streams (DEQ 2000) downgradient from the site, which might be adversely affected by contaminant delivery from the site. However, the ephemeral stream draining Imperial Gulch likely only flows during spring runoff, and runoff from the mine/mill site would provide only a small percentage to total stream flow.

10.11 Livestock Receptors

There was no indication that the area is currently used for livestock grazing. However, arborglyphs (markings cut into the bark of trees) indicate past use by sheep herders and the mining claim and mill site fall within the BLM's Deer Creek grazing allotment.

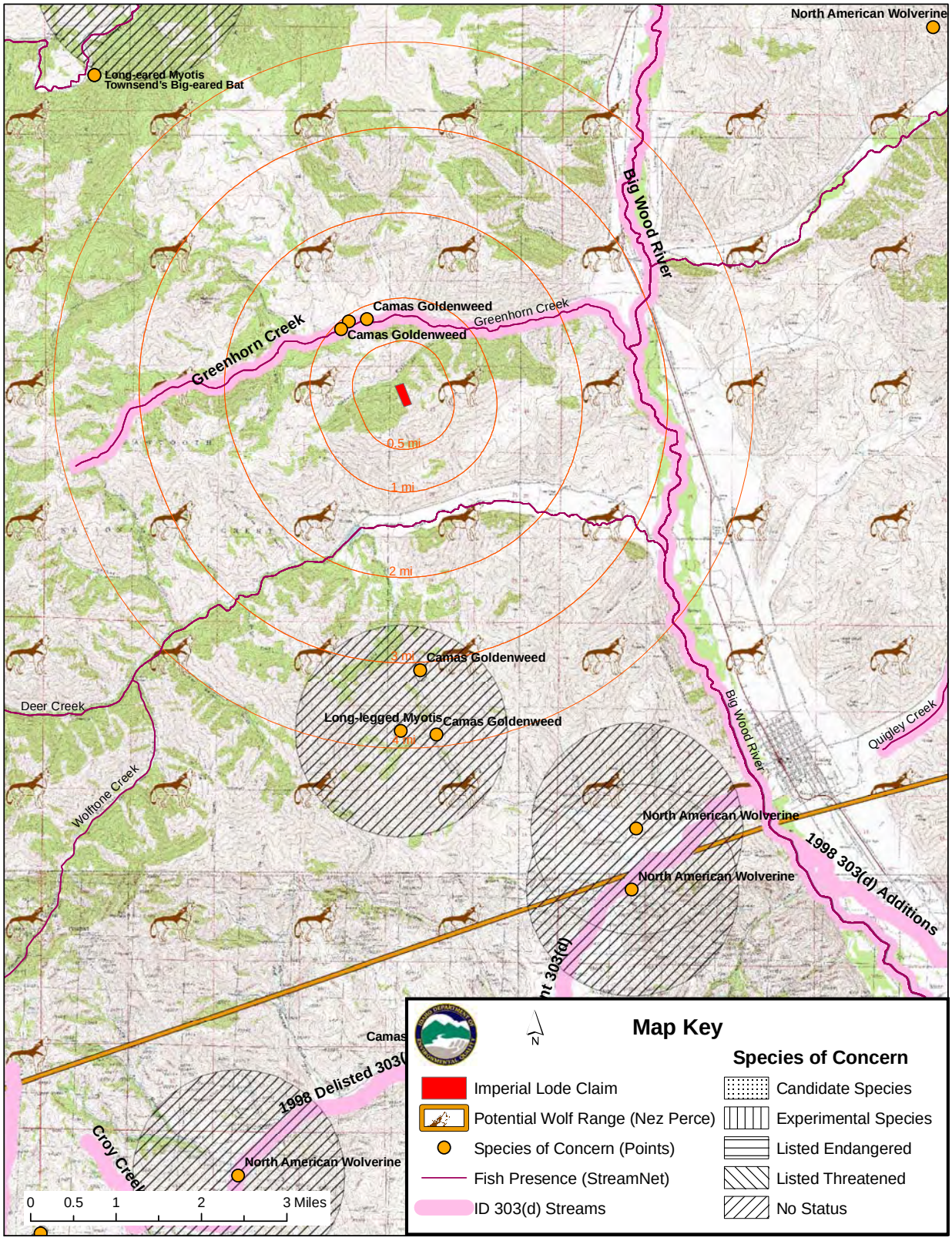

Figure 6. Sensitive species near the Imperial Lode mine (Source: Fair 100k, Sunv 100k, USGS 24K Topo).

Section 11. Summary and Conclusions

DEQ evaluated existing conditions and uses, historic information, data observations made during the site visit, analysis and size of the mine and mill wastes, potential pathways of contaminants to receptors, and potential exposures to ecological and human receptors for this report. Based on information gathered and analyzed, DEQ has several recommendations.

First, the ground water well on the property should be tested prior to any additional or future use as a potable water supply, even for occasional recreational users.

Second, if the site is considered for future development as residential property, additional site investigation and analysis should be conducted and the conclusions an recommendations from that work is used to develop risk management plans or actions.

Lastly, although the existence of numerous dangerous mine openings and physical hazards does not factor into DEQ's risk analysis of the site, closure or restricting access to these openings is warranted.

However, based on DEQ analysis of human health and ecological risk, DEQ has determined the Imperial Lode mine and mill site should be designated as No Remedial Action is Planned (NRAP).

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